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PROTOTYPING HERITAGE: COLLECTIONS, MATERIALS AND EMERGING APPROACHES TO ENGAGEMENT

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ABSTRACT
This paper presents an emerging approach to the curation of collections that subverts traditional paradigms of conservation intended as preservation of an immutable original condition. Instead, it is based on the creative reassembling of elements of the collection adopted as malleable materials to prototype devices or provokes patterns of exploration. Two examples are introduced to illustrate how this approach can be articulated in different ways. The first concerns aspects of a research project aimed at designing a range of exploratory interfaces and material artefacts to engage researchers and the public with the archive of a poetry publisher. The second involves the use of a collection of geological specimens to create new musical instruments and installation and performance opportunities. The way in which collections became a primary resource for further creative or research work in these examples is grounded in different aspects of their materiality. The paper concludes by addressing how the notion of prototyping heritage subverts a set of established practices in heritage work towards more generative approaches that contextually redefine the relationship between knowledge and artefacts.

KEYWORDS: prototyping, making, curation, co-creation, materiality

INTRODUCTION
Archives and collections carry longstanding associations with history and the past, their preservation being often intended as the maintenance of evidence and sources of authenticity, authority and knowledge [1,2,3,4]. However, some recent approaches to collections' digitisation are accompanied by a critical stance towards such views and invite us to abandon the illusion of being reunited with the past. Instead, we should acknowledge that only a "re-creation of the past as something new" is possible [5]. Our proposal suggests going beyond the mere re-creation of the past, and pushes the generative potential of archival material even further. It builds on established trends in museum practice, where a shift has taken placed from a focus on objects, permanence and contemplation, to paradigms of experience, transience and participation [6,7,8]. This paper suggests the notion of prototyping to describe and conceptualise heterogeneous forms of engagement with archives and collections distinctively characterized by the aim to facilitate further creative or research work.

The role of technology in such practices is paramount, foremost because the process of digitisation can allow for more profound and participatory interventions and manipulations on the collected artefact. Technological interfaces have been so far essentially juxtaposed to museum objects to support access and interpretative journeys. By contrast, our idea of prototyping heritage tends to weaken the separation between original object and digital devices, in favor of more hybrid formations. This approach is discussed and illustrated through two examples addressing respectively the archive of a publishing house and a collection of geological artefacts. What they primarily have in common is the adoption of transformative and collaborative strategies for handling heritage material, making their meanings and physical arrangements radically open to change, and integrated into the development of innovative technological devices.

The paper is structured around an analysis of the two projects, followed by the exploration of issues related to prototyping, and how they tend to subvert established logics associated with the preservation and curation of archives and collections. Finally, we identify tensions and problems connected with our approach in order to raise new questions and enrich further discussion.

UNFOLDING PROTOTYPES
The richness of meanings and values within the concept of prototyping demands for a preliminary overview of the term itself and its contexts of application. Most commonly intended as an early version of a product, or an intermediate stage in the design process, the prototype has been addressed as a way of materializing and sharing ideas or visions [9]. Its role is often to assess technical feasibility, aesthetic issues, usability or experience of a product in development [10]. This makes prototypes intrinsically unfinished and open to further intervention. Prototyping is also valued as a way of thinking and learning by doing [11] emphasizing their potential for integrating the activities of making, reflecting, building, evaluating and ideating in the same process. Their tangible qualities make prototypes not only particularly persuasive and effective in convincing stakeholders of the desirability of a product [12], but also ideal tools for collaboration, catalyzing creativity from different participants [13]. They do so also by eliciting discussion, facilitating the comparison of different perspectives, and contributing to the articulation and sharing of knowledge around a project. Key factors in processes of open or grassroots innovation, prototypes have been assigned an empowering role for citizens to become able to position themselves critically with

respect to the introduction of new socio-technological practices, rather than accept 'top-down' or imposed design solutions [14].

To summarise, the essential characteristics of prototypes which are useful to our exploration of innovative heritage practices are their unfinishedness and openness to change and collaboration, their material and tangible nature, their inherent connection with the sharing of knowledge and ideas, and their future-orientation, supporting innovation, invention and debate.

The convergence of prototyping with the heritage sector has found a promising territory within the Digital Humanities, variously intended as a field of practice, an approach to scholarly work, or a repertoire of topics [15,16]. Here, prototyping might result for example in experimenting with digital interfaces and information visualization techniques to develop new ways of exploring archives or collections, for example in the work of practitioners such as Tim Sherrat [17], or as produced by institutions such as the Smithsonian or the Rijksmuseum [18 , 19]. The rise of a maker culture [20], promoting collaborative practices of DIY, technological tinkering, recycling, open source and digital fabrication, offer a further site of convergence for heritage and prototyping, when making is introduced as a way to activate and bring new light over museum collections. Our two examples are respectively addressing both these fields of action, therefore offering two different approaches to prototyping.

THE POETICS OF THE ARCHIVE

'The Poetics of the Archive, Creative and Community Engagement with the Bloodaxe Books Archive' was an eighteen-month-long research project conducted by Newcastle University consequent upon its acquisition of the archive of a publisher of contemporary poetry, Bloodaxe Books, consisting of around 60,000 documents, mostly manuscripts of poems. Led by the School of English Literature, Languages and Linguistics, with collaboration from Fine Art and author Schofield as a design researcher in Computer Science within Culture Lab (a research hub focused on media art, interaction design and human computer interaction), a significant aspect of the project involved the development of digital interfaces to allow innovative interactions with the archive.

Collaboration and Creativity

We have noted following Schrage [13] that prototypes have the capacity to support collaboration and catalyze creativity. In this project there were a number of reasons why this was particularly desirable. First, the project team was comprised of researchers and professionals with very diverse disciplinary backgrounds including art, design, archive and library studies, English literature and poetry. Second, the project included around thirty participants drawn from a national community of practicing poets. Their role was to develop their own creative work in response to archive materials. There was therefore a demonstrable applicability for prototyping as a methodology. In the next paragraphs we will discuss the ways in which we approached interdisciplinary collaboration through our art and design activities and also how, through example, we presented a view of the archive as generative of leading possibilities for new creative work.

A significant feature of the project was that the archive was being catalogued and digitized alongside the research and participation activities. There was consequently a sense that the project was working with a shifting set of ever expanding materials whose own nature was in flux as new items appeared in the catalogue and digitized materials and new relationships between items were formed or made possible. Initially, this experience was most strongly felt by the design researcher (author Schofield) and the archivist and digital assistant, the former because he had access to data being produced in the library and the latter two because they were creating that same data. It was apparent to the design researcher that this sense of liveness and of a growing archive was potentially useful in supporting collaboration and making materials available to other researchers and project participants.

From the outset the design researcher resolved to pursue a strategy of making early design prototypes publicly available (both to project participants and via the internet at large) to promote a sense of the growing archive and to involve collaborators in the developing interface to the archive materials. A series of simple web-based visualizations were developed which exposed different facets of the information being created by the archivist and digital assistant in the library.

Figure 1. Visualization of connections between unsorted archive boxes

Some design work referred explicitly to the fact that the archive was in a state of transformation. In this sense the prototypicality of the work was typical of early design explorations which explore technical feasibility, aesthetic concerns and the configurability of materials. Figure 1 is an example of this early design work. Formally, the visualization is a fairly standard example of a circular dependency graph developed with Javascript and SVG. The principal feature of interest of this visualization is that it was developed responsively to some of the very first data generated for the library, an informal and messy spreadsheet detailing the contents of the cardboard boxes in which the archive was transferred to the university library from the publishers. The visualization demonstrates shared entities between these unsorted boxes. Boxes containing work from the same author, relating to the same title or from the same year shows a connection and connections are listed in the panel at the top right of the screen visible in Figure 1.

The visualization served two distinct prototyping purposes. First, it was proposed as a practical tool to assist project participants in locating materials, tracing authors or simply browsing what was there. Second, it provided an index, a snapshot, of the archive in its un-catalogued state.

A prominent concern in the development of this and subsequent interfaces to the archive was how particular views of the archive become naturalized. Online experience of archive materials is characterized by a limited set of interaction paradigms. Filtering, sorting and searching along with hierarchical categorization dominate these experiences. One function of this visualization prototype was to provide a view of the archive prior to its description in these paradigmatic terms. The prototype was intended to provide a permanent, digital reminder that all subsequent representations of the archive were the result of careful professional, discipline-specific constructions. In this sense we draw parallels with Latour's 'compositionist' manifesto, where we agree that 'what is nice [about the term 'composition'] is that it underlines that things have to be put together (Latin componere) while retaining their heterogeneity.'

[21]. With this comparison we emphasise our stance which, like Latour's 'matters of concern' moves from a bare emphasis that knowledge, representations and archives are constructed to ask 'Is it really possible to transform the critical urge in the ethos of someone who *adds* reality to matters of fact and not *subtract* reality?' [22]. Our guiding aim, however achievable it may or may not be is, paraphrasing Latour, to treat archives as so complex and entangled that they resist being treated as a matter of fact but instead can be described as a 'gathering' of heterogeneous materials, people and things [23, and see also 29].

Our prototypes try to intervene in a space where constituent parts of an object (an archive) are taken as features of interest and where those constituent parts are publicly constructed, dismantled and reconstructed into various combinations and exposed. We are not attempting to find an ideal interface design. Rather we are asking, what paths, what relations, what experiences can be generated by combining, processing, describing and exposing archive materials through prototyping. That is to say that our interest is in 'generating more ideas than we have received' [24] Our design approach attempted to put this ethos into practice. For example, in another prototype, 'The Marginalia Machine' (Figure 2 andFigure 3), the design researcher composed a set of materials to explore facets of archival materials and to articulate one possible vision of what was interesting about them.

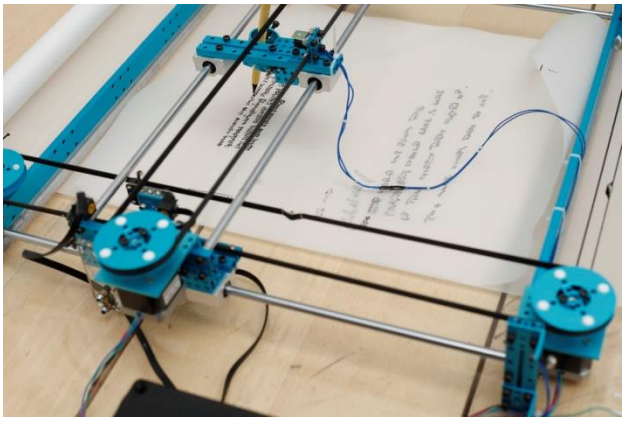

Figure 2. The Marginalia Machine

The Marginalia Machine (henceforth MM) is a drawing robot (a Cartesian plotter) which reproduces editorial notes from poetry manuscripts from the archive without the original poem texts. Taking a scanned poetry manuscript, custom-made computer vision software differentiates the text of the poem itself and the handwritten notes around it. The text is discarded and the notes are sent to the machine where they are drawn, with a pen, on a continuous scroll of paper. The MM was exhibited as an artwork in an internationally significant festival of poetry at the Royal Festival Hall, London, UK in 2014.

The development and exhibition of the MM served a set of purposes relevant to our prototyping methodology. First, it acted as conversation point around which the design researcher could interact with members of the public and other researchers discussing aspects of the research project and the archive itself. As importantly though, the MM assembled a set of features of interest in the material archive, its working history and its new identity as part of an institution. The gathering of these features was intended to add to a shared conception of what the archive is. Archivists refer to the 'life cycle' [25] of records. In this model, documents go through various phases of activity as they fall from an active role in decision making. When records become inactive (if they are kept), an archivist assumes responsibility for their management and preservation.

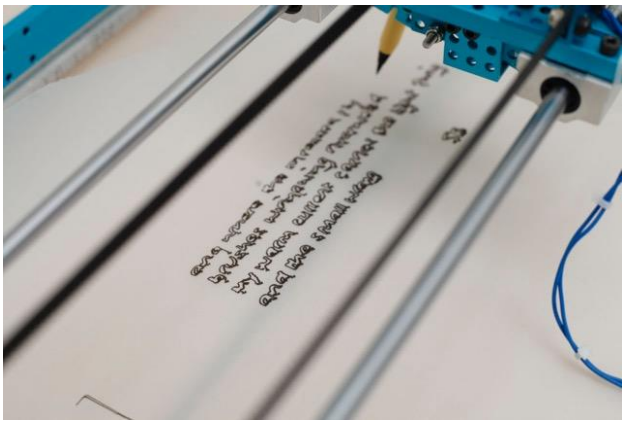

Figure 3. The Marginalia Machine, close up view

The MM attempts to disturb the separation of these phases of the cycle by re-enacting active periods (i.e. the editing process itself) during the final, inactive stage. By doing so it positions the documents as once more the focus of an active productive relationship, this time as features of an artwork. The MM emphasizes the archive as a site of professional and research work. The machine displays new items as they are scanned into the archive for the first time providing an index to that activity. Not only does it recall the initial editorial work within the publishing house itself but also situates the documents within a set of practices belonging to the archiving profession.

The MM composes a set of ideas around archiving which combines a number of elements within the archival ecosystem. It begins from the technical possibilities afforded by the digitization process of a particular kind of document combined with the state of technological progress of a particular suite of tools. The separation of printed text and handwritten notes is possible not only because of their presence, in combination, within the archive but also because of a technical failing within optical character recognition (OCR) software that is exploited by the work. The MM software relies on the fact that OCR software in its current state of technical development fares poorly with handwriting and leverages this failing into a feature of interest. The software is successful in identifying the handwriting precisely because this is what would normally be omitted from the new digital archival record. As such the MM is as much a comment on the limits of the kinds of vision embodied by hybrid digital materialities as it is a focus on the transactional past of particular items.

The generativity of this kind of prototyping is at once aesthetic and critical where our sense of the latter is additive rather than subtractive. The blending, referencing and re-enactment of the temporality of professional activity aligns with Dewey's [26] view of aesthetics as intrinsically related to the pasts of artefacts as located within human transactions.

INTERGLACIAL/ERRATICS

As part of the Pacitti Company's 2014 'Unlocked' programme, authors Bowers and Shaw were invited to respond to a number of artefacts from the natural history and geology collection at Ipswich Museum, UK. Approaching the collection as creative materials, the practitioners, who both work as sound artists, designed and developed a number of sonic responses and used various forms of data sonification and visualization to create a multi-channel sound and image installation. The artwork directly responded to locally found artefacts, including a 330 million year old tree root, a fossilised elephant's ear and a number of Neolithic tools such as spear and arrow heads. The artistic techniques included sonification of historic data, sonification of real-time sensor data and the building of instruments that incorporated conductive material synthesis.

Figure 4. John Bowers & Tim Shaw at Test Department, part of Performing Collections by Pacitti Company, photo by Mafe Valen.

The work was developed through a series of 'public making' sessions and was presented at the Pacitti Company's Think Tank space in January-February 2014. Upon arrival at the Pacitti Company's gallery space, the artists were confronted with a number of boxes that had already been delivered by Ipswich Museum staff. The boxes contained approximately 40 artefacts that had been chosen by the museum specifically for this project. Some of the objects were designated 'handling artefacts' while others, including a fossilised elephant's ear and a woolly mammoth's tooth, were packaged individually as extremely rare examples not to be touched.

The artists worked alongside members of the public to gain an understanding of the collection as material. By handling the artefacts and establishing the textural properties of the materials they were then reconfigured as 'ingredients' with which to build new instruments and create novel sensory experiences. The specimens were coupled with geological data, weather data and field recordings relating to the artefacts' places of discovery. These raw materials were then explored with electrical currents, atmospheric sensors and microphones. The collected information was processed through various forms of digitization, sonification and visualization. These various responses were then collectively assembled with each facet contributed to an overarching artwork. In the making process around 10 responses to the collection were built [27]. To give a taste of the nature of the work three are described below.

The Sonic Microscope

One participant of the public making cohort, Giovanna Maria Casetta, brought a digital USB microscope to the first session. She had used it in some of her own work around forensics to take close up images of fictional evidence at a fictional crime scene. Using a number of sound making techniques these microscopic images were made into sound generators. The first method was to pixel scan the live video feed using the software PureData-Gem. Taking the greyscale of each pixel the data was mapped to a wavetable and made audible. Changes in timbre were created by the differing surfaces of the museum samples being examined. A textured surface would create a dense, complex waveform with tight harmonics while a smooth, flat surface would create a more simple, single tone wave shape. Taking technical and conceptual inspiration from Andre Smirnoff's text 'Sound in Z', which documents early Russian experiments into acoustic technology, [28] Bowers and Shaw built an ANS Synthesizer version of the sonic microscope.

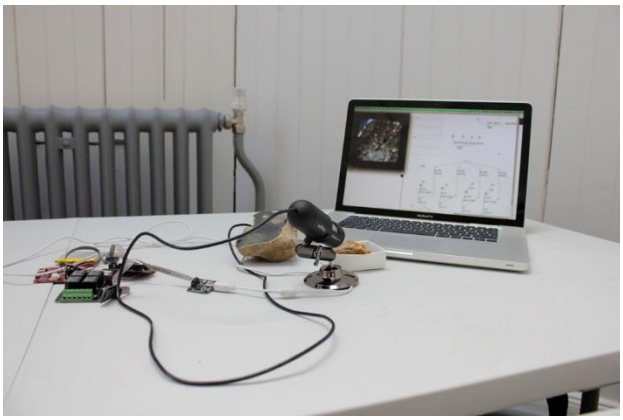

Figure 5. The Sonic Microscope

In this construction each pixel line related to a different oscillator. The gain of each oscillator was controlled by the amount of light in each pixel. The image was scanned vertically and became a graphic score adding a visual stimulus to the on-going soundscape. The Sonic Microscope was presented on a table with a number of rock samples so participants could explore sonic and visual textures at leisure.

Rock Harmonium

To explore the texture and consistency of a number of non-precious rocks from the collection, Bowers and Shaw set up a low voltage circuit powered by a 9-volt battery. The circuit was connected at one side to the battery and the other to a loudspeaker with the various rocks in between acting as resistors. As current passed through the material, varying resistances resulted in noisy splutterings amplified through a mini-speaker. The rocks were set side by side each with an on/off switch giving the construction more performativity so visitors and fellow public makers could play the construction with ease.

Figure 6. The Rock Harmonium

Field Recordings

Participants made an effort to map the various artefacts to specific locations, and it was decided that the team should collect a number of site relevant field recordings. Once collected the recordings were processed in a number of ways including granular synthesis, transducer to surface explorations, and various forms of manipulated playback. The collected recordings were approached as another fluid element that could be layered alongside the physical and sonic material.

Public Making, Exhibition and Sensory Space

It is important to note that the transformation of these artefacts from historical object to 'present' potential materials took place publicly. Rather than present the reconfigured artefacts as part of a completed artwork participants were invited to carry out and witness the process as we worked. All of the responses made were in a flexible state of flux as the artists continued to tinker and develop aspects of the piece throughout their time at the residency. During the making process the team attempted to create a working space which could be easily navigable by visitors. Keeping a clear path through the room and setting space between the various construction 'stations' allowed visitors to travel through the environment with ease. An effort was made to differentiate areas between partially complete instruments and more developed constructions. This enabled the participants to have making tables dedicated to work 'in development' whilst other channels of the installation continued. The various objects from the museum collected were placed on a desk near the entrance to the space. By setting up the environment in this way, our intention was to create a physical trajectory through the installation environment relating to our ideas around material trajectories.

While more responses were added to the environment, a structured exhibition feel quickly emerged. Putting together the work in this way created the form of a 'sensorium', a configuration of overlapping and intertwined sensory experiences. This ecology of activity could be simultaneously experienced as a whole alongside a more detailed exploration of its parts. The environment was built from a collection of 'islands' or 'stations' each demonstrating a differing construction or response to the archival material. Most stations were associated with one or two loudspeakers which were positioned into groups of three, creating a 'lattice' of listening spaces. While visitors navigated the space, complex 'crossfades' between stations could be experienced, allowing one's position within the sensorium to directly inform one's own experience of the composition. In this way each visitor had the opportunity to zoom in and out of each construction and experience the piece as a whole or focus on individual stations. To reinforce the sensory space, the room was darkened, lit by small lights, computer screens and projectors. Clear paths were left between 'islands' to allow audiences to pass through safely and with ease. The inner workings of the piece were also on display as part of the overall composition. Laptops could be seen with software windows and code patches running. Again this gave the public a chance to see the engines running as part of the work.

Activities were configured in a particular way to open up the making process to allow participants to engage with the technologies that were being used as well as the collection in hand. This method of working in public was later coined Public Making, a flexible principle of working in public, and with the public, to make creative work in response to collections, heritage sites and archives. By approaching the work in this way the artists allowed for the project to have a flexible and open nature. All of the responses were built during the time with the collections and both in and with the public. The participants who joined in could configure themselves to the work and contribute how and when they felt fit.

PROTOTYPING HERITAGE

Taking these two projects together, we want to draw out key points of commonality. We wish to discuss how both, in their different ways, can be regarded as contributing to a concern to 'prototype heritage'. We identify five key points of connection between the logic of prototypes and possibilities for working creatively with heritage collections revealed by the two examples.

1) The first reason to describe these projects in terms of prototyping is their approach to *unfreezing collections*, reintegrating their artefacts into new cycles of transformation, sometimes literally turning them into raw materials to be used in the creation of something new. The creative interventions described involve both the meanings and the materialities of the collected artefacts, rendering them temporary and contingent.

2) Furthermore, the usual contexts of display are altered through impromptu, *alternative juxtapositions*. In *The Poetics of the Archive* various interfaces generate novel associations between the archival items, allowing for a rich range of criteria to retrieve and connect the digitised content. *Interglacial/Erratics* poses a special focus in arranging novel displays and adopts juxtaposition between museum artefacts, data, technological devices and material assemblages as a core making principle.

3) Another key point consists in the *generative character* and drive of both projects. Archival and museum artefacts (or their digital versions) are variously manipulated in order to support new creative or research work. In other words, they become the basis to create something new and different, the starting ingredient for further production.

4) Additionally, both projects involve the creation of new machines and devices that can be considered *prototypes*. The *Marginalia Machine* is perhaps more re-fined than the sonic devices put together by Bowers and Shaw. Nevertheless they all generate new interactional practices and behaviors between heritage artefacts and the public.

5) Finally, *collaboration and participation* are central to both projects, emphasizing how prototyping offers a framework for collaborative making and public engagement.

SUBVERSIVE LOGICS

These kinds of creative interventions possess great potential in attracting new audiences and increasing accessibility to collections. This however requires a process of adaptation and redefinition of established principles which have guided the encounter between publics and heritage for a long time.

Education has been recognized as a crucial function for the museum since its inception as a public institution. Indeed, only recently have didactic and informative frameworks to the interpretation and communication of museum artefacts been paired with more experiential ones [31]. The idea of prototyping heritage suggests a significant shift from didactic to more generative approaches, promoting the creation of new work alongside the delivery of historical, contextual, biographical or other kinds of information about an artefact. The idea that they belong to a context of origin, usually displaced in the museum display, and in need of being rebuilt through interpretation, is at the centre of discussions particularly around the relationship between museums and cultural diversity (see for instance [32]). Both the archive interfaces discussed and *Interglacial/Erratics* consider context in completely different terms. Altering or distancing the collected items from the context of origin, and establishing novel associations and arrangements is valued as an enriching and playful strategy for engagement, rather than a betrayal of authenticity.

A further point of subversion concerns the significance of the artefact. At the basis of every archive or collection there is a

specific rationale, so that items are included because of their historical, literary or artistic value, for instance. This also reflects on the way they are communicated to the public. The reasons why the geological artefacts became relevant to creative practitioners or a general audience during the public event run by Bowers and Shaw differs from the reason they became part of the collection of the Ipswich Museum. What was emphasised in the prototyping process was in fact their sensorial qualities and their potential for generating sound. Similarly, the manuscripts from Bloodaxe Books, originally included in the archive because of their relevance to the history of the publisher and its works, are more autonomously experienced through digital interfaces depending, for instance, on their shape or the presence of selected keywords.

Recent writings on material culture in anthropology can help us deepen this point. Ingold [29] for example notes how commonly we are presented with ready-made objects without access to the means by which they were produced because, say, they are part of an archeological record or they are part of an industrial production process we cannot inspect. The means of their making is lost or hard to recover. For Ingold, there is a profound difference between 'objects' on the one hand and 'material' and 'things' on the other. Through the examination of the lived practices of 'makers' of all sorts, Ingold argues that we can approach artefacts as materials that have inherent potential, rather than objects with fixed cultural meaning. In our work, our intention has been to reconfigure artefacts drawn from collections and find new ways in which they could be understood and engaged with, in particular, creative artistic ways. In this fashion, we seek to question some traditional thinking around heritage and museum practice, which presents artefacts and objects from the past, rather than framing them in the context of their presence in contemporary culture and their 'perdurance' [30] into the future. In doing so we aimed to enable greater playfulness of engagement with the collection for both us as artists and designers working with them and our audiences, and consequently a deeper understanding of how the materials came to be the objects they are in the museum's collection (compare with [39]).

The notion of prototyping is also casting technology in a new light within museum and heritage work. Digital technologies have been widely used in museums primarily as an aid to interpretation and to enhance visitor experience, providing additional information, educational resources, playful interactions, immersive or personalized activities, or to allow remote visits of the collection [8, 33]. In all these instances technological systems are intentionally maintained separately from the museum objects, and attributed auxiliary roles. In our example projects, by contrast, they are deeply integrated into the archival or collection material, to the point that it might be temporarily impossible for the visitor to clearly distinguish them from each other. This happens precisely when heritage items are at least partially freed from fixed identities and meanings, and reinserted in a cycle of transformation and manipulation.

When collections and archival materials become involved in a process of prototyping, the relationship between objects and knowledge also comes to be re-discussed. Prototyping is a common tool in artistic research where creative artefacts are the outcome of a research process and frequently intended as embodiments of knowledge [34]. Proponents of artistic research have engaged in passionate debates to affirm their approach alongside more established methodologies and academic criteria for contribution to knowledge. In this context, the notion of knowledge itself is redefined as provisional, situated, tacit and contingent, an action or movement rather than a static entity [35, 36]. Practices of prototyping heritage similarly trigger a shift from archival and collection items intended as carrying fixed knowledge content, to their role as materials of making and knowing.

PROBLEMS AND TENSIONS

The paper advances the notion of *prototyping heritage* as a proposal to introduce a generative dimension in approaching archival or collection materials. Whereas heritage is usually interpreted as something to preserve for future generations, we want to emphasise its potential for engendering new work. The role of heritage in legitimising or de-legitimising cultures, and its dependency on power relations and ideologies, has been discussed and acknowledged by a number of scholars [37, 38]. In this light, our stance can be understood as a way of liberating cultural artefacts from fixed visions or ideologies, and restoring their position among a multiplicity of values and possibilities. We also hope that our work enables discussions to be opened out as to how those efforts at cultural legitimation are themselves the product of work which, at one time, was a form of creative appropriation in which materials were fashioned for certain ends.

We are aware however of a number of challenges that this approach has to face. By subverting established principles and practices of heritage work, the idea of prototyping heritage could generate conflict among the different stakeholders involved in these kinds of project. Despite an emphasis on materiality and manipulation, issues related to preservation are limited, as creative practitioners are generally willing to adopt measures to avoid damaging the artefact, and a great deal of these practices only directly manipulated digitised material or less precious specimens. Stronger tensions concern instead the dynamics of transdisciplinary work, inevitable when artists', makers' or designers' interventions involve archives or collections, environments already populated by a varied set of different professional identities, such as archivists, historians and curators. No matter whether these collaborations take place within archives, museums or universities, they will inevitably involve mediating between different aims, languages, methodologies and patterns of work.

Finally, we acknowledge that our conceptualization of these practices as prototyping heritage is not enough to account for their hybrid identity. It is unclear and very much open to debate if we should address the outcomes of these projects as artworks; devices or interfaces; temporary assemblages or display. A case by case distinction might obviously be a practicable solution, but we believe that further research and discussion could provide more cohesive responses and perhaps enrich the vocabulary associated with these emerging practices.

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KNOWLEDGE, IMPACT AND LEGACY IN COMMUNITY HERITAGE RESEARCH PROJECTS

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ABSTRACT

Cambridge Community Heritage (CCH)[1] was a *Connected Communities* project funded by AHRC under the Research for Community Heritage (R4CH)[2] call. CCH involved ten University of Cambridge researchers in Archaeology, History, Heritage and Public Engagement in co-produced research collaborations with community groups in eastern England in 2012 and 2013. In 2012 CCH helped 24 community groups develop groups' own ideas for heritage projects into proposals that they could submit to the Heritage Lottery Fund (HLF) *All Our Stories* fund; and subsequently in 2013 CCH worked with 28 successful groups to deliver these projects. CCH projects involved more than 5,000 members of communities of place, occupation, interest and identity including local historical societies, football clubs, church groups, traveller communities, schools, women's groups and military regiments to explore aspects of their heritage which were important to them. The projects were enthusiastically embraced by communities and generated a wide range of outcomes, receiving excellent feedback from community participants and university researchers alike. This paper reviews the aims and outcomes of *Cambridge Community Heritage*, analyses the opportunities and challenges encountered in this programme and elicits some of the issues pertaining to sustaining, tracking, identifying and evidencing both short-term impact and longer-term legacies from these projects.

INTRODUCTION

This paper reviews the aims and outcomes of the *Cambridge Community Heritage* (CCH) programme, its impact and legacies, and assesses its implications for the role of UK universities in the early 21st century. CCH was funded by the Arts and Humanities Research Council (AHRC)'s *Research for Community Heritage* call under the *Connected Communities* theme's *Research for Community Heritage* (R4CH), with the aim of supporting the development of co-produced heritage-related research collaborations between the University of Cambridge and community groups.[3] R4CH partnered the *Heritage Lottery Fund* (HLF) *All Our Stories* scheme (ICF 2015) which, inspired by the success of BBC history series '*Great British Story: A People's History of Britain'* (presented by Michael Wood and broadcast Summer 2012), aimed to give members of the public the opportunity to get involved in exploring their own heritage. Community groups were required by HLF to be constituted not-for-profit organisations operating within the third sector, but not necessarily registered charities. The CCH team constituted ten University of Cambridge researchers specialising in Archaeology, History, Heritage and Anthropology: Dr Britt Baillie-Warren (Archaeology and Heritage); Dr Sarah Baylis (Art History and Oral History); Nicola Buckley (Public Engagement); Dr Mary Chester-Kadwell (Archaeology); Dr Nicholas James (Archaeology and Heritage Management); Dr Jonathan King (Ethnography and Museums), Dr Susan Oosthuizen (Archaeology), Dr Alex Pryor (Archaeology), Dr Ken Sneath (Social and Local History) and Dr Sam Williams (Social and Local History), led by PI Dr Carenza Lewis (Archaeology and Public Engagement) with administrative support by Ms Clemency Cooper. CCH involved more than 5,000 members of the public in heritage-related research projects in eastern England in 2012-13.

CCH METHODOLOGY

A fundamental principle of R4CH projects was that the subjects to be explored and the approaches used should be chosen by community groups, not by University of Cambridge researchers. This is an unusual approach for a research council-funded project, in which research priorities are usually identified by the academic community, but this co-produced approach to identifying and prioritising project aims and objectives reflects current thinking in heritage studies and community archaeology (Moshenska and Dhanjal 2012; Skeates, McDavid and Carman 2012) and is gaining traction in academia (Facer and Enright 2016). All R4CH projects were jointly funded by AHRC and the Heritage Lottery Fund,[4] with the latter providing funds for groups to run their projects and the former funding university partners to provide support to groups.

The CCH project started in March 2102 with an open call from the University of Cambridge inviting community groups in eastern England to approach CCH with groups' ideas for heritage projects involving members of their communities. The invitation was promoted via University of Cambridge institutional and personal networks, making extensive use of social media. Recipients were encouraged to pass the call onto others. 34 groups responded to the CCH call and in May 2012 representatives of most of these attended one of two introductory

[1] http://www.access.arch.cam.ac.uk/communities/cch

[2] http://www.ahrc.ac.uk/Funding-Opportunities/Research-funding/Connected-Communities/Pages/HLF-All-Our-Stories-Initiative.aspx (accessed March 2015)

[3] http://www.ahrc.ac.uk/News-and-Events/News/Pages/Research-for-community-heritage.aspx (accessed March 2015).

[4] http://www.hlf.org.uk/looking-funding/our-grant-programmes/all-our-stories (accessed March 2015).

structured networking events run by CCH. These provided an opportunity for group representatives to find out more about the AHRC/HLF programme and to meet CCH researchers and people from other groups in intervals. Most importantly, each group took part in three or four 15-minute one-to-one meetings, each with a different CCH researcher, during which groups' ideas for projects were presented and discussed (fig 1). On the basis of these discussions, the PI subsequently allocated each group a named 'link' researcher who was the responsible for providing groups with any help they asked for in developing their ideas into realistic funding proposals.

Fig 1: Community group leaders attending structured networking meetings with CCH researchers in May 2012.

Bids by community groups for funds to run their projects were submitted to HLF by 24 CCH-supported groups in July 2012. Three months later, 90% of the CCH groups learned their bids had been successful, with each successful group receiving up to £10,000 from the HLF to run their project (fig 2). Early in November CCH held a further consultative event for successful groups during which they met again with CCH team researchers in order to identify any requests or needs for further support and begin planning the delivery stage of their project. At this stage, several other successful groups which had not been involved with CCH in the bidding stage approached CCH for support in the delivery phase.

Fig 2: Representatives of Cambridge United Football Club with Michael Wood (presenter of BBC's Great British Story) at the Heritage Lottery Fund launch of All Our Stories.

With support needs identified, PI Carenza Lewis was able to bid to AHRC early in December 2012 for further funds needed to provide continued support to groups during the delivery phase of their projects, and in February 2013 learned that this bid had been successful. From then until December 2013, the CCH team helped a total of 28 community groups[5] manage and deliver their projects, providing general support and oversight as well as specific advice, training and expertise as required. Each group was allocated a link researcher as their key contact for the delivery phase, with most groups involved with CCH in the bidding phase retaining the same link researcher they had in the development phase.

In 2013 CCH provided a series of workshops providing training in a range of skills and techniques (such as interviewing for oral history, using historical archives and archaeological excavation) (fig 3). While projects were setting up and running, CCH link researchers provided one-to-one advice to their allocated groups online, via telephone or in person as required, drawing on knowledge and expertise from others in the CCH team if and when needed.

Fig 3: A CCH training session in pottery identification.

A final plenary event was held in November 2013 when CCH groups presented the aims and outcomes of their projects as artefacts, displays and films (fig 4) and the PI and Karen Brookfield from the HLF gave presentations about the scope for future collaborations and sources of funding.

Fig 4: Freudian Slips' exhibit from CCH's final plenary event: 'talking' pillows containing audio recordings of oral histories of Cambridge laundry workers.

[5] A list of all CCH projects can be viewed at http://www.access.arch.cam.ac.uk/communities/cch/cch-projects (accessed March 2015)

CCH RESULTS:

Groups supported by CCH successfully running their projects in 2013 ranged widely in their interests, embracing communities of place, personhood and profession and including local historical societies, church groups, a Traveller charity, schools, a football supporters' club, women's groups, environmental groups and military regiments. The projects themselves ranged correspondingly widely in both their subject matter and their chosen means of investigating it, including archaeological fieldwork and excavations, documentary research, local histories, visits to collections, oral history recording, historical re-enactments and writing new heritage-related material for publication, performance and dissemination.

Two very different projects, the Saffron Walden Museum *Castle Bailey Project* and One Voice for Travellers' *Open Roads and Eastern Skies* project, are described below in order to show how CCH projects proceeded from plan to delivery and the sort of outcomes and impacts which were achieved.

EXAMPLE 1: SAFFRON WALDEN CASTLE BAILEY

The primary aim of Saffron Walden Museum's Castle Bailey project in its application to HLF was to involve 30 sixth-formers attending two local state schools in new archaeological excavations intended to find the line of the outer bailey ditch of the medieval castle in their local town of Saffron Walden in north Essex. The possible route of bailey ditch had been inferred from earlier research to run across an open area of common land in the centre of the present town (Bassett 1982), but this hypothesis had not been tested.

The 2013 Castle Bailey project, developed by the museum with CCH advice and support, included workshops to introduce pupils to the aims of the excavation; geophysical surveys to identify likely targets for excavation and locate trenches; excavation of two trenches by 30 pupils over five days in late July 2013 (including daily blogs and public site tours) (fig 5); an open day and exhibition of the results hosted by pupils in September 2013; preparation of a report on the results by CCH (Lewis and Ranson 2013); the development of learning resources for feeder primary schools and deposition of the excavation archive with the museum.

Fig 5: Students from north Essex excavating the ditch of the castle bailey discovered crossing Saffron Walden Common in 2013.

The excavations revealed two sections of a ditch close to the inferred line of the castle bailey and, particularly importantly, found pottery which dated one section to the 12th century, proving that the ditch was indeed that of the castle. This finally confirmed postulated ideas about the line of the castle ditch but also revised ideas about the development of the medieval town plan (Lewis and Ranson 2013). Integrating this information into academic research through the involvement of university researchers specialising in medieval Britain (CL) will allow the new discoveries to advance understanding of broader issues such as the development, character and role of castles (Creighton 2002; Lyddiard 2005) and towns (Ottaway 1992) in the medieval period. The 2013 excavation provided new finds for the museum, substantive evidence to underpin future interpretational material and improved knowledge of the extent and condition of buried heritage assets on the area of the Common which will inform management of the site in the future.

Written feedback forms including a range of questions including tick box, scalar and free text answers were completed by 50% of the student volunteers in order to assess the impact of the project on those who were most closely involved. This showed that despite having to excavate through extremely hard deposits and endure severe extremes of weather over the five July days of the excavation (which included temperatures into the 90s interspersed with torrential thunderstorms), 87% rated the experience as excellent, and 67% enjoyed it *much* more than they expected to. Described by several students as 'brilliant' or 'amazing', one typified attitudes in commenting 'It was an amazing experience and I would love to do something like this again' (PL), while a teacher taking part with their students saw it as 'so beneficial in terms of inspiring them (the students) for future study/curiosity' (CA). The pupils who took part in the excavations gained new work experience to enhance CVs including evidence of their willingness to volunteer, take on new challenges and work with persistence, all of which can support applications to university and for employment. 100% of respondents felt they had learned new skills in teamwork, observing, recording and analysing, with 87% strongly agreeing this to be the case. All also felt they knew more about the archaeology and history of Saffron Walden as a result of their participation, with 33% strongly agreeing this to be so. This indicated that all had gained a better understanding of their local heritage – of what survives and how this can inform contemporary understanding of the past. 100% felt they would take more interest in archaeology and heritage more generally in the future, with 53% strongly agreeing, and 100% of respondents said they would recommend the activity to others. Asked to indicate which aspects of the project that had enjoyed most, responses showed that 'finding things' was top-rated (100% ticked this box), with 'learning to do something new' (87%), 'meeting new people' (87%) and knowing they were doing valuable archaeological research (80%) also highly ranked. The CCH-linked university team supervising the students on the excavation were widely appreciated as 'so inspiring' (AH) and 'great, very patient' (FA).

More broadly, the project reached hundreds of visitors to the excavations who learnt first-hand about the project aims and results, as well as tens of thousands more who followed the excavations through articles in local press, interviews on BBC local radio or via the project website and daily blog. This all demonstrated the effectiveness of the project in helping local people become more informed about, and feel more engaged with, their local heritage. The excavations, being both highly collaborative and very public, strengthened networks between the museum and its local schools, councillors, businesses and residents and enhanced the reputation of both the university and the museum as their activities were visibly relevant and popular.

All this generated considerable enthusiasm amongst all partners for other collaborations in the future

In terms of *legacy*, or longer-term impact, robust strategies to sustain and propagate impacts were written into the Saffron Walden project plan from the outset. These sought to embed the potential benefits offered by the involvement of the museum in the project. The finds and records from the excavations were retained by the museum and will be available there for future research as needed and will also inform future displays in the museum and be used to develop education packs for use in the museum as well as in schools, cascading the knowledge gained and the sense of engagement to subsequent generations. One of the participating schools created a learning package based on the excavation for pupils to take into their feeder primary schools. These outputs have the capacity to deliver a more engaged population more interested in, and therefore supportive of, their local heritage and more aware of how this can contribute to local communities, potentially rendering heritage assets better understood and better protected by a local population which knows and cares more about them. New personal and social networks within the local community were created and strengthened as people from different walks of life contributed in different ways to the same project, including the museum staff who coordinated the activities, schools which took part, town councillors who gave permission for the excavations on town land and local businesses who provided in-kind support. Pupils participating in the excavations were inspired by the experience and this, along with the transferrable skills they gained, leaves them better fitted to gain good university places and career opportunities, ultimately enhancing their ability to contribute positively to society. Their engendered enthusiasm makes them likely to pass their attitudes to heritage and volunteering on to others in their schools, families and communities. The future of the museum is made more secure by having publicly and very visibly demonstrated its value to the local community, reaching beyond those who normally visit the museum, and as an ongoing institution it provides both place and personnel to help sustain the legacy of the project, completing a virtuous circle. Drawing on success, future collaborative projects are already being discussed, which will in turn help propagate this legacy.

EXAMPLE 2: ONE VOICE FOR TRAVELLERS '*OPEN ROADS AND EASTERN SKIES*'

The aim of the One Voice for Travellers (OV4T) group was to involve teenage female members of the Gypsy/Traveller community in eastern England in recording for posterity accounts of their lives and those of older Gypsy/Traveller women, in order to increase intergenerational knowledge and understanding within the communities. The desirability of such a project had been identified by OVFT workers and Traveller community members during work on other programme supporting women in the Traveller community. The project involved CCH researchers and OV4T leaders in developing and reinforcing contacts in GRT community; identifying, recruiting and training interviewers; contacting and recruiting interviewees; developing acceptable protocols (especially around confidentiality); recording interviews; editing recordings; uploading edited interviews to the website and CD; and developing an exhibition for the Museum of East Anglian Life in Stowmarket, held in February 2014.

In terms of outcomes, the project succeeded in recording new accounts of the lives of dozens of women, generating a valuable resource for the community and potentially for research, especially valuable given that Traveller and Gypsy communities are often marginalised both socially and in academic research (Acton 1997; Derrington and Kendall 2004; Hayes and Acton 2007). Interviews and conversations were recorded and edited by girls from Traveller communities working with community project leaders, trained and supported by the CCH researcher responsible for this project (SB). Copies of a CD of edited interviews entitled '*Open Roads and Eastern Skies: Stories of Gypsy Women*' were given to participants, visitors to the project exhibition at the Museum of East Anglian Life, and an archive copy was formally deposited with the museum. The young people designed the displays for the end of project exhibition (fig 6), which were also offered to other heritage venues involved in Gypsy and Traveller History Month.

Fig 6: One Voice for Travellers project leaders and exhibition material at the Museum of East Anglian Life in February 2014

Around 60 people were actively involved in the project, which carried out interviews with 26 women and reached around 415 people altogether, including visitors to the exhibition. Collecting feedback on the impact of this project required different strategies to some of the other CCH projects due to issues surrounding attitudes to participant observation and formal information gathering. Formal feedback including paper and online forms was elicited from group leaders and CCH researchers involved in the project, while the recorded interviews and the project exhibition also provided evidence on the impact of the project on participants. Comments[6] such as "I liked the fact the heritage people thought our history was important", "I was a bit worried if the young people would know what to do, but they did and they did it very well" and "I always thought learning about the past was boring and had nothing to do with today, but that's not how it is, the past makes us who we are and what we believe in" show how the project boosted participants' self-esteem and the value they placed on their heritage.

The experience of the project overall was rated by community group leaders at 10/10, as was the impact of the project on the community and the extent to which it had increased members' sense of connection with their heritage. The extent to which it had increased knowledge of their heritage was rated at 9/10.

[6] These and many other comments were elicited from project participants and displayed as part of the final exhibition in the Museum of East Anglian Life early in 2014

Those actively involved in the project developed heritage-linked skills in oral history, using archives and local historical research.

More broadly, the project gave the girls who took part new transferrable skills in communication, interviewing, editing, using social media and project management; boosted their self-esteem, engagement and aspirations; enabled them to make new friends within GRT community; and gave them a better understanding of their heritage, all achievements of immense valuable to the participants. Informal participant observation during project activities added to the feedback. Discussion between the PI and community group leaders present at the exhibition elicited that this was the first time the group had run an oral history project and that they had found it to be a very positive experience, inspiring in the way participants had risen to meet very significant challenges including a death within the community. It was noted that the personal story-telling had been felt to be 'healing' in many cases, as was the experience of sharing the stories afterwards. A conversation between the PI and one of the girls involved in the interviewing showed how the latter's enthusiasm for a prospective career as a teacher had been strengthened, and her self-confidence boosted, by her experience on the CCH project. As the conversation moved on, a pre-teen brother of one the participants, present but silent during the earlier discussion, contributed animatedly when the topic moved on to the use of horses in World War One and expressed immediate enthusiasm for the idea of another project which would allow him to explore further the role of the GRT community in this.

Project leaders in the GRT community gained new skills in project management, including people skills and budget management. Subsequent to the CCH project, they were interviewed on Radio 4[7] and within six months of the project completion, one had secured a place to study for a funded PhD while a second was actively looking for one (e-mail from SB to CL received 20/3/2014). The visits of hundreds of people to the museum exhibition was rewarding for the project participants and suggests that many people gained a better knowledge and understanding of GRT heritage. The project created new networks linking the university, OV4T and this part of the GRT community and generated enthusiasm for other collaborations in the future.

The legacies of the OV4T Open Skies project include a new oral history archive curated by the Museum of Rural Life and available for research in the future[8]. The teenage girls who took part were better equipped to gain qualifications and employment, and to pass their attitudes to heritage and volunteering on within their families and communities. The GRT community may be strengthened by reputational enhancement and new networks developed during the project and by a wider population better informed about GRT lives, all enhancing the capacity for GRT needs to be better catered for in the future. New collaborations in the future would help propagate this legacy.

DISCUSSION – CCH CHALLENGES, OUTCOMES, IMPACT AND LEGACY

CCH Challenges

The All Our Stories/CCH project was extremely demanding for community groups. Most community groups had little or no prior experience of running HLF-funded projects, which demonstrated the R4CH scheme's success in reaching new audiences, but increased the need for support. The timescale was extremely tight, with all projects to be completed by the end of December 2013, i.e. within a single year.

Difficulties were also faced by the CCH team, mostly stemming from challenge of meeting the demands of two very different funders, HLF and AHRC. Some of these were resolvable over the course of the programme, but others were more problematic and were symptomatic of issues encountered by many co-produced community projects. In the former category, lack of synergy between the aims and aspirations of HLF and AHRC made identifying goals, priorities and key performance indicators very difficult; late announcement of timetables, especially in year 1, compromised planning, a problem exacerbated by different timetables being followed by HLF and AHRC; while late changes to funding limits made financial planning difficult. Working under these constraints was challenging and time-consuming and made strategic planning very difficult.

A more serious issue lay in engaging university researchers in CCH. Many could not see how involvement was going to be of use to them or their research career, a suspicion implicitly supported by the fact that HLF showed little interest in the research outcomes of the community projects they funded through *All Our Stories*. This was exacerbated by the perception that while sourcing ideas from communities is at the heart of community heritage programmes, these ideas do not necessarily fit into existing research frameworks or advance identified research agendas, limiting its appeal for many established researchers, especially those with secured permanent university contracts.[9] Furthermore, the terms of the Research Excellence Framework (REF) meant that if there was no explicit, demonstrable connection between the groups' chosen projects and the academics' underpinning research, the scope for submitting the outcomes as impact case studies for the REF appeared to be limited.

Another serious problem stemmed from inadequate funding, which was especially challenging in Phase 2. Despite AHRC increasing the funds available for Phase 2, this was not provided on a per-group/pro-rata basis, with CCH only able to bid for a sum intended to support 10 groups or more. With 28 groups requesting support from CCH, the amount of funded time which could be given to each group was inevitably limited. Several researchers consequently gave considerable more of their time than was funded, which ensured groups were adequately supported but left researchers seriously over-stretched.

A third issue related to the short lifespan of the R4CH projects. All funding (from HLF and AHRC) ceased at the end of 2013, and there was thus no funded provision for maintaining post-project contact with groups, let alone for actively supporting them in sustaining or embedding project legacies. While the positive relationships that researchers had built up with their groups inspired some continued contact, these arrangements

[7] http://www.bbc.co.uk/programmes/b01sjn5t

[8] Museum of East Anglian life reference STMEA:R.L.4022 and STMEA:R.L.4023 (Classification: 8340)

[9] This long-running issue within HE was highlighted in 2010 (http://www.timeshighereducation.co.uk/news/research/research-intelligence-engage-the-selfish-gene/410836.article) and although the increased emphasis on impact in the REF since 2014 has increased many researchers' interest in wider engagement, it remains problematic (Burchell 2015; Wellcome Trust 2016).

were all on an *ad hoc* and *pro bono* basis, and impossible to maintain in the case of team members who moved on to other projects, or other institutions, after the project finished.

CCH Outcomes

In spite of these challenges, the 28 co-produced community/CCH projects were extremely successful, achieving a varied range of both tangible and intangible outcomes (appendix; Lewis 2014a; Lewis 2015). All generated new understanding of aspects of heritage, both amongst those involved and for wider audiences. Most created new resources for future research through activities such as discovering, dating and characterising archaeological sites and finds, publishing local histories, recording oral histories or creating heritage trails, apps, artefacts, displays, and exhibitions[10]. Wider transferrable skills in research, networking, communication and project management were instilled, disseminated and cascaded; new knowledge was exchanged between university and community participants; new research networks were created and reinforced; while social bonds within and between communities were created and strengthened through collaborative networking. The collaborations between community groups and university researchers worked extremely well in stimulating ideas, driving forward progress and delivering outcomes which considerably exceeded expectations. (It was perhaps ironic that the much higher-than-anticipated take-up of the CCH programme was one cause of its funding difficulties.)

Most projects made genuinely new contributions to the incremental process of advancing academic knowledge. In this, the involvement of university researchers was crucial as it allowed new information gleaned during community investigations to be validated, contextualized within and added to, the existing cannon. At Sharnbrook, for example, a previously undated and wrongly classified sub-circular earthwork was dated to the 12th century during a CCH/HLF-funded community excavation (Lewis and Pryor 2014b) and its wider significance recognized as an unusually late ringwork and thus a rare example of a transitional stage in the form adopted by medieval elite residences from castle to moated site. Groups in the villages of Foxearth (Cox 2014), Meldreth (Lewis and Pryor 2014a), Shillington (Lewis and Pryor 2014c), Toft (Lewis and Pryor 2014d) and West Wickham (Lewis, C. and Baillie 2014) all involved hundreds of local residents in small archaeological 'test pit' excavations which advanced knowledge and understanding of the development of these historic communities over more than 4,000 years. Each project generated an analytical report (see appendix) (with data submitted to local archives including Historic Environment Records maintained by local government authorities and inform planning processes). The results were summarised in *Medieval Settlement Research*[11] (Lewis 2013) and are contributing to ongoing academic research into the development of settlement, landscape and demography in southern England (Lewis 2014b), generating new insights into questions such as the impact of the Black Death in England (Lewis 2016).

Other archaeological projects run by Ashwell Museum, Cambridge Archaeological Field Group and Fenarch involved members of the public in field-walking intended to advance understanding of the historic development of landscapes spanning prehistory to the early modern period (see appendix for project outputs). Several groups including Cambridge United Football Club, women's group Freudian Slips, The Royal Anglian Regiment Museum and the Suffolk Horse Society ran oral history projects involving members of various publics in recording the memories of those involved in, or associated with professions as varied as football, the laundry industry, the army and farming in the years around the second world war, creating new audio archives, performances and apps (see appendix for project outputs).

Groups exploring aspects of local histories of place included Ely Wildspace, Heritage Writtle, Rattlesden Local History Group, Sturmer Local History Group, Tilty Archaeology & Local History Group and Wormingford Community Education Centre, generating a range of publications, exhibitions and history trails (see appendix for project outputs).

A number of CCH projects recorded, transcribed and archived memories and oral histories, many provided by much older community members and would soon otherwise have been lost. Interviews recalled experiences and lifestyles which are in now in decline or extinct, while some accessed very hard-to-reach groups such as Travellers, or others traditionally secretive about their specialist 'guild knowledge' such as horsemen. The archived recordings and films created by these projects (see appendix) will be an invaluable resource for future researchers interested in society, community, technology and change. Numerous local history projects likewise created new resources or made existing ones more accessible, which will be of value to future researchers into local communities and histories of place (see appendix). Some groups created resources for schools, publications, exhibitions, heritage centres or trails intended to engage others in finding out about or participating in community heritage.

A compulsory requirement by HLF that community groups should disseminate their results via digital outputs as well as community events ensured the outcomes were widely disseminated in the short term (see appendix), and will remain accessible in the longer term. These outputs show clearly how effectively the projects had succeeded in their stated primary aims of giving people the change to investigate aspects of their own local or personal heritage.

CCH Impact:

In considering how the *outcomes* of a successful community heritage research project can deliver *impact*, it is important to distinguish between these concepts as used in this context. *Outcomes* refer simply to what the project achieves – a site may have been unearthed or a memory recorded. *Impact* relates to the ways in which the project outcomes *make a difference*, and this may be achieved in a range of ways (ICF 2015). At the *individual* level, involvement in the project and/or awareness of its outcomes may enhance and broaden specific knowledge and understanding, but also develop skills, social contacts, networks, aspirations and attitudes, all contributing actually or potentially to personal or economic well-being. For *groups*, impact may be identifiable as new collective knowledge/skills, attitudinal change, reputational enhancement, raised numbers of members/volunteer, improved recruitment capacity and extended contacts which enhance capacity to network or act, or acquisition of collectively held heritage assets. At an *institutional* level, impact may include improved knowledge, skills, attitudes, contacts, networks and reputation while collectively held assets including resources and institutional memory may be acquired and/or enhanced. Within wider *communities*, new resources and assets may be gained, better shared understanding of local environments generated, more positive attitudes instilled, and community integration, cohesion and resilience increased as

[10] See appendix (below) for a list of outputs from CCH projects

[11] *Medieval Settlement Research* is the journal of the scholarly research group for medieval settlement studies

social networks are extended and reinforced. For *heritage*, historic sites and records may be better understood, displayed, managed and protected for present and future generations.

The CCH projects were funded by AHRC, as noted above, with a wider aim of developing new research collaborations between the University of Cambridge and community groups, and feedback showed how this was achieved. A total of 37 different groups were involved with CCH at one stage or another of the project, and feedback from the initial open days in June 2012 showed that even those which did not ultimately run HLF-funded projects appreciated the help they had been given: every single attendee valued 'most highly' the chance to meet with researchers, with 91% valuing the chance they were given to develop their project ideas, generating a legacy of positive attitudes amongst extended community-university networks.

The impact of the involvement of CCH was also evident in other ways as the first (developmental) phase of the CCH programme progressed. During the pre-submission development stage in 2012, a significant minority of groups at one point or another announced a desire to withdraw from the programme to their CCH link researcher. In some instances this was due to confidence being eroded by the perceived complexity of the HLF application process or anxiety surrounding the responsibility of choosing which of a number of possible different options to pursue. Others encountered very specific obstacles, such as the need to obtain legal consent to excavate on a scheduled ancient monument at Sharnbrook, a problem whose resolution consumed a considerable amount of CCH time and would not have been achievable without the professional sectoral knowledge of the project's CCH link researcher (CL). In nearly all cases, the CCH team was able to provide or source support in the form of reassurance, advice, advocacy and/or problem-solving which restored confidence amongst group leaders and led to bids not only being submitted, but in being successful in securing funding. Another clear indication of the difference made by the CCH support at this critical stage of the programme was evident in the high success rate of CCH-supported proposals in securing HLF funding: 90% of the CCH-supported groups which submitted HLF bids were successful, compared with a national average of c.50%.[12]

Feedback was also collected from community group leaders to assess the impact of the projects at the end of the delivery phase in 2013, using paper forms and online surveys to elicit scalar metric assessments as well as free-text comments. This indicated that more than 5,000 people had been directly reached by the 28 projects (this includes visitors to events and exhibitions but excludes remote access achieved online or via broadcast media). Formal feedback showed the CCH projects to be extremely effective in increasing community members' knowledge of their heritage: 97.2% of respondents agreed that this had grown, with the average rating for the extent to which this had been increased being 8.5/10. A wide range of heritage-related skills were developed within groups, including archaeological investigation (65% said they had acquired new skills in this activity); capturing oral histories (54%); creating photographic records (62%); using archives and collections (73%), creating archives and writing for publication (60%) and conducting local historical research (64%). Broader transferrable skills also developed by community members in the course of participating in the CCH projects included organising and running events (developed by 73% of respondents); making films/audio recordings (54%); developing webpages (57%); using social media (43%); developing resources such as educational packs, heritage trails and exhibitions (40%); working with press/media (38%). The CCH projects were also effective in building social networks within communities, with 87% of respondents saying that they had learned more about other people who were interested in their heritage in the course of the projects. Involvement in the projects also boosted people's sense of connection with their community heritage, with the average score for this being 8.6/10. Overall, the impact the project had on the community was rated at an average of 8.4/10.

Options for free-text comment on groups' experience of delivering their project were also available on the feedback forms, and this provided qualitative evidence for the impact of the support provided by the university CCH team. Written comments give a flavour of groups' attitudes: '*Very supportive - always positive and enthusiastic. Good training sessions and helpful informal support. Helped to give us confidence that our project was worthwhile*.' (Freudian Slips); '*The University has been extremely helpful and encouraging. The training days were excellent and everything made me feel more confident to proceed with the project'* (Heritage Writtle); '*The way in which support and workshops were provided from pre-application to concluding celebration was exemplary and a useful lesson for me (as a museum curator) in how to work in participation with community groups. The intense 'dig week' was great fun and a thoroughly memorable and inspiring experience all round - all project participants felt it was a privilege.*' (Saffron Walden Museum); '*The support we received, for example the workshops on writing and suitable recording equipment, have been excellent. Support on the phone, via e-mail etc. has been invaluable*.' (Suffolk Horse Society). In a scheme which increased heritage knowledge so effectively and so widely, the accessibility and friendliness of the support CCH provided and the way this boosted both skills and confidence amongst community groups can be seen to be particularly important, and in this it has achieved one of the keys aims of AHRC in funding R4CH programmes, that of building research networks linking communities and universities. Overall, groups rated (on a scale of 1-10) their attitudes to collaborating with the University of Cambridge at an average of 9.1/10, and the likelihood that they would collaborate similarly again in the future at an average of 9.1/10.

Overall, the impacts of the various CCH projects, and the programme generally, were not only many and various but, importantly, impacts were identified and evidence for them was captured by the CCH project team.

CCH Legacy:

Legacy is defined here as impact which endures. Typical legacies of CCH projects include new tangible resources created and curated for the future as well as intangible skills, networks and attitudes which were instilled, enhanced and disseminated. Some legacies may be sustainable in a static state, such as collections which are curated, or knowledge, skills and networks which are retained. Others may be dynamic legacies which can develop, adapt and grow, such as projects which continue; collections which are cumulatively added to; knowledge and skills which are expanded, diversified and cascaded to others; activities which adapt to meet or develop new opportunities; or networks which extend to draw in new members. While the benefit of achieving such dynamic legacies can be shown through evidencing the difference they make, major challenges present themselves even to highly impactful projects in identifying, establishing, sustaining and monitoring these.

[12] The numbers of applications and grants made was outlined in a filmed press event, transcript available online at http://closedprogrammes.hlf.org.uk/HowToApply/programmes/Documents/All_Our_Stories_Video_Transcript.pdf

With the CCH programme finishing at the end of 2013, it is a little early to assess the legacy of its projects but it is already possible to see how this is developing in the two examples discussed above. The legacy of the Saffron Walden project is tangible in the form of new curated archaeological discoveries now held by the museum, while the pathways to sustaining the impact of the excavations, including the intangible legacies within individuals and the local community, will be easier to monitor through their association with the museum and local schools as well as the university. Legacies from the Open Skies project likewise stem from tangible and intangible outputs, and while the involvement of the Museum of East Anglian Life will help sustain and monitor the legacy of this impact, the fact that the project relied heavily on the commitment of just three key individuals (two members of OV4T and the CCH link researcher) is a potential weak link here, should any or all of these cease involvement.

The CCH-supported project developed and run by Meldreth Local History Group[13] provides a good example of successful legacy generation. The group was a small one formed in 2007 with only a dozen active members in 2012 and no previous involvement in local archaeological investigation. The group responded to the CCH call in March 2012 wishing to carry out a programme of small 'test pit' excavations throughout their Cambridgeshire village in order to find out more about its historical development and to raise their group's profile. Test pit excavation projects elsewhere have achieved a range of outcomes which generate impact and legacy (Lewis 2014c; 2015)

Fig 7: A test pit under excavation in Meldreth in 2013

Fig 8: Residents of Meldreth and test pit excavation teams compare finds from different 'test pits'.

Surviving an early loss of confidence during the development phase in July 2012 with the help of CCH support, the bid the group submitted to HLF in late July explicitly stated that '*During the project we will build up our skills and experience so that we can continue to explore our heritage once the project has been completed*"[14] and suggested "*the village's growing sense of community will be strengthened by the project*". Bearing this out, the project's three excavation weekends were enthusiastically supported by more than 300 local residents in 2013 (fig 7, 8). Project leaders commented in feedback after the project was completed that "*We found the test pitting to be a very social activity and the project encouraged and revealed a fantastic community spirit. People made new friendships and renewed old ones*". The impact of CCH support was indicated by "*We were delighted to be given the opportunity to work with the University of Cambridge and could never have embarked on this project without (their) help and guidance*"

After the excavations were completed, the group curated a superb pop-up exhibition (fig 9) and generated a large amount of website content[15] all of which was both academically informed as a result of CCH's input and engagingly and accessibly presented. Ideas for new avenues of research stimulated by the success of the project by November 2013 included "*...geophysical survey, fieldwalking and digging more test pits. We may also be interested in archaeological investigations on a larger scale if geophysics suggests that this is warranted. Other projects which may benefit from the involvement of a university student or researcher include research into the village's manorial history and the use of dendrochronology/radio carbon dating to date old timbers in buildings*".

[13] http://www.meldrethhistory.org.uk/category_id__103.aspx

[14] Bid submitted by Meldreth Local History Group to Heritage Lottery Fund 'All Our Stories' Fund, p 2.

[15] http://www.meldrethhistory.org.uk/category/ 2013_test_pitproject (accessed March 2015)

Fig 9: Exhibition of finds from the Meldreth excavations assembled for their celebration event in autumn 2013.

Since the HLF-funded CCH-linked programme finished, the Meldreth group has indeed continued and expanded its archaeological activities in 2014[16], completing more 'test pits' involving a primary school (fig 10) and residents of a retirement home (fig 11). They have carryied out a geophysical survey on a manorial site excavated during the CCH project and are planning further funding bids for larger-scale community excavations on this site. In addition, members of the group are now involved in supporting another local group develop its confidence and expertise. In developing this very dynamic legacy, the involvement of the university was crucial in the early stages, while the active involvement of members of the History Group has been crucial in sustaining and expanding the legacy.

The above narrative shows how the CCH-supported project run by Meldreth Local History Group really has achieved identifiable culture change: a group which previously had no knowledge or experience in archaeological investigation now has this firmly established as a core activity which is expanding their reach and impact within and beyond their community to widespread benefit and appears securely embedded for the future.

Fig 10: Post-CCH legacy in action as two test pits are excavated in 2014 in Meldreth Primary School, supervised by members of Meldreth Local History Group. © Kathryn Betts, Meldreth Local History Group.

Thursday October 23 2016 No. 6783 www.roystoncrow24.co.uk

Care home dig is a winner for happy helpers

Residents at a Meldreth care home helped out with an archeological dig when a historical society paid a visit on Saturday.

Meldreth Historical Society enlisted willing Maycroft Residential Care Home members to wash and clean items dug up from a pit outside their home.

The pit contained a number of intact glass bottles, 40 pieces of pottery and various other items which will be sent off for analysis.

Maycroft manager Lynn Ward said: "Residents came out with tea, cakes and snacks for the diggers to keep them going.

"The group enjoyed meeting the residents and vice versa."

Maycroft Residential Care Home helpers were on hand to help the Meldreth Historical Society with their dig.

Fig 11: Front page local press story about a post-All Our Stories/CCH test pit excavation in Meldreth in 2014, organized by members of Meldreth Local History Group.

The Meldreth project is not alone in its legacy potential: all the CCH projects had specific, measurable impacts and also had scope to deliver many and various specific and measurable legacies. In nearly all projects, it was possible to see how both impact and legacy were enhanced by the involvement of CCH researchers in the HLF-funded projects. Considering how the legacy potential was (or was not) achieved highlights, however, that legacy is not necessarily automatically forthcoming or sustainable. The major hurdle to both sustaining and monitoring the legacy of CCH projects lay in the short-term nature of the programme: once the projects had finished at the end of 2013, there was no provision for continued support to groups, or even for contact to be maintained. Thus while details of achieved impacts and potential legacies could be identified in end-of-project feedback, it was frustrating not to be able to monitor these as they developed or to continue to work with groups which, enthused by their enjoyment of the CCH project, were keen at the end of 2013 to develop new collaborative projects. As funding for such activity would have required new grant applications not guaranteed to be successful which could not be made during the life of the projects due to the severe time constraints involved in supporting 28 projects, momentum was lost in many cases as projects finished and research teams dispersed with no onward activity planned.

[16] Summaries of activity in 2014 can be found online at http://www.meldrethhistory.org.uk/page/archaeology_in_2014

In this, CCH highlighted the difficulty many programmes with finite funding face, especially if wider institutional support is lacking. In projects funded on a term-limited basis, any legacy worthy of the term will outlast the project, and sustaining this legacy requires strategic planning and careful management. Monitoring legacies can be particularly difficult, and as time elapses, evidencing a link between project outcomes and legacy can become increasingly difficult. This challenge is explicitly recognised in the establishment of the AHRC-funded Heritage Legacies Project.[17]

Crucially, CCH shows that if impact is to be maximized and legacy sustained and monitored, systems need to be in place to ensure that required resources (which may include time, energy and/or funding), skills, knowledge and networks are present. While individuals, as the agents in the process of legacy generation, will be required to contribute time and energy, the involvement of groups and/or institutions is needed to minimize risk and facilitate eventual succession planning: both are essential to ensuring that legacy sustainability is not compromised by being invested solely in individuals who in due course may move on. Such groups or institutions may or may not have been involved in the original project, and may need to provide support which may be continuous or occasional, pro-active or reactive and range in level of commitment from simply maintaining contact to ensure legacies are monitored, to helping develop and run entirely new 'successor' projects. Universities, as continuing institutions dedicated to learning, are well-placed to fulfil this role.

CONCLUSION – COMMUNITIES, UNIVERSITIES, RESEARCH AND LEGACY GENERATION IN THE 21ST CENTURY:

CCH demonstrates universities' capacity for nurturing research and research networks beyond academia, showing how co-produced, publicly engaged research projects can act as a force multiplier not only for the impact of research but also in the quantum of what is achievable and the diversity of audiences that it can reach. It also provides evidence from numerous projects of ways in which impact and legacy can be achieved, and highlights the potential impediments which may hinder this process. CCH indicates that nearly all community-sourced heritage projects have the potential to deliver myriad outcomes and legacies that are of value both within and beyond academia. It also demonstrates the ways in which vision and resources are needed to effectively identify and nurture impact. It shows that it is important to plan ahead to develop strategies for legacy-generation, but also to be adaptable in order to capitalize on unanticipated opportunities. Likewise, it shows that effective strategies for monitoring impact and legacy must be developed: if impact cannot be evidenced, then it becomes more difficult to justify the provision of ongoing support. It highlights how short-termism can be inimical to legacy propagation, but recognizes that open-ended support will be difficult to justify. The conclusion is that legacy is best epitomized by the development of sustainable new resources, activities or attitudinal/culture change, but that achieving these often requires considerable tapered support as these embed within individuals and/or communities.

Universities, as institutions whose research role transcends individuals, are well-placed to provide this sort of on-going support. This should not be seen as a peripheral activity, as the process of multiplying, diversifying and pluralising both knowledge and benefits of research processes, which programmes such as Cambridge Community Heritage have shown to be achievable to wide-ranging benefit, is one for which universities are, of course, not only well-equipped, but essentially intended (RCUK 2013; RCUK undated). Programmes such as Cambridge Community Heritage, which develop research-engaged communities beyond university walls, clearly and explicitly extend the public benefits of higher education beyond those of private individuals, can help '*sustain a culture which demands disciplined thinking, encourages curiosity, challenges existing ideas and generates new ones; [and is] part of the conscience of a democratic society, founded on respect for the rights of the individual and the responsibilities of the individual to society as a whole*' (Dearing 1997, para. 5). In undertaking this sort of activity, universities are in fact fulfilling some of the aspirations for higher education of a more optimistic age than the present, when higher education aspired to be '*a public good in its own terms, valuable both for the student and the wider society… concerned with the development and transmission of knowledge and culture*' (Holmwood 2011, 7, citing Robbins 1963, paras 25–8). These aims are beginning to be foregrounded again by AHRC's *Connected Communities* programme (Facer and Enright 2016), which provided the funding for CCH, and exemplified in projects such as the Community University Partnership Programme at the University of Brighton.[18]

Finally, it is surely the case that enthusiasm in universities for co-produced research activity which delivers wider legacies should be high, as programmes which achieve a wide range of social and academic outcomes present one solution to the oft-lamented problem in post-Browne-era English universities that '*the boxes that academics are required to tick keep on multiplying: teaching, research, publishing, knowledge transfer, public engagement, marketing, entrepreneurship. It becomes increasingly hard for academics to devote the time necessary to the slow, incremental work of teaching and research*' (Miller and Sabapathy 2011, 52). CCH shows the value of re-conceptualizing these activities within academia not as discrete and conflicted but as potentially integrated and complimentary, as publicly engaged research programmes in which the boundaries of who is inside and outside universities are redrawn, to the benefit of all - individuals, communities and institutions as well as the sum of human knowledge. This is an important and exciting role for the publicly engaged research university in the 21st century.

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[17] https://heritagelegacies.wordpress.com/ (accessed August 2016)

[18] http://about.brighton.ac.uk/cupp/

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APPENDIX

Outputs from CCH projects

Cambridge Community Heritage http://www.access.arch.cam.ac.uk/communities/cch

Ashwell Museum http://www.ashwellmuseum.org.uk/

- Ashwell Archaeology on Facebook https://www.facebook.com/pages/Ashwell-Archaeology/220513771338285?fref=ts
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- Celebration exhibition posters http://www.cafg.net/wimpole/CAFG%202013%201.pdf
- CAFG on Facebook https://www.facebook.com/CambridgeArchaeologyFieldGroup?fref=ts
- CAFG on Historypin http://www.historypin.com/channels/view/52904/#!photos/list/

Cambridge United Football Club http://www.cambridge-united.co.uk/

- 100 Years of Coconuts http://www.100yearsofcoconuts.co.uk/
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Ely Wildspace http://www.elywildspace.org.uk/

- Memories of Ely Pits and Meadows http://memoriesofelypitsandmeadows.com/

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- Interactive map http://www.pirtonhistory.org.uk/interactive-map/
- Pirton Local History Group on Facebook https://www.facebook.com/pages/Pirton-local-history-group/261390490629238?fref=ts

- Pirton Local History Group on Historypin http://www.historypin.com/channels/view/52563/#!photos/list/

Rattlesden Local History Group http://rattlesdenpc.onesuffolk.net/clubs-and-organisations/rattlesden-local-history-group/

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HERITAGE LEGACIES: DIGITAL BUILDING HERITAGE REVIEW

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ABSTRACT
This paper presents a review of the Connected Communities Digital Building Heritage Project. The review itself is a Micro Legacy Project funded in turn by the Connected Communities Heritage Legacies Project. Specifically, it reviews the collaborative process and outcomes from 11 digital heritage projects which have used 3D computer modelling and animation, 3D printing and mobile geo-location to interpret historic sites. Each project involved collaboration between De Montfort University and a Heritage Group. The results indicate that despite the shortage of both time and resources, these projects were on the whole effective and that collaboration between both groups provided unique opportunities for the application of research to create new digital products enabling the presentation of heritage data in new and innovative ways, with the potential to reach new audiences. The experiences of these case studies however indicate that future projects would benefit from investing more time and attention in strategic planning, setting agreed objectives and including more opportunity for both product and user testing. Project outcomes could be improved by more focussed consideration as to how the resulting product will be used and promoted, and how it best serves the purposes of the Heritage Group.

INTRODUCTION
This paper presents the findings of the evaluation study 'Heritage Legacies: Digital Building Heritage Review' a Connected Communities Heritage Legacies Micro Legacy Project which investigated the outcomes of the Connected Communities 'Digital Buildings Heritage Project' in terms of the value and impact of collaborative heritage research in the creation of digital heritage resources. The evaluation project examined the collaborative research process, the project management and the effectiveness of the digital resources in meeting the original objectives of the project partners, including the De Montfort University (DMU) Digital Building Heritage (DBHG) and Digital Design Groups and each of the heritage partner sites.

This paper is presented in four sections and begins with an overview and description of the context, process and outcomes of the Digital Buildings Heritage Project with a brief case study description of each of the eleven projects. The paper moves on to present the context, purpose and methodology of the Digital

Building Heritage Review which is followed by a third section focusing on the findings of the evaluation review. The final section provides conclusions and recommendations for future collaborative projects of this nature.

DIGITAL BUILDINGS HERITAGE PROJECT.

Context - An Overview of the Digital Buildings Heritage Project

Jointly funded in 2013 by the Arts and Humanities Research Council (AHRC) and the Heritage Lottery Fund (HLF) the Digital Buildings Heritage Project provided the opportunity for eleven heritage groups (funded by the HLF) to work in partnership with the Digital Buildings Heritage and Digital Design Groups, De Montfort University (funded by the AHRC) to collaborate in the creation of digital heritage products for use by the heritage groups, to assist them in their organisational aims and objectives.

Each of the heritage groups secured HLF funding via the 'All Our Stories' project, and these projects involved collaboration with a University partner (DMU) funded by the AHRC Connected Communities Programme.

Through a collaborative process of co-design, co-development and co-production a range of digital assets where created including mobile phone applications and 3D digital reconstructions. The project used 3D computer animation, 3D printing, 3D modelling and mobile geo-location to observe, analyse, understand and interpret historic sites, including the buildings, people and artefacts associated with them.

The aim of each of these digital products was to support the objectives of the partner heritage group, typically, to facilitate new interpretation and presentation of their heritage data and to enable them to reach out and attract new audiences, increasing their profile and their connection with the local community.

For the University this project provided a valuable opportunity to partner with heritage groups; participate in real knowledge exchange; explore the interface between history and digital technologies and to broaden their engagement with wider public interest in local, regional, virtual and remote community heritage.

Outcomes of the Digital Buildings Heritage Project

At least one digital product was created for each of the heritage partners. A brief case study and description of each project, and their associated digital resource, is provided here:

Alfred Williams Heritage Society, Wiltshire

The Alfred Williams Heritage Society (no date) state that they are dedicated to promoting knowledge of the late 19th early 20th century poet and author, Alfred Williams, who lived in South Marston, near Swindon. Throughout 2014 the focus of their research was a project which looked at the Swindon and Highworth Union workhouse, a location associated with Alfred. Alongside their production of a book entitled 'The Shadow of the Workhouse' collaboration with De Montfort University enabled them to co-produce a digital reconstruction of the workhouse. The resulting video animation, available on YouTube (De Montfort University, no date), is approximately two minutes in length and shows a 3D reconstruction of the buildings. It is accompanied by a song which was also commissioned for the project.

Fig1: Screenshot from the animation showing the digital reconstruction of the Swindon and Highworth Union workhouse. (De Montfort University, no date)

Diseworth Heritage Trust

Located in the Leicestershire village of Diseworth St. Michael and All Angels is described by the Diseworth Heritage Trust (2008) as an example of a church built in the Early English style which has a history dating from the Saxon period.

Diseworth Heritage Trust requested a digital reconstruction which would illustrate the transition of the church from its earliest beginnings to modern day. Two digital outputs were created: a digital animation, lasting just over 4 minutes, explaining the development of the church from the 10th century through to the present day, and a high resolution fly-through of church showing the interior, lasting 1 minute 38 seconds, (De Montfort University, no date).

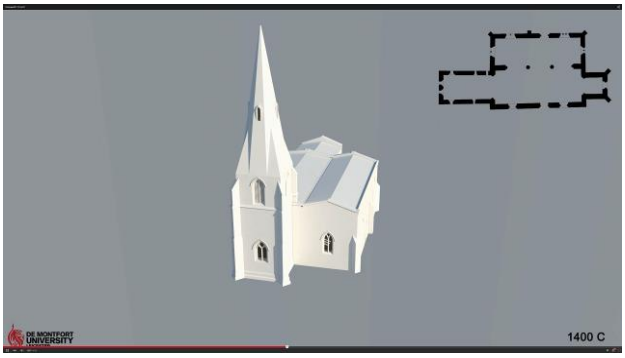

Fig 2: Screenshot from the animation of the 3D building reconstruction showing the development over time of St Michael and All Angels church, Diseworth, Leicestershire. (De Montfort University, no date)

Fig 3: Screenshot from the animation of the 3D building reconstruction showing the exterior and interior of St Michael and All Angels, Diseworth church, Leicestershire. (De Montfort University, no date)

Friends of Court Farm, Pembrey

Court Farm in Pembrey is the largest surviving pre-Renaissance manor house in Carmarthenshire and is defined by its distinctive architectural detail. The Court has been an integral part of the cultural, political, economic and social framework of Pembrey since the early 14th century and is today, superficially, derelict.

The Friends of Course Farm (no date) state that they are currently working to raise public awareness of the local history of the building, generate funds to enable restoration and to establish a sustainable future use for the property.

Since the building is no longer standing the Friends were interested in a digital reconstruction which they could use to demonstrate what Court Farm was like. Combining laser scanned and hand measured data the DMU Digital Building Heritage Group created a data set sufficient to piece together a full 3D model of the ruin of Court Farm from which they were able to extrapolate a series of reconstructions of how the building once looked. Photographs, plans and other documents, collected over a number of years by the Friends, were collated and used to create authentic interpretations and visualisation of the buildings.

The final result is a two minute video showing a digital recreation of the late medieval farm and the manor house, which can be seen on YouTube, (De Montfort University, no date).

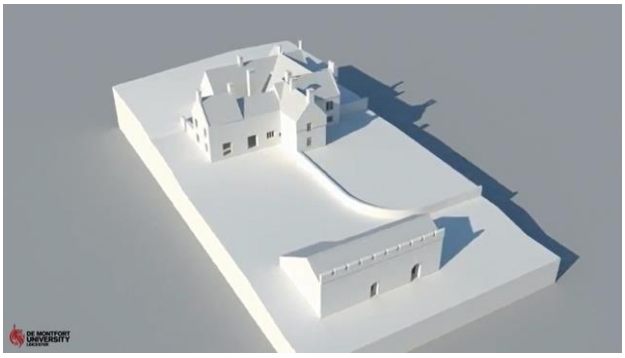

Fig 4: Screenshot from the animation of the 3D building reconstruction showing Court Farm and Manor House, Pembrey. (De Montfort University, no date)

Friends of the Welford Road Cemetery, Leicester

Opened in 1849 Welford Road Cemetery is, according to the Friends of Welford Road Cemetery (2012), Leicester's first municipal cemetery and one of the oldest in the country. Covering approximately 31 acres this historic site is grade 2 listed in the English Heritage Register of Parks and Gardens and contains the graves of over 213,000 people including the pioneer of travel, Thomas Cook and some family members of John Merrick, also known as the Elephant Man.

Working with DMU's Digital Design Group the Friends of Welford Road Cemetery co-designed and developed a mobile phone application providing visitors with an interactive map which can be used, both on and off site, to discover more about the graves and those buried within them. The Welford Road Cemetery Trail app tells the stories of over 200 people in the cemetery. As well as using the geo-location facility, the app can also be searched by name, or simply browsed. Included in the design are a number of trails including 'gruesome deaths', 'sporting figures', 'women' or 'politics' allowing the visitor to make links to similar stories and topics.

The content of each story varies, but entries typically include the plot number, the burial date and some biographical data of the person concerned. In most cases there will be a photograph of the grave and for some there will be photographs of the person or an image related to them, such as a press cutting.

The app was uploaded to App Store in January 2014 and the Friends of Welford Road held an official launch of the product later that month.

Fig 5: Screenshot from the Welford Road Cemetery Trail Mobile Phone App. (Cawthorne, 2014a)

Leicester Transport Heritage Trust:

Stoneygate Tram Depot is an Edwardian building located at 453 London Road, Leicester. The Leicestershire Transport Heritage Trust (2015) states that it was built in 1904 to coincide with the opening of the Corporation's new electric tramway system the building was only used as a depot until 1922 when it was decommission. From 1922 to 1968 the depot was leased to a number of different tenants in the motor trade.

The Leicestershire Transport Heritage Trust's principal aim is to research, preserve and promote Leicester and Leicestershire's road transport heritage and their ambition is to showcase the area's transport heritage in a permanent museum, to be housed in the currently redundant Stoneygate Tram Depot.

As part of the Digital Buildings Heritage Project the DMU team co-produced a 3D digital reconstruction of the Stoneygate Depot and combined this with an animation of Car No 31 showing how the tram would have travelled from the station, along London Road and into the Depot. This video is available on YouTube (De Montfort University, no date). An important feature of this for the Trust was the image of the tram entering the Depot as they currently have no photographs of the building as a working Tram Depot.

Fig 6: Screenshot from the animation of the Tram 31 entering the Stoneygate Tram Depot. (De Montfort University, no date)

Foxon describes how Leicester's electric tramway system was opened on the 18th May 1904 and by the 1920s there were 178 tram cars on the city's network, including Car No 31, a four wheel open top tram with seating for 22 inside and 34 outside (2013).

Withdrawn after 45 years of service in 1949 Car No 31 spent 60 years on a farmyard, resting on bricks and providing a home for chickens downstairs and piglets upstairs. Recently rescued from its rural location the tram car is now undergoing restoration. Using digital reconstruction techniques the Digital Heritage Building Group created a highly accurate and detailed model of

Car No 31 facilitating accurate and authentic visualisation of the vehicle prior to full physical restoration.

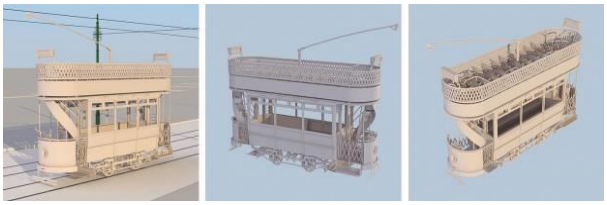

Fig 7: Examples of the 3D digital reconstruction of Car No 31. (De Montfort University, no date)

Wolverhampton Civic and Historical Society: Wolverhampton Women's Hospital

Demolished in 1978, according to Black Country History (no date) the Wolverhampton Women's hospital was the first separate facility for the care of women's heath in Wolverhampton. Established in 1886 by voluntary contributions as a dispensary this service was initially located in an existing building, but was moved to purpose built accommodation in Park Road West in 1902. Considered to be of significant social importance to the history of Wolverhampton and an early example of a purpose built medical facility, the Wolverhampton Women's hospital was at the vanguard of new designs for hospitals which were paying closer attention to methods of healthy heating, ventilation and lighting of the internal environment.

This project produced a 3D digital reconstruction of the Wolverhampton Women's Hospital and a two minute animated revolution of the site, available on YouTube (De Montfort University, no date).

Fig 8: Screenshot from the animation of the 3D reconstruction of the Wolverhampton Women's Hospital. (De Montfort University, no date)

Pembroke Dock Bicentennial Trust: Pembroke Dock 2014, South Wales:

The largest project undertaken by the Digital Building Heritage Group was the reconstruction of Pembroke Historic Naval Dockyard. Originally constructed in South Wales in the mid-19th century to secretly build innovative Royal Navy vessels, Pembroke Dock no longer exists. In order to recreate the dockyard the DMU team and the Trust worked with local historians using documentary evidence such as architectural drawings, historical maps and remaining evidence of other dockyards. Working together the Pembroke Dock Bicentennial Trust and the DMU team identified when, why and how each building at the dockyard was constructed.

The resulting product is a 3D digital reconstruction of the dockyard during its heyday in the 1860s, with a fly through animation. This video is available on YouTube (De Montfort University, no date) and was officially launched with a large public event in January 2014. The video was subsequently displayed in the Pembroke Dock 'Uncovered' history exhibition, Pembroke Town Library for six months.

Fig 9: Screenshot from the animation of the 3D reconstruction of the Wolverhampton Women's Hospital. (De Montfort University, no date)

Swannington Heritage Trust, Leicestershire:

Sited in the north-west of Leicestershire Swannington is a former mining village and is the terminus for the Swannington Railway. In 1832 the railway incline was constructed to enable coal from the mines in the Swannington valley to be hauled up a 1 in 17 slope by means of stationary winding engine. Today Swannington Incline is a tree lined path and all that remains of the former engine house is a brick outline of the foundations. Both are now managed by Swannington Heritage Trust (2012).

A 3D digital reconstruction of the both the incline and the engine house was co-created providing an accurate visualisation of the site and how it worked. This video has an animation of wagons travelling up the incline and fly-through of the engine house with a further animation of a working fly-wheel. The addition of an audio sound scape with representation the machinery and other ambient noise such as birdsong adds to the interpretation of this site.

Fig 10: Screenshot from the animation of the 3D reconstruction of the Swannington Incline. (De Montfort University, no date)

The Haywood Society, Staffordshire:

Cawthorne (2013) describes Tixall Hall in Staffordshire as the home of the Aston family. Originally built in 1555, early illustrations from 1686 show this to be a grand manor house with a five sided bay window to the main hall. After 1768 the hall and the window fell into ruin. Masonry from the window was removed and incorporated into a Catholic chapel on the estate where it remained until the demolition of this chapel in 1844. From here the stones of the bay window found their way, via a private garden, to a safe site in the Presbytery Garden of St John the Baptist Church in Great Haywood.

The Haywood Society, responsible for the rescue and re-siting of the stones, were keen to reconstruct the Tudor bay window using data from the remaining fragments of masonry and drawings.

The result is a 3D digital reconstruction of a window, (De Montfort University, no date).

Fig 11: Example of a 3D building construction showing the Tudor Bay Window from the Old Tixall Hall in Staffordshire. (De Montfort University, no date)

In addition to this the team were also able to produce a 3D print model of museum and exhibition display grade.

Fig 11: The 3D print of the Tudor Bay Window from the Old Tixall Hall in Staffordshire. (De Montfort University, no date)

Wigston Framework Knitters Museum Ltd, Leicester

The Wigston Framework Knitters Museum (2013) describe their site as situated at 42-44 Bushloe End, Wigston, Leicester and was once a Master Hosier's house with a two-storey Victorian frame-shop in the garden. The house dates from the late 17th century and has been subject to various alterations. This part of Leicestershire has a long tradition of worsted knitting and this museum is unique. In 1952, when the last master hosier died, the workshop was locked, leaving eight hand frames for making gloves, mitts and fancy golf hose, plus all the moulds and tools associated with each machine. The Digital Building Heritage Group worked with the museum, using data from a measured survey to co-create a digital reconstruction of the building showing development over time, through a series of well-defined phases, from a single-storey cottage to a larger complex of early industrial buildings.

Texture mapping, the application of high resolution photographs and composite digital artwork on to the surface of a digital object were used to provide an accurate and authentic interpretation of the brickwork and external appearance of the building. This was added to the final phase of the digital reconstruction.

Fig 12: Screenshot from the animation of the 3D building reconstruction showing the final phase of building – with texture mapping used to enhance the image (De Montfort University, no date)

Wolverhampton Civic and Historical Society: Blue Plaques Mobile Phone App

The Wolverhampton Civic and Historical Society (no date) state that their purpose is to promote the city of Wolverhampton, support research into local history, scrutinise planning applications and facilitate the erection of Blue Plaques. Wolverhampton has over 90 Blue Plaques commemorating notable people, events, companies or buildings The mobile phone application, co-designed and created in collaboration with DMU allows visitors to explore the history of Wolverhampton through its Blue Plaques. An interactive map enables the visitor to locate the plaques and provides directions to others. The app provides background information on each plaque with content-rich data which includes photographs. Any plaque can be 'favourited' allowing users to build their own interpretative trail of the city, share their discoveries on social media and allow quick and easy reference to the plaques they find most interesting.

The app was uploaded to the App Store in January 2014 and an official launch held later in the year to coincide with the installation of the 100th Blue Plaque.

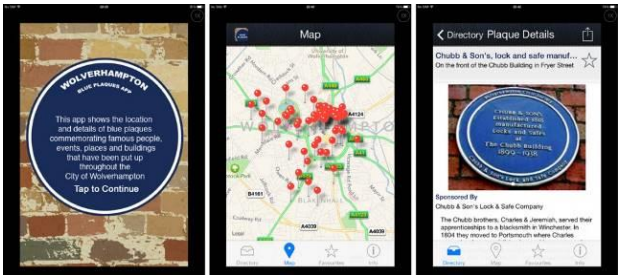

Fig13: Screenshot from the Wolverhampton Blue Plaques Mobile Phone App (Cawthorne, 2014b)

Digital Building Heritage Project Life Cycle

The Digital Building Heritage Project began in 2012 with the launch of the HLF All Our Stories project, a programme designed to help local communities explore, research, interpret promote and share their local heritage.

In May 2012 De Montfort University held a Digital Building Heritage Conference/Open Day, inviting heritage groups to visit and experience the ways in which digital technology might assist with their projects and consider the potential of working in collaboration with academics from the University. A wide range of technological options was showcased including: laser holograms, 3D printing of historic buildings; mobile phone and augmented reality applications, laser scanning and artefact reproduction. Further opportunities for discussion between the University and heritage groups were later provided in the form of two smaller workshops during which participants were able to discuss and explore their aims and ambitions in more detail, focusing their ideas on what was technically possible and how digital resources could support them in achieving their aims and objectives. Equipped with a greater understanding of digital potential the heritage groups were then in a position to make their bids for HLF 'All Our Stories' funding.

Successful applications were announced in November 2012 resulting in eleven of DMU's collaborative partners receiving funding. Shortly after this the Digital Building Heritage Group was successful in receiving funding from the AHRC to support these projects.

Work began on all eleven projects in early 2013 and continued throughout the year. In that time the project successfully produced two mobile phone applications, eleven 3D digital reconstructions of buildings and other artefacts and a 3D printed model. Each heritage partner received a digital asset to support the work of their group. In addition to the tangible assets the projects also received media coverage in the form of newspaper articles, magazine features and radio interviews. A number of the products were formally launched, with public events and press coverage. Some of the products were featured at academic conferences and symposiums and the AHRC produced a short video documentary of the project.

In terms of leading the projects the University retained overall control of the project management typically taking on the responsibility for the day to day logistics, providing technical specifications, monitoring progress, liaising and communicating with the various project personnel, setting deadlines and managing timescales. The project management approach was collaborative with both partners being responsible for the initial scoping and co-design of the product.

The types of digital resources produced by the Digital Building Heritage Project can be divided into two separate categories: digital reconstruction of buildings/artefacts and mobile

applications. Within each of these categories the projects were similarly managed, however there were differences between the mobile phone projects and the digital reconstructions. The project management process for each type of project is described below.

Project Process for the Digital Reconstruction Projects

Projects with a digital reconstruction outcome were allocated approximately a month of time from the Digital Building Heritage Group. During this time the University team would work in collaboration with the heritage partner to gather data from which they could create the digital reconstruction.

Initial discussions took place to establish the aims and objectives of the heritage group and to determine what was both appropriate, and technically feasible, to support their ideas. The University team worked in partnership with the heritage group to identify and agree what data would be necessary and between them the data would be sourced. In most cases the Digital Building Heritage Group undertook collection of measurement data, either through laser scanning or, in some cases, though hand measurement. For most of the projects additional data was required in terms of historical maps, architectural drawings and photographs. These were sourced by the heritage groups. For some of the projects additional academic expertise was sought to provide a greater understanding of the historical context and to ensure that all interpretation of the building or site was authentic and genuine.

The Digital Building Heritage Group devised a process, which was used for all the digital reconstruction projects and resulted in them developing a concept which they referred to as 'work packages'. Following the initial investigative discussions the University team would explain, and itemize what was required to achieve the best results. This could be pictures, sound, drawings etc, anything the heritage group possessed, or could source, that could inform the type of digital reconstruction they wanted to achieve. A date would then be set for this material to be delivered to the University. In some cases the University established google drives to facilitate immediately delivery of this material. This proved particularly beneficial for those projects which were at a considerable distance from the University or where a large number of documents were required. The 'work package' approach created a repeatable, streamlined procedure providing good focus for both the University and the heritage partner in terms of identifying, agreeing and supplying what was needed.

All of the digital reconstruction projects resulted in a digital output, and in some cases more than one resource was produced, for example the Leicester Transport Trust received a 3D digital recreation of the Tram Depot, a 3D digital recreation of a tram car, and an animation of the tram car pulling into the tram depot. All of these digital resources have been published via YouTube and are accessible to the public.

Project Process for the Mobile App. Projects

As with the digital reconstructions the process for developing the mobile applications also began with initial project scoping discussions between the heritage partner and the University's Digital Design Group.

Heritage partners were encouraged to think about the data they had available and consider how they wanted to present the information. In particular they were asked to think about the story they wanted to tell. Both mobile phone projects had access to a significant amount of source data and one of the key aspects of the design process was to create a focus for this data to help prioritise the content. Whilst this was a collaborative process the heritage site was responsible for what was included in their final app. The heritage partners were also responsible for the research pertaining to the content, finding more details to supplement existing stories, collating data and sourcing such things as images and press articles etc. They also identified the geographical co-ordinates for each of the data entries in the apps (in other words the locations of the graves or blue plaques) and provided these for the University programming team.

The Digital Design Group were responsible for the technical aspects of the projects providing the coding, navigation and creating the interface for the product.

Both applications were designed using the same platform. One of the important aspects of this project, from the University's point of view, was the development of a repeatable database model which could potentially be used for creating future apps of this nature for similar heritage projects.

Limited time was spent on user testing, although there was an investment in training members of the heritage teams to update and amend the content of their applications, ensuring that the apps could remain live and current. This has also enabled the heritage partners to add more information such as new entries or modifications existing entries.

DIGITAL BUILDING HERITAGE REVIEW: MICRO-LEGACIES EVALUATION PROJECT

Context/Overview

Funded by the AHRC the Digital Building Heritage Review was a Connected Communities Heritage Legacies micro-legacies project evaluating the outcomes of the Digital Building Heritage Project. Using the AHRC key aim to 'understand the values and outcomes (whether positive of negative) of Connected Communities heritage research' as the main focus for the evaluation this micro-legacies project investigated whether or not the digital resources had been successful in achieving their aims.

Initially the key questions to be addressed by this review were:

- Did the collaborative approach of these projects, and the partnership between the heritage groups and the University, add value to the process of producing a useful and effective digital media asset?
- How did collaborative research contribute to the creation of the digital resource?
- What is the value of the digital resource and what benefit has it afforded the heritage partner?
- How has the digital resource met the aims and objectives of the heritage partners?
- What was the value (to the University or to the heritage group) of being involved in the Digital Building Heritage Project?

As the review progressed the questions evolved into six key areas:

Legacy and Impact: Product Value

- In what ways has the digital heritage product brought value to the project stakeholders?
- What was the value of being involved in the Digital Building Heritage Project?

Collaborative Research:

- How did the process of collaborative research contribute to the creation of the digital heritage resource and what can be learned from this process?

Project Management:

- What aspects of the project worked well and what got in the way?

Product Evaluation:

- How successful and effective was the digital resource in meeting the original aims of the project?

Research Outcomes

- In what ways has this project contributed to research outcomes for the University and the Digital Heritage Building Group?

Methodology for the Review

The following activities were undertaken in order to review the Digital Building Heritage Project

- Semi-structured interviews with a selection of the academic and research staff from the Digital Building Heritage and Digital Design Groups
- Semi-structured interviews with a selection of the heritage partner groups
- Site visits to a selection of the heritage partners
- On-line survey of all heritage partner projects
- Review of web analytics including YouTube views
- Viewing, downloading and using each of the digital products
- Additional data gathering including reviewing:
    - media coverage for the digital products
    - the web presence of all the heritage groups
    - the Digital Building Heritage Group website and on-line blog
    - the AHRC video 'Digital Heritage'

Semi-structured interviews with academic staff

Comprehensive data was gathered through a series of semi-structured interviews with key University staff, including the Principal Investigator, the Co-Investigator/lead app project manager and one of the lead developers. Participants were asked for their opinions regarding the following: What impact did the digital product have? What value did they gain and what did they learn from working collaboratively with the heritage partners? What were the research outcomes? What were the successes of the process and what made it more difficult? What benefit did they, as an academic gain from their involvement with this project?

Semi-structured interviews with heritage partners and site visit

Site visits and semi-structured interviews were held with two heritage partners, one an example of a mobile phone application, the other an example of a digital re-construction and animation. Participants were asked about their opinions regarding the following: their experiences of collaborative working and their relationship with the University partners; the impact and use of their digital product, the most beneficial aspects of the project and how they might advise similar groups who might consider undertaking a project of this nature.

On-line survey with heritage partners.

All eleven partners were asked to take part in an on-line survey and a total of three were completed and returned. The key purpose of the survey was to ascertain how the sites were using the products, what their initial objectives were in taking part in the project, whether or not the digital product had helped them achieve these objectives and how beneficial their involvement in the project had been to their organisation.

Limitations of the Review

In terms of quantity, the information from the heritage groups was limited with restrictions in terms of both distance and access. All heritage groups were invited to complete the on-line survey, however only three groups responded. A number of heritage groups were approached to take part in an on-site visit and semi-structured interview but only two took up this invitation. The two sites visited did however cover a range of the digital resources and these case studies provided good feedback and were a rich source of information. In addition a small amount of anecdotal information was collected through conversation and email with heritage partners.

As a result the positive experiences of the project are represented in the findings of this study, but there may be limitations in the data relating to other, perhaps less positive experiences, which, due to the level of response may not be fully represented and remain unrecorded.

DIGITAL BUILDING HERITAGE REVIEW: MICRO-LEGACIES EVALUATION PROJECT – KEY FINDINGS

The main findings of this review are outlined here under six key headings:

Legacy and Impact: Product Value

In what ways has the digital heritage product brought value to the project stakeholders?

The review found good evidence that the digital heritage products have provided significant value to the heritage partners and their projects. The 3D print of the Tixall window and video reconstruction was one example of a product which was being used to show visitors a new interpretation of something which was no longer visible, bringing context and meaning to a building in a way which compliments and enhances the existing and tangible evidence of surviving masonry from the window and drawings of the old Hall.

Digital reconstruction of things which no longer exist, such as Court Farm or Pembroke Dock have helped the heritage sites to further develop their own research by showing them a richer visualisation of their buildings and enabling them to better understand their heritage. Accurate visualisations of things previously unseen which could only be imagined have helped to confirm previous research and inform new ways of viewing these sites.

The mobile phone applications have improved the audience experience, enabling on site visitors to access interesting and relevant content directly related to the object they were viewing, such as a Blue Plaque in Wolverhampton or a grave in Welford Road Cemetery. Both mobile applications have enhanced the interpretation of the artefacts and provided new ways of telling the stories about the people and places involved. Visitors were also able to make use of the geo-location features to navigate the site in ways which were not previously possible.

There is evidence that the digital products have supported the heritage partners in providing visitors with additional data and presenting their material in different ways. For example a visitor to Welford Road cemetery could now use the mobile phone application to find a grave, discover the story of how the individual within it died, perhaps see a photograph of that person or read a press article about their life. Digital animations have made it possible to show audiences how buildings such as

Diseworth Parish Church and the Framework Knitters Museum have changed over time using engaging, interesting and accessible media.

Legacy and Impact: Project Value

What was the value of being involved in the Digital Building Heritage Project?

The review confirmed that involvement in these projects had helped heritage groups to learn more about the potential for developing and using digital resources to interpret and promote their heritage. These projects broadened horizons and raised the ambition of heritage groups making them feel more positive and excited to develop further digital assets.

A sense of pride and being 'taken seriously' was evidenced in the conversations with heritage groups and it was felt that their participation in these projects had, not only raised their confidence, but also their profile. This had made them feel more empowered, particularly in relation to future bids and dealings with funding bodies and other key organisations.

There was evidence that academics and researchers enjoyed, and professionally benefitted from, the challenge of developing new skills; practising existing ones; working at the 'cutting edge' of technology and discovering new ways of solving problems in order to deliver the highest quality digital product that was technically and economically feasible.

The projects provided members of the University, both staff and students, with unique occasions to work on 'live' projects in a way which was not typically part of their academic environment. The process of developing client-based relationships, and the experience of working on this type of collaborative enterprise, was reported as both a novel and invaluable opportunity. De Montfort University has a particular ethos for developing strong links with its local community and it was felt that the Digital Building Heritage Project provided an ideal platform for creating and building such relationships. Working on these projects provided a distinctive learning environment and research resource for MA and PhD students offering the experience of working with real case studies providing actual, first-hand, exposure to all the pressures and processes that occur within real, rather than theoretical, experiences.

Both the University and the heritage sites had used the projects to raise their profile through press coverage, web presence, social media, conferences and symposiums. Examination of the Digital Building Heritage Project blog showed it to be active and current with regular posts on all projects. There were numerous examples of the Digital Building Heritage and Digital design Groups showcasing the co-created digital resources at regional and national events/conferences and similarly a good range of examples where projects had been featured in the media. As recently as Feb 2015 this project was showcased to members of Museum Development East Midlands (MDEM)

In some cases heritage sites benefitted, not only from the digital product itself, but were also able to employ their research and the resulting content to create other resources such as brochures and booklets. One example of this was the Friends of Welford Road Cemetery who not only produced a range of printed, themed cemetery trail leaflets but had also gathered sufficient material to potentially enable them to write book.

Collaborative Research:

How did the process of collaborative research contribute to the creation of the digital heritage resource and what can be learned from this process?

The over-riding impression from this review was that it would have been impossible to create these digital heritage assets without a collaborative process. Each of the project partners contributed specific and unique skills, experience and expertise, all of which were essential to the final outcome. The heritage partners understood and could source the content and the material. They alone knew the context of their heritage and how they wanted to promote the aims and ambitions of their organisation. The technical expertise came from the University both in terms of skilled and expert personnel but also equipment. The combination of these experiences and skill sets were necessary for the final product and neither partner could have achieved the same result alone. There was good evidence of both reliance and respect for the skills, knowledge and abilities contributed to the project by each of the partners.

It was considered possible that similar products could have been created using commercial design companies but the reality was that small heritage groups, such as those represented in this project, would probably have been unable to afford this option. Additionally a commercial company would perhaps be specialists and possibly unlikely to have had access to the same richness of resource (in terms of skills, expertise, technology and machinery) that had been available from the University.

The collaborative approach was felt to support an environment in which historical knowledge and technical expertise could be exchanged with the shared anticipation and understanding that this would facilitate the creation of innovative solutions for presenting and interpreting heritage. Another outcome of this collaborative approach was the inevitable sharing and accommodation of different working practices, some of which had worked well, and some of which were less effective. The development of the work-package process, as used by the Digital Heritage Building Group to gather data, provided an effective project management tool encouraging heritage partners to develop new skills in electronic communications and file transfer, and also perhaps, in professional time and project management. This was a good example of sharing good working practice, however, there was some evidence that collaboration between the partners was occasionally less conducive. In some cases it was felt that the University took the role of 'leading' the project and that they had, what seemed to be, a 'final say' in some of the design decisions. Some heritage partners expressed a feeling that they had 'not quite got what they had asked for'. Further examination of these instances showed that, in most cases, the University was making these decisions based on technical and resource restrictions, and not through their own preferences. One example of this was the mobile phone applications. Initially it was hoped that these would be available on both android and i-phone platforms but the limitations of both time and money meant that this was not possible and so both applications were created and launched on as i-phone apps only. The problem was not perhaps with the decisions that were made but the communication of these decisions and the consequence this had on the relationship between the two groups. Establishing "necessary trust and mutual commitment among partners" (Thorkildsen and Ekman 2013, p157) is an essential part of any cultural heritage collaborative design process.

One aspect of the collaboration which worked well was the focus the project provided. The discipline of sourcing material for a digital product required significant thought around the purpose of the product and what it is meant to achieve. Working together the heritage groups and the University team were faced with questions such as, what do we include and what do we leave out? Heritage groups were encouraged to develop their research skills, categorise content, prioritise their material and to focus on the story they wanted to tell. Together with the University team they had to think about the ways in which they wanted their material to be presented. For example, with the Wigston Framework Knitters Museum, it was agreed that the rendered version of the building, showing the brickwork, would be limited to the final stage of the building as this would be the most historically

accurate representation. There is some evidence that, on some projects, not all of these collaborations were comfortable and in some situations the process of creating the digital representation raised questions about some of the existing historical evidence and the way in which it had been interpreted by the heritage group. This sometimes resulted in difficult conversations about interpretation. In most cases this was resolved by further research and examination of the evidence, providing ultimately a better and more accurate understanding of the building or artefact, however, in a minority of examples, these discussions remained inconclusive.

The multi-disciplinary requirements of the project not only created collaborative opportunities between the University and the heritage groups but also within the University. In order to meet the various requirements of the project the University team was diverse and drawn from a number of academic disciplines. The opportunity to work across departments, develop relationships and networks was described, by those involved, as being highly beneficial both personally and professionally.

Project Management:

What aspects of the project worked well and what got in the way?

The management of the Digital Building Heritage Project was evidently successful in developing, creating and delivering tangible digital heritage products for each of the heritage groups. On this level the project management was demonstratively effective. Evidence from the review supports this and also provided a number of useful lessons for future projects.

Examining the project sequentially, for inception to legacy, provides a useful overview of the leadership and management of the process. At the outset of the project there were good processes for capturing the needs of the heritage partners and demonstrating the technical abilities of the University. This was done through the open day and subsequent workshops, both of which were well attended and expertly delivered. The mechanisms for funding the projects however, appeared to have created significant pressure at the beginning of the project and may be responsible for limiting appropriate scoping activity at the initiation stage. Heritage groups were first to receive their funding, after which the University had a very short period of a few weeks to submit their bid for funding to support those projects which had been successful. Although the earlier ground work had been done, much of this had been speculative as it was not known which groups would want to work with the University. The time available for detailed planning and scoping for specific projects was unhelpfully short. A frequent comment from all those involved in the project was that they needed more time to fully complete their products and that they would have liked more resources, particularly in terms of academic staff time. It would appear that projects were not afforded the time to be accurately scoped at the start of the project and that this is the result, in part, of the short period available for the University to prepare their bid to the AHRC, as well as the unexpectedly high volume of successful heritage groups the University was expected to support.

The issue of insufficient resource, particularly in terms of academic time, was cited as a significant difficulty a number of times in the review. In part this is due to the situation described above, however, as the project progressed there were other contributing factors. One of the time management problems was about scheduling activity around the requirements of the academic calendar. Academic staff who teach were more available out of term time and often not during the teaching periods. This required careful task management and scheduling of activities to ensure that projects requiring academics with teaching commitments were timetabled into the project at the appropriate time. Unfortunately there was evidence that delays in project progress resulted in academic staff time being required when it was no longer available, as work on project had slipped into the autumn term. This not only created additional pressure for the academics concerned but also resulted in some projects being rushed to completion or not having all the features which were originally discussed.

Although these projects were ostensibly collaborative there was, in most cases, a feeling that the relationship was client (heritage group)/provider (University). The majority of this relationship worked well and there is good evidence that the partners communicated and worked together effectively. There was also evidence however that the 'client' expectations of the project might not always have been in line with that of the 'provider'. Some of this is because heritage groups had a limited understanding of what would be technically possible within the available time and resource. They relied on the University team to provide guidance and leadership on this and in most cases this was successful, however it was clear that some groups may have been given enthusiastic and ambitious visions as to what was possible and the type of digital product they would receive. Managing the expectations of stakeholder should be part of project scoping and again this mismatch in expectations could, in part, be due to insufficient attention being paid to this at the outset of each project (due to pressures mentioned earlier regarding allocation of funding). Another aspect of this was the enthusiasm with which both academic and heritage partners approached the projects. It is clear that there was a good deal of excitement at the start of these projects and a certain amount of discussion around possibilities and what could potentially be achieved. It is possible that the heritage partners interpreted this as what would actually happen, rather than what could potentially happen. As the project progressed, and the realities of time and technicalities became clearer, the outcomes of the project were reduced, leaving some heritage partners with an impression that they had not quite got what they were expecting. Another mismatch in understanding was around working methods and the allocation of resource. The review found that some of the heritage partners thought that partnership with the University meant they had a dedicated relationship with the team over the period of their project. In reality of course the University team were working on various projects simultaneously and whilst the heritage partners understood this in principle it is evident that some were confused by this and perhaps felt they could have had more contact time.

One interesting observation from the review was the subtle impact that cultural differences might have had on the management of the project. Variance in expectation has already been discussed but some of the confusion, and perhaps frustrations, felt on the project might be the result of different working practices and different interpretations. For example, typically academic staff work in an environment which values and promotes experimentation, creativity and is potentially quite fluid. They are usually comfortable in an environment in which they may not necessarily know what is possible but they are willing to try something out to see if it works and if it does not they will try something different. This is the underpinning nature of creativity and innovation. There is a possibility that positive conversations with the heritage groups, perhaps seen as exploratory and about possibilities by academics, were regarded by the heritage partners as being more concrete and actual. If this was the case then heritage partners may well have been disappointed when the final product did not match all that was discussed. Another observation from the review was the occasional disparity in values between the academics and heritage groups, in others words, what one group regarded as important was not necessarily seen as vital by the other. An interesting example of this was a discussion regarding one of the 3D reconstructions, in which the heritage group expressed

disappointment that their building was not 'coloured in' but left as a white object however the University team regarded this as more stylish and in line with professional museum display. This is not an argument about accuracy or the integrity of the reconstruction but more about stylistic differences. The heritage group wanted something which they felt looked more attractive and were a little frustrated with the white detail whereas the University team viewed this as clear and professional. Working practices and the ways in which heritage groups operate also impacted on the project in other, more tangible, ways. For example, the governance and management of these groups and the fact that many heritage groups are run by volunteers influenced the availability of staff and decision making practices. There was evidence that some projects were delayed because certain decisions had to be taken by a governing board which only met once a month.

The review found that logistics and communications were well managed and the University work-package process provided an effective method of gathering data which was particularly useful when working with those who were at a distance from the University. In the main the location of the heritage site did not seem to cause any particular issues, although there was some comment from academic staff that local projects seemed easier to work on as it was possible to visit on a more frequent basis, which helped with their understanding of the project and enabled them to develop excellent working relationships with the people involved.

One significant element of the project, which does not appear to have happened, was evaluation. There was very little evidence that heritage groups have performed any visitor analysis or user testing and so it was unclear how effective the products had been. Few of the heritage groups were able to explain how the product had met their objectives, although they did describe their product as successful. They were not able to provide tangible evidence to support this claim. The limited time available for the each project was used on researching, designing and developing the products with little or no time available or allocated to user testing or evaluation.

One issue which arose with some, though not all, the projects, was that the heritage group was not always certain that the project had finished. The on-going nature of the development of their product and the fact that they were waiting for some minor tweaks and changes meant that they were not formally aware that the project had been completed, although they did know that the product had been uploaded to YouTube, or launched on the App Store. A common feature with creative projects of this nature can be that it is difficult to know when they are complete as there is often a continuous and constant process of revision and refinement. In the case of the Digital Heritage Building Project there does not appear to have been a formal conclusion in the form of a 'sign off' meeting or equivalent process. Consequently some groups reported that they were not certain as to the status of their project.

Finally there was an interesting 'post-project' observation that many of these projects had been highly successful, through the research they had done on this project, in generating a substantial amount of content which, whilst not used for this project, remained an invaluable resource for future projects, digital or otherwise.

Product Evaluation:

How successful and effective was the digital resource in meeting the original aims of the project?

As previously stated, one of the limitations in the management of these projects was the lack of evaluation or testing of the actual product.

There was no evidence that any of the heritage sites had undertaken formal testing of their products, although there was informal anecdotal evidence via emails and other visitor comment that audiences had enjoyed the products and found them interesting and informative. There was no evidence that these products had attracted new visitors to these heritage sites, but again, this had not been formally investigated so if there are new visitors this was unrecorded.

The lack of any formal evidence means that finding tangible evidence to demonstrate the effectiveness of these products was difficult and limited to such data as YouTube video views or App Store download statistics. Whilst this provided some indication of usage they were not immensely positive and may well be misleading in terms of assessing the impact of these products. The YouTube statistics indicated that the most viewed video had over 1,490 views and the least around 40. However this is not a complete picture as we do not know how the heritage site had chosen to use this product and it would certainly be very wrong to assume that number of views is a measure of one product being more successful than the other. It is perhaps worth noting that the video with the highest viewing figure is one that was showcased by the Digital Building Heritage Group at a conference where it attracted a good deal of interest and was very popular.

All websites associated with the heritage groups involved in this project were viewed as part of the evaluation to ascertain if and how they were promoting the product. The results of this were varied, with most not mentioning it, a couple featuring it on the front page and others making reference to the fact that this product was in development, whereas in fact it was completed and available. Again it was difficult to know how much could be concluded about the usage of the product from this activity as this could well be more of a comment on the quality and validity of the website itself.

Three of the heritage groups had promoted their products with high profile launch events, all of which had received local press coverage. At least one of the products had been part of a six-month exhibition and there was evidence that others had been shown to group members and public audiences at events such as open days. This would indicate that these products had been successful in helping the heritage groups raise their profile and promote their heritage to their local communities.

Discussions with the heritage groups suggested that they either did not know how much their product was being used or were not yet in a position to use it. Interestingly this might suggest that the creation of this product was not part of their overall strategic planning but was perhaps more opportunistic, something that they did because they had the chance, rather than something that they had considered to be of operational value. In one case the product had been developed with the view to attracting schools to the site. This had not happened and this might well be because there had been no supplementary activity to directly encourage the schools to use the product, which might suggest that the product on its own was not sufficient to attract this new audience and that additional promotional activity was required to make this happen.

Research Outcomes

In what ways has this project contributed to research outcomes for the University and the Digital Heritage Building Group?

The Digital Building Heritage Project has been highly productive and rich in creative output. There has been immense opportunity for presentations at conferences and symposiums and the projects have facilitated excellent public engagement.

In terms of traditional research outcomes such as academic papers and publications and it was felt that the challenge for future projects of this nature was to identify opportunities for presenting this type of research.

CONCLUSIONS AND RECOMMENDATIONS

In the light of the lesson learned from this review the following recommendations are made for future projects of this nature:

Strategic Planning and Project Management

Set clear objectives – know what you want to achieve

Key to the success of any project is defining and understanding the main objective of the project. In many cases the stated aim of these projects was to achieve increased audience engagement and those who succeeded in this understood the nature of their target audience, designing products which suited this need, and promoted them appropriately, for example exhibiting the Pembroke Dock reconstruction video in the town library. Future project teams should be encouraged to think about when and how people will use their product and consider the needs of the visitor in their design process.

Project scoping – understand the feasibility is your project

Understanding the size and scope of a project is something which should be clarified and communicated at the outset of a project with all partners in agreement as to what is feasible and what is viable. Considerable pressure and frustration was created for the project partners where the scope of the projects was more than that which could be achieved with the available resources. Scoping worked well with those projects which were clear about the resources they had and what they wanted to achieve. It worked less well where the outcomes were not clearly defined at the outset and were subject to regular review and alteration.

Plan for product testing and involve users

Effective testing of digital products requires a number of different approaches, ensuring that the product actually works, that users can and will use it and that the product achieves the aim for which it is intended. These activities should form part of at the project plan and should be incorporated within the initiation of project. The volume of projects supported by the Digital Heritage Building Project and the time for completion did not provide sufficient scope for design, development and testing. For some projects this was less of an issue, for example the video re-constructions work technically, however without further evaluation there is no evidence that they have met their aim. The limited amount of testing and time available for the mobile apps has meant that the products are working but still have bugs and issues which need resolution before they can be considered fully functioning. The potential impact of this is that users will become frustrated with the product if they perceive that it does not do what they think it should and they will cease to use it. Product testing should be clearly included in the project plan, even if this limits the amount of content available. It would be better to have less content that works well than more content that is considered not to work.

Product and Project Evaluation

As well as testing the practical functionality of the product greater consideration should be given as to how and when evaluation of the products and of the project as a whole should be conducted. Whilst there is good evidence that the project has been successful in creating the products, working collaboratively and developing good engagement between the University and heritage groups there is less evidence as to the effectiveness of these products to attract new audiences or engage people in new ways with the heritage, which was a clearly stated objective of most of the heritage groups. Further research is required to assess more accurately the impact that the products have had on audience engagement, however information on this would be very difficult to ascertain as there is no evidence of initial benchmarking and therefore no tangible baseline to demonstrate increased usage or engagement. The process for evaluating both the project and the products should be part of the initial project plan and data should be collected throughout the project.

Collaboration and Building Relationships

Developing strong relationships with and between all project partners will not only make this type of project easier to manage but will potential lead to better outcomes as there will be a greater understanding of what is required and how it can be achieved. Those working on projects of this nature should be mindful of the subtle differences which might exist between partners and careful to ensure that all communication is suitably delivered and understood. Regular and appropriate communication, occurring at key points in the project, will help facilitate good relationships and in turn contribute to positive project outcomes. It must be remembered that effective communication does not happen by accident but should be a planned and well managed activity. This requires an investment of time from all involved and particular those leading or managing the project. The establishment of a communication strategy as part of the project initiation will help all parties understand their contribution and responsibilities in this area.

Resource Allocation

All projects were completed and all heritage groups were in receipt of a product within appropriate timescales and within budget. However, the number of projects supported in the time available created significant pressures on the academic team in particular, resulting in some products being rushed and delivered with less functionality than was originally planned and agreed. Lessons for future projects are perhaps about scoping but also about being realistic about what can be afforded with the money available.

Product Usage and Promotion

Although each project resulted in a tangible product it was disappointing to see how few were apparently being used to their full potential. Consideration should perhaps be given to helping heritage groups consider how they will use and promote their digital product and should consider the whole life span of the product and not just its creation. Further thought might also be given to the user/audience expectations and potential usage of the product and more advice provided to the heritage groups regarding the inclusion of users in the design process. This would increase understanding of how people are likely to engage with the product and help the design team make informed decisions as to the needs and requirements of the users and how these can be accommodated within the product.

Research Outcomes

The pressures on academic staff to produce research which can be measured and assessed using traditionally recognised systems such as peer review and the research excellence framework are immense and the fact that projects of this nature do not easily result in such output needs to be addressed. It should also be recognised that these projects are very positive in other valuable areas including creative output and public engagement.

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