Framing collaborative processes of digital transformation in cultural organisations: from literary archives to augmented reality

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Abstract: At a time when it is particularly urgent to identify models of intersection across the digital and cultural sector to respond to an emergent funding and policy environment, this article contributes to a body of scholarly work around designing digital interventions for museums by identifying the role of cultural content in shaping design spaces for collaboration. The context of the article is a research project that brought together magical realist literature and the development of an Augmented Reality smartphone application realised through a public programme held at a museum of children's literature. This process created an open-ended *design space* within the organisation embedded into the development of public engagement workshops around magical realism and place making. It investigates how the cultural content (from archival material) occupied a key role in shaping technological development and suggests strategies that could grant autonomy and sustainability to cultural organisations in engaging in digital transformation.

Keywords: digital heritage; innovation; augmented reality; collaboration; design space.

Introduction

As cultural organisations progressively embrace digital technologies for a variety of purposes, from communication, to engagement and preservation, exchanges across cultural and technology sectors are becoming more prevalent (MTM, 2015; Department for Digital Culture Media and Sport, 2018; Stuedahl and Vestergaard, 2018). This is signalled for instance by the growing number of museums adopting a formal digital strategy (Stack, 2013; Johnson *et al.*, 2016). The role of the digital is increasingly recognised as a cross-departmental concern rather than the unique responsibility of a dedicated team. The idea of the post-digital museum (Parry, 2013), in which the presence of the digital is no longer a novelty, moves beyond the notion of 'digital skills' and suggests how talking of digital literacy better describes how the digital is now becoming a way of thinking spread across different roles and teams within a cultural organisation (Barnes *et al.*, 2018). The imperative to more 'joined-up thinking' through

digital technologies continues to provoke research into how such intra-organisational collaboration can best be conceptualised and managed.

The digital transformation of cultural institutions may be considered in relation to their on-going and widely debated evolution into less authoritative, more inclusive organisations (Vergo, 1989; Mason, 2004; Simon, 2008; Adair, Filene and Koloski, 2011). Consequently, the literature on museum co-production, or focusing on the design and use of digital interactives and applications in cultural and heritage sites, has hitherto concentrated on the impact on audiences and the emerging possibilities for engagement, empowerment, and multivocality (Iversen and Smith, 2012; Kensing and Greenbaum, 2013; Holdgaard and Klastrup, 2014; Smørdal, Stuedahl and Sem, 2014; Graham, 2016). By contrast, the day-to-day dynamics of collaboration, the mechanisms and forms of partnerships and knowledge exchange around these processes have received only collateral attention.

Both in research and in professional practice there remains a desire to explore the expanding range of possibilities presented by new technologies. However new modes of working require new knowledge and new collaborative strategies across cultural institutions themselves, as they conceive and manage new relationships with external parties. Cultural organisations recognise the power of new technologies in facilitating imaginative engagement with spaces and objects, in affording innovative forms of participation, and in drawing new kinds of value from otherwise inaccessible archives.

Nonetheless, in existing research from both the museological and design communities around digitally-focused collaboration we observe approaches that are limited in their capacity to support the production of strongly experimental outcomes elicited from the

contributions of diverse participants in the form of workers from across cultural organisations, audiences engaged with a topic or materials, and specialists in the forms and methods of digital production. At one end of the spectrum, there are collaborations driven by pre-determined research questions or requirements. This approach is suitable for known problems to which participants have clearly defined relationships. It is less well adapted though to the generation of new, innovative ideas generated partly outside of a particular discipline because of the a priori definition of the basis of participation. The second tendency emphasises an experimentation and engagement with audiences, which takes precedence over particular outcomes. This approach is excellent at engaging broader participation but less well suited to producing valuable (in themselves) outputs or answering well defined questions for the organisation or for research (unless those questions are specifically concerned with engagement.)

The approach we propose is closer to the second tendency that poses a stronger emphasis on process, but at the same time, maintains a clear focus on the final output. To describe this approach we suggest a formulation of *open design spaces*, which is intended to capture valuable scholarship and practice in various forms of design collaboration and consider its applicability to digital partnerships in cultural organisations, which support both co-creative experimentation *and* the production of new knowledge, artefacts and experiences.

We centre our contribution on a case study: *Children's Magical Realism for New Spatial Interactions: AR and Archives* a research project based at Newcastle University, UK. The project explored the development of immersive technologies, specifically Augmented Reality (AR) on mobile phones, incorporating archival and exhibition material held by Seven Stories, the National Centre for Children's Books and

responding to ideas from magical realist literature for children. The project engaged audiences (mostly children 7-11) and knowledge specialists in children's literature and education, archivists, academic researchers and professional developers. Within this project, we built on the affordances of the cultural content itself, in the form of notes, doodles and drawings from the archive of a children's author of magical realist literature, David Almond, to support the collaboration and play a role in the definition of an *open design space*. Using this material, we developed scenarios in which the imaginative capacity of all parties could engage with the professional and design knowledge of technologists resulting in both an innovative app and in recommendations for future collaborative practice.

Based on this example, the article advances a set of propositions, guiding principles and questions to support the development of fruitful digital cultural partnerships. The discussion focuses on the following points:

1) a suggested alternative to the established knowledge exchange approach, in the form of *open design spaces* of inspiration;
2) the role of cultural assets in shaping technological development, sustainability and cross-departmental process.

In the next paragraphs, we review scholarship around digital cultural partnerships and design experimentation in museums, and thus develop context for our contribution.

Digital cultural partnerships

The history of the digital transformation of museums and other cultural organisations is also a history of different models of collaboration. The discussion around collaborative models typically intersects with debates on participation and with the development of

new technologies for the museum. A significant body of literary work addressing collaborative relationships and processes of co-creation within museums is published in the field of Human Computer Interaction and Design Research (Dindler *et al.*, 2010; Fuks *et al.*, 2012; Ciolfi *et al.*, 2016), and maintains a strong focus on the design activities and the various steps leading to better understandings of the context and the stakeholders. The museum and curatorial studies communities, by contrast, tend to focus on opportunities for inclusion, access, engagement offered by digital applications (for an overview see Kidd, 2014).

The DCMS #CultureisDigital report (2018) describes digitally-propelled cultural creativity as a key factor in the future prosperity of the UK. In response to the intrinsic limitations (time, dedicated staff, finances) of cultural organisations in engaging autonomously in digital innovation, collaborations and partnerships with technology firms have been advocated as the way forward, particularly for small and medium-size organisations (Sapsed *et al.*, 2013; Department for Digital Culture Media and Sport, 2018; Li and Ghirardi, 2018). The DCMS report sketches respective benefits for the technological and cultural sectors, such as access to creative minds, talent and equipment, but also advances more provocative suggestions, such as that '[c]ontent creation can also help to drive technical innovations, pushing the possibilities of the software and its experiential potential' (2018 p.13). This statement is significant insomuch as the idea that cultural content can drive technological development, subverts the more common dynamics that see technologies entering the cultural sector as accomplished tools or platforms, ready to be 'filled' with content to communicate and manipulate. We wish to explore the ramifications of this first assertion asking what happens when we take seriously the notion that content can be a genuinely agential

actor in provoking creative, technical innovation. To do this we will ask how the notion of open design spaces, in turn characterised and shaped by boundary objects in the form of 'repositories' (Leigh Star and Griesemer, 1989) afford distinctive forms of collaborative networks in cultural organisations.

Typical models

The usual model of culture-technology partnership sees organisations in the role of receivers, or end-users of the technology. Besides commissioning and outsourcing tasks to technology firms or R&D labs (Sapsed *et al.*, 2015; Hemsley, Cappellini and Stanke, 2017), a common approach to developing digital projects takes the form of research-led initiatives strongly relying on the facilitation of the academic partners (Holdgaard and Klastrup, 2014; Ciolfi *et al.*, 2016; Li and Ghirardi, 2018). Further, many digital initiatives maintain an indirect, limited relationship with the core exhibition or the collection to which they are supposed to respond to. Their co-creative process is clearly separated and maintained as collateral from the organisation's public programme.

With the imperative to develop new, stronger and more creative digital cultural partnerships, as advanced in the #CultureisDigital report (DCMS 2018), it is particularly urgent to gather best practices, guidelines and empirical studies on how best to develop new collaborative initiatives. Further, the current policy and scholarly environment points at a growing role of design in innovation ecosystems (Follett and Marra, 2012; Cautela, Meroni and Muratovski, 2015; Whicher and Walters, 2017); and recent funding schemes such as the Innovation Vouchers and digital-skills development

programmes supported by the National Lottery Heritage Fund and the Arts Council[1] (in the UK) encourage organisations to seek out external sources of knowledge and expertise that can contribute to innovate their practices. In particular, we lack examples focusing on the role of cultural assets within processes of digital innovation, and challenging the current perception (and self-perception) of cultural organisations as mere receivers and end-users of technology (Li and Ghirardi, 2018). We ask whether cultural assets such as the collection, or content of a particular exhibition are inevitably a 'filling' for the technology that is developed, the jam in the innovation sponge cake as it were, or could have a stronger and more direct influence on such development by acting as a boundary object allowing different organisational collaborations to arise without prior consensus (Leigh Star, 2010).

Participatory configurations in academic research with GLAM institutions

Collaborative projects aimed at creating novel digital displays or interactives are frequently framed as participatory processes of co-creation involving museum staff, members of the audience (usually identified as relevant groups or communities) and researcher-designers. The theoretical background of, and rationale for various types of participatory configuration continue to be a subject of debate (Ciolfi, 2013; Ciolfi *et al.*, 2016; Stuedahl *et al.*, 2019). In initiatives inspired by a Participatory Design tradition (Schuler and Namioka, 1993) the focus is on understanding and finding expression for the perspectives of participating publics (Taxén, 2004; Dindler *et al.*, 2010; Smith, Iversen and Dindler, 2011). Such approaches offer the prospect of investing users in

[1] The National Lottery Heritage Fund invested £1 million for digital skills development in cultural organisations. The Arts Council has launched a £1.1 million Digital Culture Network to increase digital capacity.

outcomes, fulfilling strategic or cultural imperatives around inclusivity and establishing more egalitarian, dialogic relationships between cultural gatekeepers and audiences. However they also suffer drawbacks thanks to the very factors that contribute to their success such as the degree of involvement with participants and the challenges of effectively redistributing agency (Morse, Macpherson and Robinson, 2013). Within GLAM institutions such a devolution of power and responsibility may not always be unattainable without generating a series of intractable problems including: demand on staffing levels (Marselis, 2011); a ceding of curatorial authority provoking debate over the museum's message; a lack of alignment in terms of goals and degrees of control over the process; the fact that a number of the creative choices are made before the start of the collaborative phase, as well as the ambiguity around the role of the researcher-designer as both adviser and participant (Holdgaard and Klastrup, 2014).

Children's Magical Realism intersects a tradition of research aimed at including participants' perspectives in design processes, particularly in museum practice. Such traditions share principles of openness, participation and the expansion of the physical and conceptual space for design. We have described how Participatory Design approaches have been widely explored in museums to engage audiences in co-curation and co-creation activities. A different case is that of experimental processes led by designer-researchers in collaborations with museum professionals or volunteers (the work of Petrelli and Ciolfi at the University of Sheffield being a case in point, such as in (Petrelli *et al.*, 2013; Claisse, Ciolfi and Petrelli, 2017)). These projects show a set of recurrent features. In particular, they frequently require long processes that include, for instance, numerous ideation sessions, focus groups, co-design sessions, meetings and evaluations, which are onerous on staff time and require bureaucracy and management

process of their own. The design process accounted for in this literature is described as open, risky, messy, evolving-by-making (Petrelli *et al.*, 2016) and driven by the desire to 'enable imagination' and support the blending of different realities such as the past and present dimensions (Fraser *et al.*, 2004). It is not our intention to criticise the aims or realities of this research but to ask whether we can identify elements of other promising models for collaboration. We are interested particularly in developing models which may be less onerous on staffing and that explore more fully the capacity of content to take play apart in the construction of knowledge through the making of new technological things.

Other scholars have investigated how cultural professionals develop understandings around the potential of new interactions to support their audiences (Maye, Avram, Dominique Bouchard and Ciolfi, 2017). Nevertheless, in such studies cultural professionals typically take the lead in developing only the content for the interactives, whose design is still firmly in the hands of the designers. In summary, whilst empowering cultural organisations to autonomously design digital installations is sometimes recognised as an eventual goal in these initiatives (Petrelli *et al.*, 2014; Ciolfi *et al.*, 2016), the design activities proposed still tend to constitute an additional task for the organisation outside of conventional role and remit definitions.

Collaborating with technologists in GLAM institutions

By contrast, the model of collaboration between cultural organisations and commercial technology firms has received limited academic attention, with only passing mentions to some key differences between the two options. For instance, Petrelli et al point out that in commissioned work designers present more accomplished and finalised prototypes to the cultural partner, whilst in research-led projects there is a constant exchange of work in progress, to enhance the shared ownership of the process (Petrelli *et al.*, 2016).

Rather than investigating effective collaborative models, much of the literature provides general claims that media enterprises can benefit from partnering with cultural organisations promoting diversity and enhancing a sense of cultural identity 'which allow regional actors to create the most suitable conditions for cultivating the formation of a multimedia industry' (Laurentis, 2006, p. 79). However, these partnerships are usually limited to (once again) the cultural institution providing the content that fuels media industries (ibid. pp 80-81). Other proposals maintain the potential of online platforms to support 'design-driven collaborative initiatives between cultural organisations and design communities' (Russo, 2011, p. 339) and interestingly but hitherto vaguely suggest a role for museums as laboratories 'for extending partnerships and building capacity' with commercial design practices engaging with social issues (ibid. p.335). Hackathons are a particular instance of this tendency. Culture Hacks (Briscoe and Mulligan, 2014; Rey, 2017), specifically, are an emergent model of collaboration where institutions 'offer' cultural content and cultural data to developers and creative technologists for quick experiments towards inventing new products or services. However, hackathons tend to be centred on networking, and their outcomes are unreliable and may not always be well aligned with the institutions' agenda. Additionally, hackathons' participants may not be willing to fully develop their prototypes after the event, and more generally, the episodic and self-contained nature of the hackathon does not promote a stable and sustained collaboration between institutions and developers around a project.

A different case is that of projects facilitated by agencies or incubators, such as The Space (supported by the BBC and the Arts Council of England). Its activities include generating new partnerships and commissioning new digital creative work that would benefit cultural organisations. However, incubators like The Space focus more on the

task of matching organisations and designer/artists/technologists, rather than proposing any particular new model of collaboration.

Design Spaces

The recent 'turn to openness' in cultural heritage institutions is oriented towards the development of collective design activities to support practices of 'commoning', especially in relation to increasing access and use of digitised cultural content (Marttila, 2016). The concept of meta-design, advanced by Fischer et al. (2004) is also relevant to our investigation insofar it challenges the role of end-users in the design process, by concentrating on the creation of design templates for others to use. These methods are guided by the desire to democratise cultural and production processes, making organisations more socially accountable but are not intended to be opportunities for R&D around novel technologies. Further, in PD-inspired curatorial initiatives, the contributions from the participants tend to concern the content only, and in meta-design, only skilled users would be able to fully engage in the co-evolution of open systems as advocated by proponents of this method.

As our project addresses the development of open-ended, generative, shared environments for ideation and experimentation, the notion of *design space* became relevant to the problem of reconfiguring digital cultural collaboration. This expression has been used in heterogeneous ways across the Design Research and Human Computer Interaction communities. Dove et al (2016) provide an overview on the diverse interpretations of this concept, that they discuss in relation to revisiting the design process to understand constraints and missed opportunities. Their working definition is explained as: 'a dynamic conceptual space that bounds possible or probable designs, and which is constructed and explored through design activities.' (Dove, Hansen and Halskov, 2016). We align our understanding of a design space as akin to these authors'

emphasising its openness and multidimensionality. In particular, Botero et al (2010) emphasise the importance of recognising multiple actors and co-creators of the design space, beyond the designers, and suggest that 'what counts as design space should also be expanded to include other things like social practices and agreements and not only physical artefacts' (Botero, Kommonen and Marttila, 2010). Nevertheless, we find Heape's description of an 'emergent and systemic whole of interweaving, traces by trajectories of exploration, experiment and change' (Heape, 2007) particularly fitting. Gaver's (2011) use of the term in relation to inspiration is also particularly relevant to us. In our effort to develop alternative models of digital-cultural partnership, we recognise how the idea of an *open design space* is useful to frame the dynamic coming together of agencies as well as creative and reflective processes of ideation.

This article suggests alternatives to the diffused paradigm of collaborations based on the exchange of complementary knowledge (e.g. in Hess, Colson and Hindmarch, 2018). It does so by reframing the idea of knowledge exchange in terms of an exploratory process of mutual inspiration, and by proposing how a design space and co-design opportunities can be embedded in the public programme of cultural organisations, rather than taking place in separate sessions adding to the staff workload. In this sense, our notion of a design space refers both to *literal* space: space to have and exchange ideas; *temporal* space in the working day to conduct the various activities necessary and *ideation* space: event structures, ways of approaching collaborative working and formats for having ideas together. Further, although our project took place under the auspices of a UK Research Councils (UKRI) funded project with the direct involvement of academic researchers, it provides a model which we believe could realistically be reproduced in whole or in part by cultural organisations working with designers or

developers to enhance the agency of the former in the production of new technological experiences. Our approach addresses the sustainability of digital experimentation in cultural organisation asking, how can this be achieved in ways that can be staff-led and do not divert significant resources from the day-to-day activities and programs in place? Which alternatives are possible to the model of the museum-as-commissioner or the museum-as-testing ground for digital design experiments?

Cultural content as boundary object

Star and Griesemer's work (Leigh Star and Griesemer, 1989) on 'boundary objects' as a nuanced alternative to ecological understandings of organisational networks in (Callon, 1984; Law, 1987; Latour, 1988) has already proved helpful for understanding how museum objects structure work (in the broadest sense as ' include[ing] cooperation around serious play endeavours such as skiing, surfing, and hiking ' (Leigh Star, 2010)). Their initial definition used the context of a scientific collection process to observe how a range of involved parties (amateur collectors, scientists, curators and the like) were able to make sense of a set of objects in the forms of, for example, maps and specimen index cards in ways that would both preserve the value of their own particular activity for the individuals involved (say doing amateur field work) and afford a degree of knowledge sharing in unstructured collaboration. As the authors put it, '*In natural history work, boundary objects are produced when sponsors, theorists and amateurs collaborate to produce representations of nature*' (1989, p. 408). A crucial aspect of Star and Griesemer's idea relevant here is that not only could the various parties to the natural history project above interpret the objects flexibly but that the object acted as an organising schema through which knowledge could be created and shared across different work contexts.

The design community has long recognised the validity of boundary objects for thinking about the objects of design and their role in sharing knowledge, in particular as it pertains to the shared creation of new designed things. Noting that 'performative design artefacts, such as mock-ups, prototypes, and design games, could act as boundary objects', Bjögvinsson and Ehn (2012, p. 105) describe how such a view of the working in progress of design is based on an understanding of 'socio-material Things as assemblies rather than being on things as objects.' Our work aligns well with this perspective but differs from previous research inasmuch as our focus is less on the emerging objects of design (prototypes, sketches etc) and instead rests on 'found[2]' cultural content and its surrounding practices conceived of as, itself a boundary object. We describe the archival papers as a boundary object not purely in their material dimensions but also as they are differently acted towards and made sense of by the various groups of our project. To the collection managers at Seven Stories, the papers are a location of work, the object of cataloguing processes, a material for cleaning, and a resource for educating visitors or informing scholars. To the children and their parents and guardians who were participants to our project they were a way of discovering more about David Almond and his books, a source of literary and visual interest and (with our interventions during the workshops) a springboard to imagining the fantastical. To the exhibition and marketing teams they were a trove of images and text for display, a source of prestige for the institution and a resource for inspiring exhibition design. To the designers/developers in our research team they acted in ways including many of those above but additionally as a resource for workshop ideas, as materials to include in

[2] As opposed to explicitly created through the contemporary design activity

a mobile app and as a way of involving and motivating the interaction of the different groups involved.

There are a number of features of boundary objects noted by Star and Griesemer (1989; 2010) which we feel are pertinent to the construction and maintenance of open design spaces and explore below as they might apply to the 'content' of our project: the papers of an archive of children's literature and the various parties with whom it was necessary to share a common knowledge representation. In fact, all of the main features of boundary objects: their interpretive flexibility; their status as a material/social arrangement; and the focus they bring on scale (Leigh Star, 2010), all could be considered in greater depth than space allows here. We will however highlight some of these features as they inform our analysis of our project and attempt to explain why we think it was successful and consequently why we believe this model holds promise for future development.

Magical Realism for New Spatial Interactions

Children's Magical Realism for New Spatial Interactions: AR and Archives was a seven-month research project based at Newcastle University's Culture Lab with the involvement of the School of English Language and Linguistics and in partnership with Seven Stories, the National Centre for Children's Books. The project responded to a combined UK, Arts and Humanities Research Council/Engineering Physical Sciences Research Council (hereafter UKRI) call to contribute to the 'Next Generation of Immersive Experiences.' The call sought initiatives addressing how arts and humanities knowledge could inform the development of new immersive technologies such as virtual, augmented, mixed reality, and forms of new cinematic experience. Consequently, our project was subject to a number of formal constraints which

mandated the inclusion of various elements. First, we were tasked explicitly with the exploration of immersive technologies. Second, the project required the presence of an industry partner, a role that was fulfilled by Seven Stories. Lastly the project was to have direct implications for the future capacity of the partner themselves and the industry more broadly to collaborate around immersive technology. To better satisfy this last point we also included members of the development community in the North East in some of our later workshops which focused on promoting engagement with our methodology. These constraints shaped and directed our project but were also productive in the formation of some of our projects research questions. As well as a number of interaction design methodology questions we also wanted to use the opportunity to develop and trial the collaborative methodology which forms the focus of this paper. In planning the project and submitting the funding application we worked closely with our partners, to co-define these goals. We decided together on the materials to be used in our workshops, on the output – a smartphone app, and on the number and format (though not initially the content) of the workshops themselves.

We have said that our project responded to the UKRI funding call by developing a number of interaction design research questions. We describe some of this work briefly here to give context to our later descriptions of the workshop series that constituted our main enquiry as presented here, i.e. the possibilities for exploring new patterns of digital collaboration with cultural partners. Our response to the call was based on awareness that recent technological developments in the field of AR would support more complex interactions for mobile devices, and new ways of rooting virtual objects in the real world. Additionally, the recent acquisition of the archive of children's literature author David Almond by Seven Stories and the associated exhibition of some of those

materials, offered the opportunity to bridge the notion of mixed reality afforded by AR with inspiration coming from Almond's approach to Magical Realism (Hammer, 2006; Latham, 2006). The genre of Magical Realism grew from a Latin American phenomenon into a global one and is characterised by ambiguous crossovers between real and imaginary worlds, and also between times and places (Faris, 2004). The canon is rich in descriptions of places enlivened and complicated by the presence of the fantastical and it was this aspect that we saw as useful as an informant to our design process. Hence, the project was grounded on the hypothesis that Almond's magical realism could inspire unorthodox ideas about spatiality and overlapping realities that could inform the design of new AR applications. This context provided a shared challenge for our workshop process. We and our project partners had common ground in our interest in exploring the relationship between Almond's work, the possibilities of new interactive technologies, and the experience of place in children's lives.

The project consisted of six workshops conceived as ways of activating knowledges and imaginations from the different parties involved (children participants, [ANON] staff members, developers, researchers) in the appraisal of Almond's materials (in the exhibition and the archive) towards the development of a bespoke smartphone application. Five of the six sessions involved between five and twenty participants aged between seven and fourteen years old with one other session targeted at adults only (professionals from Seven Stories [ten people] and members of the local developer community [five people]).

The application itself aimed at using AR to engage audiences with content from the archive, which would otherwise have found little public exposure and the desire to share these materials with broader audiences was a motivating factor for Seven Stories. The

final version of the app, called Magical Reality, allows users to discover and interact with a set of geolocated objects placed in the Ouseburn Valley, around the museum building in an outlying area of Newcastle upon Tyne.
Users are guided by navigating displays on their screen in finding the items, which are 3D versions of the sketches and notes from the archive, and present various degrees and forms of interactivity. After each item is uncovered, the app displays the full page of sketches and notes it came from.

Our study is based on the analysis of documentation and reflective notes produced during the workshops and the application development process (led by one of the researchers), integrated with a set of seven interviews constituting a representative (in terms of their professional discipline) sample of the parties involved. Names of interviewees have been changed to preserve anonymity. Our findings are consolidated through examining respectively the way the cultural asset, the archive of papers, shaped the process of designing a new interactive product; and the sustainability of the project achieved by turning each stage of the research process into public engagement. By doing so we develop our definition of a design space in the context of digital collaborations in the cultural sector as shaped by both the content itself and the event formats. The article culminates with a discussion around questions of knowledge and approaches to collaborative work based on the articulation of open design spaces across the organisation.

The cultural asset: a boundary object

Central to our contribution is our argument that the cultural asset, constituted by the David Almond archive, the exhibited materials and more broadly his entire body of work was an agential and coordinating factor in producing a design space for the

collaboration. Specifically, we propose that this space emerged out of a focus on and a set of activities associated with the cultural asset in terms of both its physical affordances and capacity to activate particular forms of knowledge in the various parties to the collaboration acting as mentioned as a boundary object. As outlined above, an important premise of the project was that magical realism could suggest interesting new ways of considering spatiality, movement, place, memory, and the unseen and that this could suggest innovative interactions in AR applications. In the following paragraphs, we offer a set of observations into the process of drawing insights and ideas that informed the design of the application, demonstrating how these emerged during the development and running of the workshops. In doing so we establish how the cultural asset itself was strongly agential in suggesting these avenues to insight by providing a focusing frame to the design space.

Archives as lost civilisations

One of our earliest workshops, 'Archives and lost civilisations', was seminal in considering how the archive could shape design spaces for collaboration. Participating children were given weathered boxes containing enigmatic objects and facsimiles of archive papers, presented as belonging to a fictional lost civilisation living in the local area in a distant past. The children were asked to speculate about the uses and roles for these objects, and to associate them to specific locations in the area. The intention was to create meaningful links between the archival content and the environment, through fictions, and to use these fictions to shape the design space of the emerging app.

Papers acted towards

This workshop was co-planned with collections and exhibition managers at Seven Stories. Our aspiration was to draw on the knowledge of the content of the Almond

archive and of the processes of archiving held by the collections staff. 'Handling sessions' are a common practice at Seven Stories and the collections team has a programme of archive-based activities, based around using materials as inspiration for storytelling. In this sense, the papers were already acted towards by the staff in a way that recognises their value for working with publics. Our purpose was to use this imperative to capitalise on the materials for engagement, and preserve its value *while at the same time* using the outputs from participants' creative work to shape the design of the app. We were explicit from the onset about the dual purpose of our event, making comparisons between magical realism and AR and continually 'flicking' between foci of the papers and fictions we were presenting, and the way they related to AR and interaction. In this sense we consciously facilitated a situation in which 'groups that [were] cooperating without consensus tack[ed] back-and-forth between both forms of the object' (Leigh Star, 2010). The papers then acted as a nexus between the various elements of our project, acting as a binding agent.

Structuring collaborative relationships through content

Earlier we said that we identified all three of the main facets of boundary objects (interpretive flexibility; their status as a socio-material arrangement; and their focus on scale) at work in our use of archival items in project workshops. Below we discuss how these functioned in the delineation and maintenance of an open design space.

[fig 1 here]

Images as loose structuring

Many of the images in the Almond archive have qualities as either useful, ambiguous or figurative. **Error! Reference source not found.** for instance shows an elaborate doodle with a word, possibly 'Caroline,' written above. **Error! Reference source not found.**

meanwhile is recognisable as relating to a particular Almond book, My Dad's a Birdman (2007). Both were interpreted freely in the workshop but provided different avenues for the various parties to feed into the app design.

[fig 2 here]

For the archivists and exhibitions team, the images represented a chance for children to experience the archive in a way that engaged with its history. The explicit casting of the papers as part of a fiction was, however, a new technique to them and one that they stated as of future use to them,

> 'the value here was in getting inspiration and ideas, thinking in new ways, to have an example of what is possible.' (Susan, curator at [ANONYMISED])

For us, these images encouraged an explicit relationship between the papers themselves and issues of space and place that we wished to explore through the app. The lessons we derived from this activity in terms of the app design are already discussed in depth in our published work elsewhere [ANONYMISED] but briefly the sketches allowed us to imagine how we and children might associate particular images 'belonging' to their surroundings as either representations of topography acting as a kind of map (as in **Error! Reference source not found.**) or as populating characters with literal connections to their environments (as in **Error! Reference source not found.**.) Hence, the characteristics of the archive content were not only flexibly interpreted but also structured the possibilities expressed through them thanks to their own particular qualities as being abstract, figurative or suggesting particular visual styles.

[fig 3 here]

Text as hook

Similarly, short quotes afforded the opportunity for children to found their fictions in the papers and by doing so bring the various social arrangements around the papers into dialogue without the need for explicit consensus between them. **Error! Reference source not found.** shows a quote 'Have you ever seen the dead,' from the book, A Song for Ella Gray (Almond, 2014). This suggested an exploration of the book and its themes of death and loss through discussing this informally with the children. It was a source of macabre inspiration for the children's visioning of a lost civilisation and for the design team both an indication that this was an interesting item to include in the app (see [fig. 4 here]) and a recognition that a horrific atmosphere in elements of the app experience might be engaging to children's imaginations as a frame for particular items.

[fig. 4 here]

Open design spaces in future professional practice

Thanks to typical tendering processes within the museum sector, the available features of a technology tend to be well defined and pre-understood when it comes to the stage of using it to host or display cultural content, within a cultural organisation. Our project demonstrates that, by contrast, it is possible to generate an expansion of such possibilities from a process focussing on the content itself. Although we recognise that cultural content has inspired technological development in a variety of ways and occasions before, our contribution is distinct in that this inspirational process was consciously crafted and designed in its own right. Further, whilst storytelling and fiction have a strong tradition as part of different design research techniques, the process of fictionalising the relationship between objects, places and searching activities differ significantly from more established uses of fiction in design (mostly oriented at providing a context for testing and experiencing a prototype) (Carroll, 1997; Blythe and

Wright, 2006; Blythe, 2014). In our workshop, fictioning becomes the vehicle to generate a pool of moods, aesthetics, features and interactions that pre-exist the designed technology. Effectively, it allows a broader set of stakeholders, including the museum staff, to engage with the kind of processes that designers may go through among themselves. Structuring and modelling this process in the way we described in this article is important because it can be embedded in the usual activities of a cultural organisation. This is the focus of the following section.

A sustainable design space

Despite the general awareness that collaborations are 'a sustainable method of supporting upgrades in museums' technological infrastructures and digital offerings' (New Media Consortium, 2016), the concept of sustainability does not feature prominently in the literature that focuses on designing digital interventions for museums (exceptions are over a decade old and a have a slightly different focus, such as [Zorich, 2003; Anani, 2005; Norberg *et al.*, 2005]). Among the factors that motivated the success of our project, according to interviews and reflective annotations, are its feasibility and sustainability. We avoided purely research-oriented formats such as focus groups, observations, or co-design sessions directly aimed at developing the app. Instead, the design process itself took the form of a series of public engagement events (the 6 workshops) akin to those which would have normally been planned by Seven Stories as part of their programme. The workshops did not require significant extra resources, time or tasks from the museum's staff, but constituted an addition to the public programme, thus generating value for both the museum and its public.

> For Seven Stories it's been an opportunity to work with digital experts and in collaboration with our audience which is something we really like to do [...] it

> informed different aspects of our programme and young people could engage in different ways (Jenny, partnership manager at Seven Stories).

We used existing and underused resources in the form of Almond's archival material, and the workshops themselves were relatively cheap and quick to plan and implement. Further, the project involved members from different departments and roles within Seven Stories, which does not have a specific digitally-focused team but is working towards embedding digital thinking as a cross-cutting function within the organisation. Multiple agendas and motivations for getting involved surfaced through multidimensional processes including preliminary meetings, visits to the archive, curatorial and public engagement tasks.

During the project the researchers facilitated the process, led the ideation of the events, and the design of the app. However, most activities were co-planned with the museum staff. In this process, we consciously considered whether our role could be performed by non-academic designer/developers and by the museum's staff. A comparison between the academic-facilitated collaboration and purely commercial partnerships with designers/developers surfaced more than once during the interviews. The shared perception among the interviewees was that academic-led initiatives are usually more explorative, and allow for the consideration of a variety of ideas, taking more time and more risk following potentially not efficient paths and experiments. By contrast, direct partnerships with technology firms focus at finalising a product based on a clear commissioning process. For instance, Seven Stories's collections manager pointed out that:

> 'We are really used to working with academics, it helps a lot in idea generation and help us strategise. We have worked directly with technologists before but I think it is good to get academics involved, it is really important. We work on another app

> at the moment but academics are more willing to test, trial new things, while technologists are too product oriented.' (Matt archivist at Seven Stories)

Although this did not surprise us unduly, it helped in framing our process and understanding that part of the value was in the identification of steps towards the opening up of an enduring design space within the organisation. We considered that most of our actions, particularly planning and running the workshops as well as extracting clues for designing the app, could have been undertaken by the organisation's staff. This claim is founded on the assertion that the creation of the design space was not based on specifically design-oriented activities, but emerged directly from the planning and delivery of public engagement. The following quote suggests the complementarity between building digital capacity and making space and time within the usual workload of the organisation:

> At Seven Stories the capacity to work with digital is limited. I'd say that our digital knowledge is patchy across the organisation, [...] and sometimes finding digital capacity across the different teams has been a challenge so that element of making space (within people's workloads) is something I would reflect on further in relation to this project. (Jenny, partnership manager at Seven Stories).

Outcomes: the Magical Reality app

We launched the Magical Reality app shortly before the end of our 7-month project. Full results of user studies are forthcoming in separate publications but here we offer some brief considerations based on our own observation of the app in the wild as an outcome produced within our collaborative process. In short, we ask whether the process we undertook, produced a product that was actually distinctive from offers produced through other development processes. We have described elsewhere [ANON-PREVIOUS PUBLICATION] how the workshop processes we undertook were successful in translating ideas from Magical Realist literature and from our experiences

in and observations of the workshops into features of the app design. Some of these are also summarised above. Here instead we will attempt to summarise some elements of the apps distinctiveness and relate them back to the process that we undertook.

Imagined histories: telling stories through places in technology

Much work exists that uses technologies such as AR and geolocation (e.g. GPS) to situate evidence of the past in contemporary space. Other work has built on the affordances of AR technology to place creative work before publics as art or entertainment. The app we produced mixes these modes by mythologizing or rendering mysterious the objects of the past (in the form of archival papers) reimagining them as elements of fantasy. This unusual mix was, we argue, afforded not only by the initial aims of our project which were in any case co-developed with our partners but also through the wide-ranging and varied character of our workshops. We suggest that the direct involvement of children, through the frame of creative workshops gave license to a freer interpretation of the archival items. This leads us to our second observation.

Archives in apps

Our session 'archives as lost civilisations' developed fictions around archive items and related them to local spaces. What is particularly notable about this approach is the extent to which the outcomes present in the app, AR objects that effectively re-interpret or re-imagine the archival times, depart from a typical presentation of archival items by our project partners in their exhibitions or by other cultural institutions elsewhere. During the lifespan of our project, our partners Seven Stories hosted an exhibition focused on David Almond's work. The exhibition contained among other things papers from the archive which were used variously to interest visitors in his creative process, in his biography or in the novels themselves. The papers constituted a form of evidence

which supported an exhibition wide narrative about the author and the value of his work. The treatment of the archival items in our app reflected their place in the workshops: that is as a site and material for creativity. Their value was conceived of as partially based in their relationship to Almond and his stories but also as an attribute of the formal qualities of the sketches or notes and their affordances in inspiring creative ideas. In this way the framing of our workshop as a design space in which a shared creativity is operative presented a challenge to the cultural value of the materials we worked with. We (and the archivists we worked with) feel that such a challenge is a healthy one.

Conclusions: Beyond knowledge

So far, we have illustrated how cultural resources can influence technological innovation processes, so that new kinds of interactions can be imagined. In doing so we offer a counterpoint to patterns of digital innovation that brings accomplished technologies to the museum to deliver cultural content according to predefined possibilities. Crucially, the project contributes to reframe the role of cultural organisations from technology users to technology shapers.

Children's Magical Realism leveraged the knowledge, skills, attitudes of children, museum professionals, designers and researchers and, through its process; it reconfigured our understanding of what constitute knowledge exchange. The idea of the boundary object was useful to explain how the transfer of knowledge and the application of different forms of expertise were not based on complementarity. Instead, these forms of knowledge converged dynamically within an open-ended set of activities

and space for exploration and inspiration that lasted for the entire duration of the project.

The different inputs to the design which emerged from the workshop came to constitute a pool of not wholly formalised ideas, acting tangentially or collaterally in influencing design or curatorial/archival work. It is this indirect but progressive relationship between the cultural asset, the workshopping activities and the design decisions that we wish to emphasise. This relationship may also be understood in terms of the difference between inspiring and informing design (Sanders, 2005). In our project, individual participants were never framed as collaborators, as the workshops did not propose design decisions as their outcomes. Rather, activities engaging with Almond's magical realist literature became the opportunity to generate a pool of potential sources of design inspiration. These emerged from the affordances of the cultural asset as interpreted and articulated by the researchers, the museum's staff and the children participants. Such points of inspiration were then reflected upon and elaborated to inform decision-making during the design of the app.

We propose then that shifting the focus from knowledge exchange to inspiration-generation could be an important factor in building digital in-house capacity within cultural organisations. This recognition may productively inform future design process treating its resources as grounded in features of the cultural asset itself and capitalising on existing, public-facing initiatives. The processes devised and undertaken in Seven Stories broaden the notion of what an R&D activity in museum contexts can look like asserting that the creation of expanded creative and ideation processes can run alongside and inform processes of digital transformation and digital technology development within cultural organisations. It achieves this by using the cultural asset as a starting point and by maintaining a sustainable approach that is conscious of museum

professionals' workload. Further work is needed to identify the key features of a design space for cultural institutions and which different configurations of such space can support curatorial, communicative, engagement and educational functions through the development of digitally-enabled initiatives.

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Figure 1. An abstract drawing from the David Almond archive

Figure 2. A drawing from the David Almond archive for his book 'My Dad's a Birdman'

Figure 3. An extract from the Almond archive reading 'Have you ever seen the dead?'

Figure 4. A screengrab from 'Magical Reality' showing an archive extract surrounded by computer generated smoke