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# **Memoryscapes: Designing Situated Narratives of Place through Heritage Collections**

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## **Abstract**

Memoryscapes presents a detailed case-study of a design-led inquiry concerning the development of immersive experiences to support city-centre urban redevelopment, to encourage visiting and touristic activity. Our approach sought to explore how we might make innovative use of local heritage assets, within these digital experiences, to enhance engagement with place. We brought historians, ‘placemakers’, design-creatives and technology-developers into dialogue, in a series of co-design sessions (over 9 months, through 6 workshops and with 77 participants). Our initial workshop allowed us to explore and develop extant theories of trajectories and immersive experiences, which led to the development of a design toolkit. The toolkit facilitated further co-design sessions with stakeholder communities. This paper contributes a deepening and nuancing of theory of trajectories by applying it in a specific context, namely heritage-led immersive experiences for use in urban areas; and provides critical reflections on the design toolkit to support interdisciplinary stakeholder development of immersive urban experiences.

Keywords: digital immersive experience design; digital heritage activities; interdisciplinary co-design, urban development

## **1. Introduction**

Cities are sites of perennial interest for technologists (Mitchell, 1995; Ratti & Claudel, 2013). Increasingly, there is a rhetoric around the notion of the ‘smart city’ (Willis & Aurigi, 2018; Townsend, 2013) which includes a concern to explore the technological infrastructure required to underpin it (Herzberg, 2017), the human-centred aspects of how such behaviour settings might be designed (Forlano, 2016), and the ethics of inhabitants’ engagement with such augmented environments (ibid).

City centres were traditionally areas reserved for commerce (Lees, 2015), but are increasingly being challenged because of the introduction of disruptive technologies, which are shifting our patterns of consumption (Weltevreden & Atzema, 2006), ultimately affecting footfall and engagement with place (Millington & Ntounis, 2017).

City councils are therefore considering how they might find new ways of keeping city centres viable, engaging and of long-term value for touristic and leisure pursuits, alongside maintaining and growing retail traffic (ibid).

Given the over-arching interests in 'smart cities' it is perhaps not surprising that people are turning to new digital technologies to explore how they might support new modes of engagement with place. Increasingly, there has been interest in exploring how digital technology might be used to support for example, the performative arts (Benford, Greenhalgh, Crabtree, & Flintham, 2013) or touristic pursuits (Brown et al., 2005), allowing city visitors to experience them in new ways (Rowland et al., 2009).

A key asset however, within many cities is access to heritage, through either the built environment or museum and gallery collections. These are often seen as both primary drivers of touristic activity and the means for cities to further define and reinforce their unique sense of place (Millington & Ntounis, 2017).

Whilst the heritage sector generally remains successful in attracting visitors to its venues (Davies, 2018), it is currently facing a series of financial and organisational challenges that will shape its future, as a decade of austerity measures in the United Kingdom (UK), together with the impact of COVID-19 diminish the monies available from government-supported schemes. In England, this has resulted in increased competition for funding from organisations such as the Heritage Lottery Fund, Arts Council and Local Government. Indeed, the latter have seen budgets drastically reduced, with the result that they have limited support for, or disinvested entirely from cultural funding (ibid). There is a need therefore for heritage and cultural venues to act more entrepreneurially to cover funding gaps (ibid).

Similar to cities, heritage sectors around the world are looking to digital technologies to encourage visitor engagement and access to collections (Russo &

Peacock, 2009). Interactive tours, online digitised archival collections and augmented and virtual reality integrate digital media with physical artefacts for engaging visitors with heritage assets (Vlahakis et al., 2002; Wojciechowski, Walczak, White, & Cellary, 2004; Ciolfi & McLoughlin, 2012). However, viewing archived collections online can decontextualise assets when they are displayed away from their original place of use, or creation, and when presented with limited support for interpretation. This restricts how much can be understood about the assets and limits the audience to those with access to the technology. The HCI community has long recognised these problems, with researchers exploring issues such as designing for better user experience (Ferris et al., 2004), creating emotional connections (Petrelli, Whittaker, & Brockmeier, 2008), along with issues relating to the digital experience of heritage materials (Ciolfi & McLoughlin, 2012; Kirk, Durrant, Kosem, & Reeves, 2018).

The augmentation of physical objects with digital memories and ambient technology, for instance, has demonstrated some success for facilitating user engagement with memory-related objects via digital online photographs (Petrelli, Whittaker, & Brockmeier, 2008). This has been shown to enhance visitor experience through inciting curiosity and engagement (Ciolfi & McLoughlin, 2012). Sound, smell, touch, visual representations, prior knowledge and experience, overlaid with additional artefact detail such as information cards, enable visitors to experience multi-sensory embodied engagement with objects (Dudley, 2013). Furthermore, museum exhibitions offer an opportunity to extend the engagement of the artefact with other related heritages providing context and a meaningful sense of place (Giaccardi, 2011). It is important to also note that within the HCI literature there has been an exploration of theory concerning the design of immersive and touristic digital experiences, for example Benford et al's (2009) Trajectories of Interaction framework and Carrozzino

and Bergamasco's (2010) consideration of levels of immersion and types of interaction, which provide frameworks for thinking about the design of new kinds of situated heritage experience.

There are opportunities, therefore, to bring together the agendas of both the smart city and the heritage sector. Smart city agendas are concerned with how technologies can be used to enhance the operations and attractiveness of place for the benefit of citizens, visitors and the authorities. Heritage sector agendas seek to understand how technologies can be employed to facilitate and improve audience engagement with heritage assets by widening participation, deepening understanding and engaging those not typically engaged through providing them with richer context. The combination of these two agendas points to an interesting space of contextualised, location-based immersive experiences, developed around heritage content (which we refer to as 'memoryscapes'). This is an area which has been underexplored and in which there is significant scope to better understand how relevant stakeholder communities *might* be brought together to design and develop such heritage-focused, urban immersive experiences.

Working with various stakeholder communities (e.g. historians, placemakers, design-creatives and technologists), we developed a novel toolkit for the design of memoryscapes, utilising 'Boxes of Delight' which contained physical heritage artefacts. Within a workshop setting, these were presented alongside carefully designed scenario cards, providing detail about places, environments and audiences. Collectively, these items supported creative thinking and dialogue to seed development and evaluation of narratives and immersive experiences, for memoryscapes.

In this paper, we present a detailed case study of the development and use of the toolkit we used to facilitate interdisciplinary stakeholder dialogue in the design of

‘situated narratives’ or memoryscapes for Newcastle City Centre. We make two contributions. First, we contribute to literature on the theory of trajectories of interaction by a) combining it with work on levels and types of interaction, and b) exploring extensions and nuances made possible by specifically considering heritage practice, and the concerns of different stakeholder groups expertise and experiences in place-making, heritage and technology and second, we present and reflect upon the design and utility of our toolkit which responded to our exploration and development of trajectories theory, and brought it in to dialogue with tangible heritage artefacts to support stakeholder engagement in the co-design of memoryscapes.

## **2. Background Context**

This project was developed to support the design, evaluation and application of immersive memoryscapes. Memoryscapes are defined here as multi-sensory, immersive, participatory experiences, utilising re-contextualised heritage assets, that take place in public spaces, intended to re-imagine and reinvigorate public spaces as destinations. Our key partners in this project were Tyne and Wear Archive and Museums (TWAM) and FaulknerBrowns Architecture. TWAM is a major regional museum, art gallery and archival service based in Newcastle upon Tyne in the UK. They operate 9 museums, support a further 55 and manage the region’s archives. Their collections are of international importance in art, science and technology, archaeology, military and social history, fashion and natural sciences. TWAM provided valuable insights and access to their collections, as well as expertise on visitor experience and historical collection curation. FaulknerBrowns Architecture are an architectural practice working nationally and internationally, who collaborated with Newcastle City Council on master planning the redevelopment of Newcastle city’s principal retail area.

### ***2.1 Heritage asset access***

Memory-based organisations such as TWAM often amass a large and varied collection of historically significant assets. The majority of these cannot be displayed in galleries or museums as there is often inadequate space to display more than a small portion of the collection, at any given time. Those that are publicly accessible are often decontextualised from their original locations and uses. Addressing these problems has become increasingly difficult in recent years with reduced funding in the UK, particularly outside of London (Arts Council England, 2019). Immersive technologies offer one possible opportunity to re-contextualise these assets, making them accessible in new ways and in new locations and offering possibilities for new kinds of participatory dialogue about pasts. Re-contextualisation is an important element of contemporary museum practice which allows heritages to be experienced in more ‘authentic’ ways that remove layers of ‘Authorised Heritage Discourse’ and reach more people (Smith, 2006; Tsenova et al 2020). Re-contextualisation also provides an opportunity for participatory engagement with heritage, allowing users to respond to immersive experiences whilst contributing and enhancing narratives through qualitative and quantitative responses. It is important to note the wider debates about what should and should not be in a museum, and that the best way to recontextualise non-local heritage assets is to return them to the countries from which they were taken (Marshall, 2020; Robertson, 2019).

In the UK, cultural venues, particularly those with public funding, are required to increase engagement and accessibility. The demographic of visitors to museums is relatively narrow and thus outreach has become increasingly important. However, this is difficult when budgets, and in turn staff numbers, are falling. Many cultural heritage organisations recognise the value of taking objects out of the museum context and



allowing users to experience them in other ways. TWAM have created a range of ‘Boxes of Delight’ to do this. These are themed boxes of deaccessioned heritage that can be hired to support heritage activities (particularly in schools). Further opportunities exist to use digital technologies to get heritage items out of collections, and like many museum services, TWAM also provide digital access to much of their collections through (mostly image-based) media included in their website (see <https://www.twmuseums.org.uk/>).

Globally the museum sector has long recognised a further problem in making collections visible. As Mendoza reports ‘[i]t is estimated that the museums of England and Wales hold at least 200 million objects, with approximately 90% in storage’ (Davies, 2018). Some collections held in storage are rotated through exhibits open to the public, but much remains hidden from view. The problem is further compounded by limited digital archiving of these collections, which restricts what can be posted online for people to explore. The resource requirements and expertise required for such digital archiving means that it is commonly only undertaken piecemeal, when specific projects or exhibitions are awarded funding.

## ***2.2 Designing interactive heritage experiences***

Processes for designing interactive experiences and participatory design approaches are well documented in HCI research (Bossen, Dindler, & Iversen, 2012; Bratteteig & Wagner, 2012; Vines et al, 2013) and include specific consideration of issues in the design of outdoor heritage experiences, such as the use of context and time to support the co-design process (Halloran et al, 2006). Much of this work considers the nature of the context of the setting, for example Ciolfi and McLoughlin’s (2012) work with Living History Museums and McGookin et al’s (2017) exploration of the impact of seasonality in mobile heritage experiences. It is common in these (predominantly)

mobile-interaction-based studies to focus on the learning experience of specific heritage visitors, but there are broader frameworks for exploring the delivery of interactive experiences, and ones which go beyond mobile device-led experiences. For example, the Trajectories of Interaction framework (Benford et al, 2009) supports understanding how visitor journeys through museums and galleries (among other kinds of interactive installation) can be shaped. Their conceptual framework offers a hybrid set of design concepts, combining **space, time, roles** and **ecologies**, for designing complex cultural interactive user experiences (Benford et al, 2009). Space is considered as the ‘spatial structure’ upon which the experience is performed. This can be a physical, virtual or hybrid space that combines the different spatial structures. Each experience has a temporal aspect including the activity timeline, participant scheduled available time, interaction time and the overall activity time. Participants may interact with part of the experience, the whole experience or extend the participation to include related follow-on activities. Different roles are adopted by different participants in the experience depending on whether they are active participants, passive observers or have a professional role in orchestrating the event. Interactive experiences require an interface for participants: this may be a physical, virtual or hybrid space utilising a range of technologies and diverse interfaces that are assembled into ecologies for enabling interaction (Benford et al, 2009). The framework was developed to better understand user experiences as journeys, but further work is required to “explain the complexities of experiences that are extended over space and time and that involve multiple roles and interfaces” (ibid: 9), and it is this challenge we address in this paper by applying this framework to the development of memoryscapes.

Of course, Benford et al are not the only researchers to have considered these issues and Carrozzino and Bergamasco (2010) have already begun to (arguably)

develop this line of reasoning through an extended focus on **types of interaction** and **levels of immersion** as key characteristics of heritage-based immersive experiences. They suggest that ‘non-interactive’ types of engagement might support passive viewing experiences, including static or dynamic projections or displays of physical artefacts. However, ‘device based interaction’ might offer participants a medium with which to interact with an activity through devices such as keyboards, touch screens, or wearable haptic devices, and they suggest ‘natural interaction’ provides a more organic approach to interaction using sensors to capture motion through for example, movement or speech. Each type of interaction offers a different level of immersion, and these levels are categorised by Carrozzino and Bergamasco (ibid) as being non-immersive, low immersion or high immersion. Technologies that offer no immersion are most likely to appear in the device interaction category. Whilst these technologies offer a mode of interaction, the interactive activity is the least organic of all the interactive types. Wearable devices that allow the participant to immerse themselves in visual, auditory, haptic or motion-based experiences provide a higher level of immersion but are still described as offering low levels of immersion by (ibid). The highest levels of immersion offered come from more natural interactive types that give participants a fully embedded experience combining more than one of the sensory inputs available.

In terms of the built or urban environment, collective storytelling also plays a critical role in supporting sense of place and heritage (Giaccardi, 2011). Digital interventions have been used to engage village communities with sharing information such as event details, suggestions, advertising, historical photos and audio content across a network of mobile, desktop, large display and touch screen technology (Taylor et al., 2007). Likewise, placemakers such as planners, architects and city councils often use digital interventions to engage communities in discourse on matters of behaviour

change, civic consultation, crowd sourcing and connecting communities (Johnson et al, 2016; Wilson, Tewdwr-Jones, & Comber, 2017). Urban redevelopments are frequently accused of erasing pasts and creating bland spaces with little connection to the locale, therefore limiting broad engagement with place (Blokland, 2009). Embedding historical cultural experiences in the urban realm offers an opportunity to reimagine and reinvigorate public spaces. In our work we explored the ways in which our histories can be recontextualised through *immersive experiences*. Bringing artefacts out of the museum and into the urban realm offers a wider platform for facilitating visitor engagement, not just with heritage collections but with spaces themselves (such as city centres).

Immersive experiences offer new opportunities to shape and enhance the quality of our public spaces, helping to reinforce the character and identity of places to make them more attractive and engaging destinations. The declining fortunes of some of our urban retail places is well-known, and Newcastle City Council and the city's Business Improvement District company, NE1, have been working with architects FaulknerBrowns Architecture to overcome this challenge in Newcastle city centre. Central to this work is a desire to make Northumberland Street (Newcastle's principal retail area) a welcoming place that offers a wide range of ways for users to engage with the area and to broaden the appeal beyond retail. A strategic aim of the masterplan is to create a desirable 'destination' built on the unique character of Newcastle. The masterplan recognises the potential of digital interventions within the urban area to reimagine and reinvigorate the public space.

With these challenges in mind our research aimed to explore strategies for encouraging and facilitating meaningful participation in designing accessible memoryscapes within the public realm at the earliest stages of the ideation process

possible. As memoryscapes sit at the intersection of heritage, public engagement, place-making and immersive technologies, we argue that an interdisciplinary, co-design approach is essential to their creation.

Below we present a detailed case study of the development and use of the toolkit we used to facilitate this interdisciplinary stakeholder development in the design of memoryscapes for Newcastle City Centre. The development of the toolkit allowed us to examine the ways in which trajectories of interaction apply in a specific context, namely heritage-led immersive experiences for use in urban areas. The use of this toolkit not only provided ideas for recontextualising heritage through immersive media and technology, but also on how interdisciplinary work can foster productive tensions borne of disciplinary tradition and knowledges. The focus in this paper, however, is deliberately on a detailed examination of the creation and implementation of these design tools, in part because of space limitations, but also because we want to do justice to the production and implementation process and what we learned about trajectories, levels and types of interaction in this process. We have explored how the memoryscapes toolkit supported interdisciplinary dialogue and the productive outcomes it stimulated in Swords et al. (2020).

The toolkit was developed through an initial workshop and then used in a series of further co-design workshops with diverse stakeholder groups, the results of which are discussed below. In doing this we developed a set of specific sensitising concepts and structures, outlined in our results, which are of use for the future design of urban memoryscapes. We conclude with a discussion of these concepts and the role of participatory design in the development of urban memoryscapes.

### **3. Initial Workshop**

A project launch workshop was designed to engage members of the creative, heritage,

technology and placemaking sectors with the Memoryscapes project. This further allowed us to begin to explore how trajectories of interaction combined with levels of immersion and types of interaction, might apply to the specific design of city-scale memoryscapes for heritage experiences. This was crucial for two reasons. First, it allowed us to explore the relevance of these factors a) in relation to heritage practice, b) for different stakeholders with expertise and experiences in place-making, heritage and technology, and c) through dialogue between these groups. Second, it enabled us to better understand how we might configure our relationship to, and engage with, different communities within our intended co-design process. We illustrate the value of this process below by highlighting the extension of the concepts outlined above, drawing on the contributions from participants in the initial workshop. These additional dimensions were then used in our evaluation of the toolkit itself.

By taking a step back to evaluate trajectories, levels and types of interaction in context, we were able to navigate challenges of instrumental rationality (Mattern, 2013), also referred to as techno solutionism (Morozov, 2013), where particular technologies or forms of media are privileged over others, restricting the development interactive content to that which fits a designated technology. This is also why the toolkit itself is designed to be used in the early phases of design timetables to influence scoping and brief development. In relation to the double diamond (Design Council, 2019), the toolkit fits in the ‘discover’ and ‘define’ parts of the process.

### ***3.1 Participants***

Participants (n=26) from each of the different sectors were invited to attend the workshop, which was held at a city-centre based heritage organisation. The workshop details were disseminated through social media and invites were sent out via the

project's partner networks. Workshop details were posted on the Eventbrite public events portal where participants could register to attend the event. Table 1 below, provides an overview of the participants that attended the initial workshop.

**Table 1**

*Participants in the Initial Workshop*

Participant	Type of Organisation	Sector
P1, P2, P3, P4, P9, P20, P23	Museum	Heritage
P5, P10, P11	Academia	Technology
P6	Academia	Heritage
P7, P13	Game and App development	Technology
P8, P12	Local authority	Place
P14, P17, P18, P21	Academia	Place
P15, P16	VR Development for place	Technology
P19	Animation	Technology
P22, P26	Architecture	Place
P24	Digital Consultancy	Technology
P25	Placemakers	Place

### **3.2 Procedure**

The day began with presentations, first from a project researcher to introduce the project and the workshop activities, then a heritage representative (Head of Programmes at TWAM) spoke about issues surrounding curation of large heritage collections and the challenges of new audience engagement. Participants were then formed into 4 sector-based groups. Each group had a facilitator from the research team at their table, taking notes and encouraging discussion about how immersive experiences might look and the opportunities and challenges of them in the city. Participants were encouraged to document their ideas on flip chart paper and at the end of the session discuss their ideas with the larger groups.

The round table activity was followed by a presentation by a place representative (the Director of FaulknerBrowns Architecture in charge of the master planning for the redevelopment of Newcastle city centre). In this presentation participants were shown a number of different examples of immersive activities that visitors to cities across Europe could experience, such as interactive floorscapes, overhead canopies and musical street furniture. Participants were then invited to complete a tour of the heritage organisation's archives to give them a sense of the types of heritage artefacts that could become part of an immersive experience, and to also reinforce the scale of the collections.

Participants then had lunch, during this break facilitators identified common themes that appeared in the data captured on the flip chart first activity. These themes included:

- Immersion (levels of and technology types)
- Relevance (of the experiences to the place they were to be carried out at)
- Ownership (of the places and associated interventions)
- Narrative (of the experience)
- Inclusivity (of audiences)

After the lunch break a technology representative (from a local immersive tech company) gave a presentation on the types of technology *their* organisation currently works with and gave examples of how it had been implemented for cultural or heritage activities. Participants were then asked to get into mixed groups with participants from different sectors to their own. They were then asked to explore in a round table discussion *each* of the themes identified above, in the context of engaging with heritage. This activity was repeated 3 times, with each participant being asked to sit with a different group for each round to ensure that the different sectors were represented in the discussions.



### ***3.3 Data analysis***

Data from the activities consisted of summative notes during the round table activities, which were documented on flip chart paper by the groups themselves, and facilitators written notes taken during group discussions at each table. After the workshop all materials were gathered and transcribed. The data was then subjected to a deductive thematic analysis (Braun, Clarke, Hayfield & Terry, 2019) structured around the concepts of trajectories of interaction (space, time ecologies and roles), and types of interaction and levels of immersion. Through this process a set of sub-categories relating to each theme were identified. Data was then subjected to a *secondary* and *inductive* analysis, suggesting two new further themes to support the design of complex user interactions for digital-cultural immersive experiences.

### ***3.4 Results***

In this sub-section we present the results of this thematic analysis of the workshop notes to understand the application of trajectories, levels and types of interaction. By exploring them with experts and in a specific context before developing the design toolkit, we were able to extend and/or deepen our understanding of the key themes of space, time, roles, ecologies, types of interaction and levels of immersion and their subcategories (Table 2).

**Table 2***Theme Category Codes*

Benford, Giannachi, Koleva, & Rodden (2009)				Carrozzino & Bergamasco (2010)	
Space	Time	Ecologies	Roles	Types of Interaction	Levels of Immersion
Physical single site	>10 min	Physical object	Passive observer	Smell	None
Physical site specific	2-10 min	Virtual static projection	Shared (multi-player)	Sound	Low
Physical distributed (city-wide)	5-10 min	Virtual automated projection	User shared	Taste	High
Virtual online	1-2 min	Hybrid screens	User specific local	Touch	
Hybrid (physical and online)	<1 min	Physical devices	User specific remote	Sight	
		Physical cameras		Movement	
		Sensors			

Within Benford et al's (2009) Theory of Trajectories the definitions of **space** included 'physical', 'virtual' or 'hybrid'. When describing experiences designed for the urban realm, participants expressed a desire for further categorisation of the physical suggesting a need to specify whether an intervention is to be hosted at a 'single physical site' or a 'distributed physical site' (i.e. city-wide). Furthermore, when creating heritage experiences that have site specific requirements either due to location or physical make-up, it was seen as important that those requirements were considered within a design.

**Time**-based aspects of design were also considered as the amount of time an overall experience might take to complete. Groups did not consider the amount of scheduled interactive time a visitor might have nor did they consider the individual activity time for each element of an experience. The difference in focus on temporal aspects, as defined within the trajectories of interaction framework, was likely due to differences in the perception of how people might engage with an experience in a dedicated exhibition space such as a museum or gallery versus visiting an experience situated in the urban realm. Whilst visitors actively seek out experiences at a museum or gallery, with dedicated focus, the experiences designed for memoryscapes are arguably much more likely to be chance encounters for people moving through the city, whilst engaged in other activities (e.g. commuting, shopping, passing through etc.).

Benford et al., (ibid) define **Roles** as: 1) active participants; 2) passive observers and 3) professional roles. However, how our participants described what would be considered ‘active participant’ suggested further nuanced sub-categories: a) shared multi-player; b) user shared; c) user specific local and d) user specific remote. Activities that required shared multi-player roles were those that were specifically designed to require more than one person to participate in the designed activity, whereas user shared activities allowed one or more people to engage with an experience without a participant having to rely on another in order to participate. Activities involving user specific local roles refer to the activity needing to be carried out in the physical location of the intervention, whereas user specific remote activities allowed users to participate away from the location through mediums such as social media.

Participants identified a common set of interfaces which can be considered to fall under the concept of **Ecologies**, which had varying configurations of supportive technical infrastructures embedded in the environment. These included: physical objects

(such as a statue); virtual static projections (a projection that always plays); virtual automated projection (a projection that plays in response to participant actions); hybrid screens (such as touch screens); physical devices (such as mobile phones); cameras and sensors.

Carrozzino and Bergamasco's (2010) concepts of the differing levels of immersion and different interaction types were evident in the conversations our participants had as well. However, our groups went slightly further, articulating the range of sensory experiences that might also be drawn upon for immersion, including sight, sound, smell and taste, a range of sensory experiences common in the urban realm.

A second pass of the data using inductive analysis identified two new themes that could be used to support the design of complex user interactions for digital-cultural immersive experiences. We briefly outline these below. The first focuses on the behaviour setting (Schoggen 1989) of the participants in the immersive experience.

A participant who engages in an immersive experience through a performance or a museum visit is present because they have chosen to attend that specific experience. Our participants however, noted that city scale experiences can occur whilst a number of different kinds of behaviour are being engaged in, for example someone may be passing through on their way to another space (to go to work or to meet a friend) or their visit might have another purpose (e.g. shopping, visiting the bank). Participants suggested that the ways in which someone may come to engage with a city scale immersive experience would inevitably need to be factored into the design. Therefore, understanding participant **behaviour** was argued to be very relevant. Workshop participants noted relevant behaviours pause, explore, learn, participate, play, socialise, contribute, observe and passage featuring as categories under this theme. **Pause**

describes when participants are encouraged to spend time at a particular location.

**Explore** is when participants travel (virtually or in person) around the city, visiting and experiencing different locations. **Learn** is behaviour in which the participant develops new knowledge or understanding, for example of a particular subject or place.

**Participate** describes the behaviour of engaging through activities and interaction beyond observation, and **play** describes engagement in activities for enjoyment, amusement or recreation. **Socialise** is the in-person or virtual engagement in social interactions, such as meeting or conversing. Participants **contribute** by submitting information or other assets to an experience. **Observe** describes behaviour of viewing but not actively participating in an experience and **passage** is the behaviour of engaging with a transitional space between two locations.

Workshop participants also pointed to the importance of considering the **environmental impact** of the experience. Aspects such as ownership, ongoing support and maintenance were included in this discussion. This concept is specifically relevant to designing immersive experiences for the urban realm as it focuses on the impact the technology has on public and privately-owned assets. Participant responses within this theme included augmenting the existing built environment with new technology such as a projection; new permanent interventions; temporary interventions; overlays; insertions; and redefinition of the area i.e. a street with cars would need to be pedestrianised for an experience or installation to work practically. Table 3 describes the new themes and their associated categories.

**Table 3***Proposed Additional Theme Category Codes*

Behaviour	Environmental Impact
Passage	Insertion
Learn	Overlay
Play	Redefinition of space
Socialise	
Explore	
Observer	
Participate	
Contribute	
Pause	

The literature review identified that design concepts of **space, time, roles** and **ecologies** provide a grounding for designing immersive performances. Additionally, immersive experiences for heritage activities require consideration of **types of interaction** and **levels of immersion** desired. Our memoryscapes approach for developing immersive experiences for audience participation in heritage activities in urban settings brings together the approach of Benford et al. (2009), with Carrozzino and Bergamasco's (2010) ideas, extending them by bringing in nuance and further subcategories relevant to memoryscapes and highlighting further relevant dimensions of **behaviour** and **environmental impact**. We refer to these combined themes as the memoryscapes design concepts.

Based on our findings from the initial workshop, and seeking to mobilise and apply the design concepts we derived from this, we developed a memoryscapes toolkit for facilitating new approaches to the co-creation of designs for immersive experiences focussed on memory-based artefacts for urban settings. The toolkit was explicitly

designed to identify and draw out the key challenges and opportunities that co-created ideas presented. The toolkit and its application are detailed further below.

#### **4. Designing for Memoryscapes**

Building on the initial workshop we undertook a collaborative study to explore the design of a memoryscape that re-contextualised assets from the TWAM collections and enhanced evolving plans for the redevelopment of Newcastle city centre. To do this required the development of bespoke design resources for this project. These were critical for collectively ideating, developing and challenging narratives around cultural-heritage assets for city-scale immersive experiences with stakeholder groups. Below we detail the key elements of the toolkit that were developed for this purpose.

##### ***4.1 The memoryscapes toolkit***

The memoryscapes toolkit was developed by drawing on the research team's interdisciplinary knowledges, the initial workshop and interviews with experts in the field of place-making, heritage and immersive technologies. The toolkit comprises a goal-oriented workshop designed to generate ideas for heritage-led immersive experiences from groups of participants. Groups draw on a combination of physical 'cultural prompts' and three categories of bespoke 'Design consideration scenario' cards (place, environment and personas) to develop their ideas, and 'Evaluation' cards to record them. These elements are designed to be used in combination to facilitate exploration of multiple scenarios for participants to stimulate iterative design processes.

##### ***Cultural prompts***

One of TWAM's museums, (Discovery Museum), curate a number of 'Boxes of Delight' that contain diverse tangible heritage objects which can be freely handled. We

used a selection of these boxes to prompt participants to think about cultural heritage in Newcastle city. Each box contained objects relating to a theme based around local histories (e.g. George and Robert Stephenson, Victorian Homelife, North East Shopping in the Past). Figure 1 shows a box containing objects of interest relating to sport in the city in the 1930s. Items such as a football, football shirt, tennis ball and racket, football boots, sports programmes and other sport memorabilia were contained within the box. Description cards are included in the boxes to provide further detail about each object contained. Although the themes for the boxes are general, the heritage objects are drawn from TWAM's deaccessioned collection and are thus specific to the history of North East England.

### **Figure 1**

*Objects from the 1930s sport themed 'Box of delight'*

#### *Place cards*

Place cards represent geographical spaces provided on the FaulknerBrowns Architecture city masterplan (figure 2). Maps of the area and additional information about spaces were supplied including a textual description and any physical constraints. The place cards are deliberately specific to the location the interventions are being designed for. In this case the location was the city of Newcastle, when using the toolkit to design interventions in other locations, place cards specific to that location would need to be created.

### **Figure 2**

#### *Place Card*

Images of other similar spaces with different types of interventions are provided on place cards. These images act as a prompt to encourage participants to consider how the space could be adapted or redesigned. Place cards were designed to encourage participants to consider elements related to **space** and **environmental impact**.



*Environment cards*

Environment cards represent a physical object that can be integrated into the experience such as a bin, lamp post or canopy (figure 3 shows an example of a seating environment card). Objects within environment cards are used to prompt participants to consider how a user might interact with a heritage item, whether it would be a physical artefact or projected display for example. The objects described are based on those typically found in the urban realm and included examples of objects from cities around the world that have been developed as interventions to encourage visitor engagement. These cards are generic and widely reusable for most locations. Further detail about each environment is provided on the cards to facilitate discussions about interventions such as whether they will be temporary or whether they will be part of existing urban objects or new installations. The environment cards were designed to encourage participants to think about **types of interaction, ecologies and levels of immersion.**

**Figure 3***Seating Environment Card**Persona (audience) cards*

Persona cards provide a description of a person or group of people likely to engage with the experience. TWAM employees were interviewed to understand both the demographic of current museum visitors and of those with whom they wanted to increase engagement. This information was used to develop the persona cards. The cards describe the age, gender, current employment status and nationality of the different types of visitors. General information about the person or group is also provided, for example whether they are regular visitors to museums or likely to engage with cultural activities. Furthermore, the purpose of their visit to the designated place is described along with the time they have to engage with an activity. The persona cards

are also designed to be reused across different locations. They were designed to represent two types of demographics – those that typically visit heritage and cultural venues and those that don't. The latter were purposely designed to promote thinking around how to engage different visitor graphics in cultural and heritage activities within the city. Table 4 demonstrates which prompts were specific to a location and which were generic.

Table 4

*Prompt card reusability*

Prompt	Location Specific or Generic
Place Card	Location specific
Environment	Generic
Persona	Generic

Figure 4 describes a 'group of youths' containing a range of younger visitor types with differing motivations for engaging with immersive interventions. These cards served not only to encourage participants to think about the range of visitors that might engage with the designed experience, what their motivations are and how long they might be likely to engage with an immersive intervention, but also to test the participants 'memoryscape' design against different accessibilities, motivation and time constraints. The persona cards serve three purposes, to encourage consideration of the **role** of the visitor, the **temporal** aspects of the experience and the **behaviour** of the visitor.

**Figure 4***Group of Youths Persona Card**Evaluation cards*

In addition to the design scenario cards, an ‘evaluation card’ was produced to document the design of a memoryscape idea. Drawing on the findings from the initial workshop the questions within the evaluation card were designed to probe further around topics relating to the design concepts identified in the literature (table 2) and those that emerged from the initial workshop (table 3). The concepts each question is designed to explore are described in Table 5.

**Table 5***Evaluation Card Questions Relating to Memoryscapes Design Concepts*

Memoryscape Evaluation Card Questions	Related Memoryscapes Design Concept Probes
Place:	Space
Object/Medium:	Ecology; level of immersion; interaction type
Description of experience:	All
What’s the hook to engage people in the experience?	Behaviour
Length of experience:	Time
Geographical scale of experience:	Space; environmental impact
Audience interaction type(s):	Behaviour; environmental impact
Max audience size:	Space; role
What might people do after the experience?	Behaviour; role; time
Are there audiences the experience would work best with? Why?	Behaviour; role
What might cause problems?	Environmental impact
How might participants add to, edit, and respond to the experience/narrative/heritage?	Behaviour; role; level of immersion; interaction type; ecology

Does the experience require any engagement before a participant gets to the experience location? If yes, what?	Space; behaviour; role
Are there audiences the experience wouldn't work well with? Why?	Behaviour; role
Are there locations the experiences wouldn't work?	Environmental impact

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#### ***4.2 Memoryscapes workshops***

A series of ideation co-design workshops using the toolkit were held in order to generate a significant number of proposals for memoryscapes for Newcastle city that could be further analysed and to evaluate the memoryscapes design concepts. 6 ideation workshops were held over 9 months, with a total of 77 participants. Table 6 provides an overview of the different sectors represented by participants at each workshop.

**Table 6**

##### *Workshop Participants*

Workshop	Place	Creative	Heritage	Technology	Interested members of the public (not specific to a discipline)
WS1 (n=17)	6	3	5	3	
WS2 (n=13)	1	7	1	4	
WS3 (n=15)		1	2	1	11
WS4 (n=17)		3		5	9
WS5 (n=8)	8				
WS6 (n=7)			7		
Total	15	14	15	13	20

At each ideation workshop, participants were briefed about the project and provided with instructions for the workshop activities. Participants were split into groups of between 4-6 people and each group was assigned a researcher to facilitate the

activities. Each group selected a 'box of delight' and were encouraged to remove the objects, read the descriptions and discuss the objects and overall heritage (box) theme. Participants were encouraged to discuss and develop narratives and start to explore ideas for immersive experiences based around an individual object, a group of objects or the overall theme of the box.

Groups then randomly selected a Place, Environment and Persona card which were introduced sequentially, often when momentum amongst groups waned. The introduction of each card offered a vehicle and context for prompting design ideas, as well as constraints and challenges to the group's design. The cards were arranged face-down and selected at random (either by the facilitator or a group member) to encourage creativity and innovative thinking, sometimes presenting groups with combinations of place, environment and personas that would at first glance seem to be incompatible. Participants were initially asked to discuss how they might develop an immersive experience (related to the heritage items from the box of delight) at the location identified on the Place Card. Participants were then asked to consider the urban object on their Environment Card and to design what an immersive experience that included or responded to all the factors presented on the cards. Finally, participants were asked to consider how well their idea would work with their selected visitor or visitors on the Persona Card and whether their idea needed to be amended to meet the personas needs. Throughout, participants were encouraged to focus on the narrative and experience without considering constraints such as technology, budget or management aspects to ensure that designs were led by considerations of the heritage and place. In the time remaining, participants were encouraged to review their designs against different Persona or Environment Cards to see if this altered the experience.

Following this design phase, participants completed an evaluation card to describe/detail and sketch the experience(s) they had designed. As an example, an excerpt of the evaluation card from a design idea in conjunction with a glove stretcher can be seen below in figure 5. The experience is entitled ‘What am I?’ and the objects are from the ‘Boxes of Delight’ themed ‘Mystery Objects’ (WS5 EC2).

### **Figure 5**

#### *Memoryscapes Evaluation Card Example*

At the end of each workshop the groups would present their design ideas to the rest of the participants. In total, across the 6 workshops, 32 evaluation cards were generated.

### **4.3 Data analysis**

Workshop participants used a combination of *drawings* and *text notes* to illustrate design ideas on the evaluation cards. The evaluation cards were transcribed and coded. The combined Memoryscapes themes (tables 2 and 3) were used to structure a content analysis of the statements and illustrations that appeared in the evaluation cards – alongside the illustrative designs presented, this analysis provides an overview of the predominant concepts developed across the workshops. Each code was applied to each relevant unique instance within an evaluation card. The weight of the codes is calculated as the **number of codes per item/total number of codes per theme** (e.g. if 96 items were coded against interaction types and 31 of those items were coded against the interaction type sight then 32% of items coded against interaction types related to sight). A total of 666 items were coded across the 36 evaluation cards, which included 6 evaluation cards from WS1, 8 from WS2, 14 from WS3, 2 from both WS4 and WS5 and 4 from WS6. Not all evaluation cards contained items relating to codes from each theme. Each evaluation card is numbered in the order it was transcribed and is referred to as EC<sub>n</sub> where n is the evaluation card number for example Workshop 6, Evaluation

Card 2 becomes WS6 EC2. In the sections to follow we provide discussion of the codes derived from the combined brief text notes and images, and provide supportive visual evidence of the participants' illustrations.

## 5. Results

Below we use the thematic breakdown of memoryscapes, as illustrated in tables 2 and 3, to discuss the ideas proposed in the co-design sessions, evidencing how participants felt they should be designed. We further elaborate on these ideas by discussing design concepts developed during the workshops. In particular, we emphasise throughout how ideas presented responded to the evolved memoryscapes design concepts developed above.

### 5.1 Space

Activities that were carried out either in a single physical space (**single site**) or distributed across **city-wide** physical spaces featured most frequently in the memoryscapes designed at 31% and 32% respectively. City-wide experiences start at a single location taking the visitor on a trajectory of ongoing activities transitioning from one location to another based either within or outside the city. In WS6 EC4 a memoryscape named 'Black and White' was created through discussing items from a box of delight relating to football (see figure 6).

#### Figure 6

##### *Black and White*

The experience starts from a single location based on the Place card that was randomly selected by the group. This particular place is a transition space (a tunnel)

where the public travel through from one destination to another. The transition space also provided entry to a fashion store, a library and a pub. The Environment card that the group received for this place was a canopy, which prompted discussions around recreating the atmosphere of football players coming through the tunnel to enter the football pitch on match day. The memoryscape design developed to include three main activities:

- (1) an immersive experience of walking through a tunnel which involved projected displays of match days from the past with accompanying sounds including crowds cheering, football commentators describing the game and vox pop style recordings from the general public on their own experiences of the match days;
- (2) an augmented experience at the shop window of the fashion store where participants could find out information about football fashion over the years. Details such as changes in style, branding and cost would be provided either through written information or recorded commentaries. An augmented reality dressing up experience was also described where participants could stand in front of the shop window and see themselves dressed in different football outfits as the outfits were projected over their reflection on the window;
- (3) a follow-on experience where participants could take part in a city-wide 'spot the ball' competition which 'forms a trail via tunnel canopy ... to match/stadium or exhibition' (WS6 EC4).

In addition to leading participants to the local football stadium it was also stated that the trail could lead participants to any current exhibitions taking place in the city. The memoryscape design took participants on a trajectory formed through a series of transitions between spaces and interfaces and traversals between physical and virtual



environments. Throughout the ball hunt there are various interventions forming a diverse ecology of floor stickers, soundscapes and statues relating to football and match day memories again in the style of recorded commentary from members of the public describing their experiences of going to a football match. Further prompts to engage participants include encouraging members of the public uploading their own photos through a smart phone interface to use for interventions to social media, further promoting the city and trail. 24% of all the memoryscape designs suggested similar follow-on engagement activities delivered remotely through an online platform either through an app or social media.

Single site activities are those that are carried out at the place selected during the activity with no follow-on activities prescribed. Further to this, activities described as **site specific** can only be carried out at the specific site due to physical or historical constraints. The ‘Digital Bookcase’ memoryscape (WS1 EC3) (see figure 7 below) presents a set of activities that are both single site and site specific. The ‘Digital Bookcase’ memoryscape was conceived from a box of delight containing Victorian school objects. The memoryscape takes place in a covered passageway, which is a transition space that links a row of shops to a library. The memoryscape design includes sensors along the passageway, which activate LEDs to light up as participants walk past. Additionally, the sensors assist in developing a trajectory through the experience by activating projections containing videos with associated audio of talking heads narrating stories of their own experiences of playing games as a child. Each talking head video is based on a person from a different era and ethnicity that grew up in the city where the experience takes place.

### **Figure 7**

#### *Digital Bookcase*

The 'Digital Bookcase' is also an example of a site specific memoryscape which relies on certain physical characteristics of the site to allow for the activities within the scenario design. The place selected for the 'Digital Bookcase' memoryscape is a passageway with large shop windows on either side which can be used for visual displays. The passageway is naturally dark and the group designing the memoryscape scenario considered that it was a space that some people would feel vulnerable walking through. The group's design included lights that illuminated the space as a person walked through to make it a more welcoming place for people to visit. The light display would work in other similar spaces that were tunnels but would be less effective in an open space such as a city square or main street.

## **5.2 Time**

The most frequent length of **time** assigned to interacting with the memoryscape scenario experiences was **>10 minutes** with 36% of experiences requiring this much time for visitors to carry out activities. 27% took **5-10 minutes** to carry out, with many of these activities taking either 5-10 or >10 minutes. 20% of activities were designed for **2-5 minutes** interaction, 17% of the experiences could take anywhere from under 1 minute to 1-2 minutes. As the name suggests, 'Canopy' (see figure 8 below) includes a physical canopy that is placed over a city square where participants can lie on grass or sit on reclining chairs and look up at a projection of a football game displayed on the canopy (WS3 EC4). The time it takes to complete the 'Canopy' memoryscape is user determined where temporal restrictions relate to the participant's own time constraints rather than those applied to the memoryscape activities.

## **Figure 8**

*Canopy*

The ‘Tunnel of Curiosity’ describes a memoryscape that is designed to take participants over an hour to complete (WS6 EC2) (see figure 9 below). The memoryscape describes an escape room type activity whereby participants have to complete a set of tasks to reveal a combination lock code that can be used to release themselves from the room. Each of the tasks relates to a historical item found in the ‘Mystery Objects’ box where participants have to figure out the item or its purpose before the number is revealed.

### **Figure 9**

#### *Tunnel of Curiosity*

### **5.3 Ecology**

Interactions with **physical objects** such as the sensory machine, seat and street light objects designed for the ‘What am I?’ scenario (see figure 5), were the interaction interface that featured most frequently in the memoryscape designs with 40% of 136 items being coded against this category.

Mobile devices were the second most popular interface (18%). Interaction with mobile devices took place in the form of taking photographs or ‘selfies’ throughout memoryscape activities and sharing with other users such as the photographic trails discussed in 5.1. Likewise, through submitting videos to be used within exhibitions such as the recorded commentaries of match day experiences also discussed in 5.1.

**Virtual automated projections** (13%) and **virtual static projections** (11%) were the next most popular interfaces that featured in the evaluation cards. Virtual automated projections included installations such as the augmented reality dressing up experience described in the ‘Black and White’ evaluation card. Other types of automated projections included projecting images on floors and walls that changed over time. ‘Escape Street’ includes ‘floorscapes’ and ‘wallscapes’ as shown in the illustration

developed by one participant based on the group's description of a memoryscape using objects from the 'Seaside Holidays' themed box of delight (figure 10, WS4 EC1). The floorscapes were obstacle courses projected on the ground that participants with skateboards could navigate. When a skater completes a course correctly a new course is projected on the floor. The projections were designed to automatically change so the activity remained fresh, keeping participants engaged with new content. The wallscales were described as static light projections onto a wall. The projection content included objects from the box of delight which were all items related to 'seaside holidays'. As with 'Digital Bookcase' light was also used in 'Seaside Holidays' to illuminate dark areas and create a sense of safety in locations that were deemed as uninviting or unsafe due to their location and isolation from the more populated areas of the city.

### **Figure 10**

*Escape Street - Illustration Showing Dynamic and Static Projections*

**Screens** (7%), **sensors** (6%) and **cameras** (4%) were the least popular interfaces. Screens were predominantly used for the talking heads vox pop installations described in the 'Digital Bookcase' and the 'Canopy' memoryscapes where football matches were displayed on an overhead canopy. Sensors were used for detecting participant movement and responding in some way such as lighting up the tunnel in the 'Digital Bookcase' scenario. All but one of the memoryscapes describe the use of mobile phone cameras by participants to take either selfies with installations or to take photos of installations. Only one camera was included in the memoryscape designs, this featured in the 'Tunnel of Curiosity' and had been included so a game facilitator could observe participants and call out game instructions.

There were no significant patterns between combinations of devices to demonstrate a preferred ecology. The data showed that physical objects and interactive devices were the most popular combined interfaces, often featuring some sort of

projection, either static or automated. Where automated projections occurred these predominantly relied on some sort of interaction with a participant either by passing a sensor or touching a physical device such as a screen or a button. Again the 'Digital Bookcase' is an example of this where the participant moves through a series of sensors which activate different components of the experience in the form of video projections. Although we have captured sound as a type of interaction within this paper it is worth noting that sound as an interface for conveying information featured highly alongside physical objects and interactive interfaces with 10 items featuring all 3 components as an ecology.

#### **5.4 Roles**

76 items were coded against different **roles** for different types of interaction. **User shared** experiences such as the 'Canopy', 'Black and White' and 'The Tunnel of Curiosity' where participants could take part in an experience with other people were the most popular type of role (32%). 83% of the activities assigned as user shared could also be carried out by a single person at the site location. 'The Tunnel of Curiosity' was the only memoryscape that had a facilitator included in the experience for giving participants game instructions.

**Observers** or onlookers contributed to 16% of the roles that were described in the memoryscapes. Onlooker roles are similar to those that happen in traditional museum or gallery spaces whereby a visitor observes something from afar rather than directly interacting with an artefact. **Shared** roles adopting a **multi-player** activity appeared in 13% of the evaluation cards. Examples of shared roles include playing hopscotch in the 'Digital Bookcase' or solving the clues in 'The Tunnel of Curiosity'. Some 12% of the evaluation cards featured **remote participation**, whilst the majority of these related to people contributing to the experience through social media activities.

One experience ‘Geoscapes/Earthscapes’ (WS2 EC5) describes an activity where participants can contribute their own narratives through geotagging locations they have visited, relating to the activity. ‘Geoscapes/Earthscapes’ was developed from discussions around the ‘coal mining’ themed box. The activities described in ‘Geoscapes/Earthscapes’ related to finding out information about coal mining at various locations within a city and its surrounding areas. Participants of the experience were encouraged to contribute their own stories around coal mining and to provide location details of any coal mines that could be visualised on an online 2D map with annotated notes, photographs and sound clips.

### *5.5 Types of interaction*

Perhaps surprisingly, given the overwhelming visual nature of much augmented reality and virtual reality development, sound featured most as the **type of interaction** described within the memoryscapes designed. 41% of the 96 items coded against types of interaction related to **sound**. ‘Black and White’ included a tunnel that provided an immersive experience using auditory and visual cues relating to football matches. The ‘Digital Bookcase’ featured talking heads or vox pop style videos. ‘Talking Heads’ (WS3 EC12) was an experience designed around the ‘Mystery Objects’ box that included videos of actors projected on a wall talking about the various objects in the box. ‘A Day in the Life of Annie Laws’ (WS1 EC2) was a scenario based on the life of a local servant girl. The memoryscape described an experience involving an ecology of varying interfaces installed in an alleyway. An iron sculpture depicting the servant was placed on the wall. Pictures of items from different rooms where the servant might have worked were to be displayed on the wall of the alleyway and participants were encouraged to leave stories about the servant or related topics via an online app which were projected on a wall. Sounds of keys jangling were to be played so passers-by

would be alerted to the installation beginning their trajectory through the experience. The keys related to the various keys the servant used as part of her role. Additionally, a bell sound activated as participants walked through the alleyway to replicate the sound of the servant bell being rung by the masters. Push button audio featured in 'Coal Mining in Geordieland' where participants could push buttons at selected locations to hear stories about local miners and pits (WS2 EC4). Sound was used not only to engage participants with experiences but also to provide further information about selected topics and to enhance the sense of immersion in the experience.

**Sight** was featured in 32% of items coded against interaction type. Examples included visual projections and statues such as those used in the 'Black and White' and 'A Day in the Life of Annie Laws' memoryscapes. Other visual installations included the use of statues, images and text. 'Projecting a Lifestyle' (WS1 EC4) (see figure 11 below) describes a 'scavenger hunt' whereby participants scan a QR code which activates projections of images from the street's past such as old shop names, receipts from the past and old buses that used to drive along the street. 'Waterscape' (WS2 EC8) describes having physical replica boats that participants could sit in and row whilst looking at photographs of local 'champion rowers'. 'War Time at Tyneside' uses maps to show where bombings happened in the local area. 'Roman around in Newcastle' (WS3 EC11) describes having projections of Roman Soldiers and carvings in shop windows.

### **Figure 11**

#### *Projecting a Lifestyle Scenario*

**Touch** (9%), **movement** (8%) and **smell** (6%) also featured as types of interaction. 'Would You Lick it' (WS6 EC1) involved a 'feely box' where participants could pick items up inside the box, feel them and try to guess their purpose. 'Escape

Street' included 3D murals of items relating to the seaside that could be recognised through touch as well as sight. Movement was used in 8 memoryscape designs to trigger responses in interventions such as lighting up the alleyway in 'Digital Bookcase' or creating a responsive light show in a bus stop as described in Play (WS2 EC1). 'The Invisible Woman of Ridley Place' described how the smell of carbolic soap could be provided to create a sensory experience relating to Victorian times (WS1 EC6). 'NE1 for the Beach' (WS4 EC2) described having the smell of the sea pushed into the air to recreate a seaside atmosphere. Surprisingly taste also featured as a type of interaction and appeared on 3 different memoryscape designs. Figure 12 shows an illustration from (WS4 EC2) featuring food kiosks selling beach related food items such as 'fish and chips' and 'candy floss'.

### **Figure 12**

*NE1 for the Beach - Inner City Seaside Promenade Experience*

#### **5.6 Levels of immersion**

Most of the experiences were ranked as highly immersive with 61% of the 39 items coded against levels of immersion relating to **high immersion**. Interventions such as the 'Immersive Cube' experience, contained within the 'NE1 for the beach' memoryscape, illustrated in figure 13 describe a fully immersive experience whereby the participant enters a cave with a 360-degree view of a virtual reality projection. 'Words/Messages from the Past' (WS21 EC5) includes a physical interaction where the user enters a message in Morse code using a typewriter which activates some talking head statues in the wall. 'Black and White' uses auditory and visual cues projected onto a tunnel to provide a high level of immersion that imitates walking onto a football pitch on match day. 'Waterscape' uses physical boats and paddles, so the participant gets the experience of rowing the boat albeit on land rather than water.



**Figure 13***Illustration of 'The Immersive Cube' Experience*

33% of memoryscape designs featured **low immersive** experiences such as the 'Points in the street that play music and have stories of the Gala as you walk past them' described in 'Mining Durham Gala' (WS2 EC7). Other examples include using headsets to listen to audio descriptions in 'Roman Around in Newcastle' and the triggering of audio in 'Sounds of the Tyne' (WS3 EC2). Only 2 memoryscapes featured activities with **no immersion** these were both related to memoryscapes generated from the 'Mystery Objects' themed box and involved being able to see and touch the physical objects to guess what they were used for (WS6 EC1, WS6 EC3).

**5.7 Behavioural impact**

The behaviours **pause, passage, learn, play, socialise, explore, observe, participate** and **contribute** generated from the initial workshop come into play here and each featured under this theme. The most popular type of behaviour involved participants **contributing** to an experience, 35 of the 159 items coded against behavioural impact involved some method of contribution by the participant. For example, taking photos of the ball during the spot the ball competition in the 'Black and White' memoryscape and uploading the photos to a central resource such as a social media account affiliated with a related exhibition. This requires the participant to perform an action, in this case uploading the photo to extend the exhibition content. 'Black and White' was also 1 of 10 items coded against participate, engaging participants in aspects of football heritage through immersive experiences, such as walking onto the pitch and hearing the crowd roar or virtually trying on historic kit.

Pause refers to participants spending time at a location, for example if there is an area that is a meeting space or a place of rest with seating areas. Pause featured as the

second most popular behaviour with 25 items coded against this category. ‘Roman around Newcastle’ includes activities intended to encourage members of the public to pause in a particular area. For example, a floorscape of a map provides key points of local Roman history. Further activities such as spending time in the passageways in both the ‘Black and White’ and ‘Digital Bookcase’ memoryscapes are also designed to encourage participants to pause at interventions placed in the experience.

Engaging participants with an intervention through play (19 coded items) and making a passage between places (18 coded items) were the next most popular modes of behaviour. ‘A Day in the Life of Annie Laws’ was set in an alleyway that participants would only normally walk down to get from one destination to another. Interventions developed for the passage of participants between spaces were designed to encourage the public to utilise spaces that had previously been identified as unattractive in the city masterplan by the local council. Whilst the intention was to encourage use of the physical spaces the activities supported the transitioning between one space to another. ‘The Tunnel of Curiosity’ demonstrates the transitioning of participants moving from a row of shops to the local library, creating a trajectory between observing elements in the shop window and engaging with ongoing activities held at the library such as dressing up or recording a ‘vox pop’ style video of one’s own experiences within a specific location or the wider region. Elements within ‘The Tunnel of Curiosity’ such as responsive LED lighting were designed to make the space more inviting and safer and to encourage the participants to move from one space to another. ‘Waterscape’ provides physical interventions of boats that participants can sit on and simulate rowing. This type of intervention was designed again to encourage people to use the space as more than just an alleyway to walkthrough by introducing elements of play.

Other activities developed to encourage play included encouraging families to stand either side of a wall and experiment with different ways to communicate using methods from the past as described in ‘Shared Communications’ (WS1 EC1). Floorscapes such as hopscotch games or noughts and crosses were described in the ‘Digital Bookcase’. In ‘Play’ participants were encouraged to do movements such as ‘star jumps’ to make a ‘light show’ in a bus stop. In ‘Permission to Play’ (WS2 EC2) participants were encouraged to interact with dynamic projections linked to sensors that capture participant movements where ‘more elaborate movements are “rewarded”’. ‘Permission to Play’ allowed individual users to interact with the installation but it also encouraged ‘collaboration and coming together’ ‘as, e.g., higher number of coordinated movements elicit even better responses.’ Additionally, ‘Permission to Play’ offered ‘onlookers who do not feel they can “play”’ a way to engage with the intervention through observation, where participants view but do not interactively participate in the experience.

Socialise, explore, learn and observe had similar results against behaviour. Half of the items coded against socialise related to using social media to further engage with an installation either through posting Twitter statuses about an artefact or experience or through posting photos to social media (WS3 EC1, WS4 EC2, WS3 EC3, WS3 EC8, WS3 EC10, WS3 EC11). The remaining items coded against socialise related to physical socialising with others either at church, library (WS3 EC11), going to the football match (WS3 EC2, WS3 EC7) or through following a trail to a museum (WS3 EC6). Several memoryscapes featured both exploration and learning i.e. where an opportunity to learn was described, an opportunity for exploration was also described. ‘War Time at Tyneside’ featured an exhibition in a shop window with a map containing points of reference to local businesses that were hit by bombs during war time. The

display was overlaid with soundscapes of bombs falling and subsequent explosions. The map featured QR codes which linked to further information about WW1 and WW2 relating to the local area. Participants learnt about local war history through reading the information on the map and associated links and through physically exploring the locations around the city.

### ***5.8 Environmental impact***

The majority of the memoryscapes featured interventions that required **insertions** into existing physical spaces (50%). An example of a physical insertion can be found in the rowing machines described in (WS2 EC8) or the metal sculptures described in (WS1 EC2). Augmenting existing environments with **overlays** of audio or visual interventions featured in 47% of the items coded against environmental impact. 3 memoryscapes featured interventions that required a **redefinition** of an area such as pedestrianising the street in ‘NE1 for the Beach’, removing the outdoor seating area of a café to a raised mezzanine for ‘Escape Street’ and creating an escape room in ‘The Tunnel of Curiosity’.

## **6. Discussion**

Our project aimed to explore how we might engage stakeholder communities in a co-design process that would develop and explore new kinds of memoryscapes, e.g. heritage-focused, urban immersive experiences. Through 7 workshops and the development of a co-design and consultation process, with stakeholder communities, we generated a set of 36 memoryscape concept designs. This body of design ideation provided substantial insight into key stakeholders’ concerns, interests and desires, with regards the design, and situation of, memoryscapes, in urban settings, specifically focusing on the redevelopment of Newcastle City centre. From this we have developed

a resource that can be drawn upon by both Newcastle City Council and Faulkner Browns Architecture as they start to plan for redevelopment of the city centre. It also provides a set of resources for our other partner organisation TWAM, who now have a set of community approved design concepts to draw upon when thinking through future possibilities for supporting access to their collections. This may also afford new opportunities for TWAM to commercialise their collections, which is potentially vital for their future sustainability.

The following sections reflect on the utility of the toolkit we developed to support the co-design process; the sensitising concepts employed and further developed; and the implications that we have derived for the development of city centre memoryscapes; before concluding with considerations for future work.

### ***6.1 Enhanced sensitising concepts***

The analysis of our workshop output relied upon, but extended existing theoretical work. In particular we drew upon the trajectories of interaction framework of Benford et al. (2009) and Carrozzino and Bergamasco's (2010) concepts of 'types of interaction' and 'levels of immersion'. We found these various constructs particularly useful for characterising and exploring the memoryscape designs. Our work demonstrates how these constructs can be usefully brought together in a novel way. It was clear from our context though that the notion of 'roles' within the trajectories framework needed further elaboration beyond the passive / active distinction. For our purposes there was more interest in developing different kinds of active role and fleshing out the play of possibilities for different kinds of active engagement. Equally, the types of engagement suggested opportunity for further refinement to explicitly consider different levels of sensory engagement. Given that our experiences were to be situated in public places which are already richly sensed (sights, smells, sounds and possibly even tastes) this

should not be surprising. Heritage settings have obviously examined such sensory panoplies before (any visitor to the Jorvik Viking Centre in York, UK, will be able to attest to this) but it is conversely rare for technologists to think about immersive experiences with this framing, and there is very little in the digital heritage literature which considers these issues.

Beyond refining some of the existing frameworks our subsequent analysis suggested two further constructs that could also be used to unpack the design concerns and constraints that our participants reported, and provide further detail about space, time, ecologies and roles. New design concepts concerning **behaviour and environmental impact** (table 3) suggested some useful new considerations. Behaviour suggests thinking about how a designer might wish to characterise the human activity in an immersive experience. This goes beyond the active/passive distinction already alluded to, and acknowledges that with memoryscapes, unlike outdoor heritage settings (e.g. Ciolfi and McLoughlin 2012, Halloran et al 2006, and McGookin et al 2017) the reasons people may come to engage with the immersive experience are potentially very separate to the intentional and focused consumption of heritage content. People may be shopping, meeting friends, going for food etc. They may well be passing through, pausing for a short time or visiting for an engaged experience. These different activities in the urban realm need to be accounted for in the design process and offer alternative designable routes into immersion and engagement with heritage content. In addition, environmental impact explores the footprint of the immersive intervention and the nature of its effect on the space in which it is deployed, and again this is quite markedly different from other outdoor heritage settings. In Kirk et al (2018) for example there are comments about how the digital intervention in the heritage setting needs sensitive design to not add unwanted impact on the experience of those not partaking of the

digital encounter. In the memoryscapes setting this goes further, or at least in a slightly different direction, acknowledging the importance of infrastructure (for example street furniture, facades, buildings, roads etc.) which are not there for the immersive experience, must still be accommodated, but could be worked with, and which in combination with the immersive experience affect the aesthetics and ambience of the local environment in a way not really considered in the ‘ecologies’ element of the trajectories framework (which is concerned much more with the technical and device-based infrastructures of an experience). We found that our participants were using a variety of these different considerations in their designs, and it makes sense therefore to consider how the definition of these constructs can be formalised in the design process. We argue that these constructs are a productive addition to the frameworks suggested by Benford et al. (2009) and Carrozzino and Bergamasco (2010) and build on the previous considerations of outdoor heritage settings, in particular for the development of interventions across the urban realm, in city-scale immersive experiences, which in particular, co-opt public spaces.

### ***6.2 Critical reflections on the memoryscapes toolkit and the co-design process***

The toolkit we developed comprised the ‘Boxes of Delight’, and the scenario and evaluation cards. The combination of these allowed participants first to engage with heritage objects (as sensitising devices) through an exploratory discussion phase, providing participants with a ‘ticket-to-talk’. The process then supported participants to develop narratives either around individual objects or around themes linking several objects together. Additionally, participants discussed their own experiences relating to the narratives and objects presented. The ‘Boxes of Delight’ provided tangible, physical objects to prompt discussion around heritage artefacts. The place, persona and environment cards introduced contexts, constraints and creative opportunities for

consideration within the development of memoryscape narratives and developing experience designs. The evaluation cards provided a mechanism to document the memoryscape design concepts.

The cultural prompts, design scenario cards and evaluation cards encouraged stakeholders to consider the sensitised design concepts. Place cards provided detail about the physical constraints and historical reference of a space which contributed to whether a memoryscape was site specific by design. Furthermore, the questions on the evaluation card regarding the ‘Geographical scale of experience’ and ‘What might people do after the experience?’ encouraged stakeholders to consider whether the intervention was something to be experienced as a standalone experience or as one that involved follow-on activities across the city. The evaluation card also prompted stakeholders to consider the length of the experience contributing to the notion of time.

As discussed the toolkit was designed to encourage creativity not driven by technology solutions. A combination of physical cultural prompts, environment cards and questions on the evaluation cards relating to how participants would interact with an experience encouraged stakeholders to consider a diverse range of interaction interfaces from talking statues to city trails that could be documented on social media. Equally, these prompts encouraged stakeholders to consider how participants immersed themselves in the experience, whether they would be fully immersed in a virtual cube or whether they would passively observe others interacting with displays. Finally asking stakeholders “Are there locations the experiences wouldn’t work?” within the evaluation card prompted discussion not only around the environmental impact of a memoryscape but also any associated operational or maintenance activities and costs associated with the experience.



When considered against a model of the design process such as the Design Council's Double Diamond model (Design Council, 2019) it is apparent that the memoryscapes toolkit primarily supports the initial 'discover' and 'define' phases. The 'discover' phase is focussed on exploration and understanding of the problem space, followed by generation of a broad range of ideas, often with the engagement and input of stakeholders. The toolkit defined the problem through workshop briefings, selection of 'Boxes of Delight' and information captured in the place cards. The prompts provided by the artefacts in the boxes and the freedom given to participants in the initial stages of the workshop to think creatively and with few constraints generated an initial 'explosion' of ideas for assessment and iterative development. The introduction of place, environment and persona cards serve to guide workshop participants through the second, 'define' phase of the design process through the introduction of constraints which serve both as concepts against which ideas must be evaluated and also as further prompts, generating and refining ideas. It is important to note that the place cards for our project were extracted from the masterplan developed by the architects. The cards presented workshop participants with a high-level analysis of the character and qualities (positive and negative) of the place currently, together with conceptual ideas and examples of how design interventions may enhance a particular place. As such the place cards form part of the problem definition (discover phase) and also constrain/guide thinking about the nature of the immersive experience that could be introduced (define phase).

The outputs of the toolkit process could be used to define an experience-centred design brief at the end of the define phase. This brief would then be the basis for later stages of highly-focussed ideation and evaluation, including considerations of budget, technology and practicality, prior to a prototype and build out phase. This would extend

the toolkit to the 3<sup>rd</sup> and 4<sup>th</sup> stages of the Double Diamond model, ‘develop’ and ‘deliver’. Further research could seek to establish the efficacy of this approach and consider whether aspects of practical, technological and financial considerations need to be introduced at an earlier stage of the design process.

As can be seen from the number of concepts generated and the rich observations detailed previously, the toolkit approach was successful in generating active participation and discussion in the ideation workshops, producing both quantity and diversity of ideas. In that sense, the process was very successful. The process also facilitated at various points mixed (interdisciplinary) teams of stakeholders discussing ideas, which allowed for richer discussion. It is of note that Claisse, Ciolfi and Petrelli (2017) point to how participatory design projects in the cultural heritage sector have explored inclusion of visitors, curators (and with their intervention) volunteers in the design process. Equally, much of the previous work done to explore specifically outdoor heritage experiences (for example Ciolfi and McLoughlin 2012, Halloran et al 2006, and McGookin et al 2017) has focused on supporting actual heritage settings and therefore the networks of stakeholders to be found in those settings.

As our work serves to explore resituating heritage collections outside of the institutional boundaries of the heritage setting, placing them in public places, it is germane to include broader sets of stakeholders who might have wider interests in working with and providing access to heritage collections and who are responsible for the urban spaces being redeveloped. Further it is evident that broader considerations of ‘visitor’ behaviour and reconsideration of what we term environmental impact become more important in these non-heritage contexts (more on this below).

However, the analysis of the findings did reveal a number of limitations with the approach. For example, we have tried to demonstrate through the weight of diverse

ideas presented, the utility and efficacy of the method, but not all groups used the evaluation cards to document their design ideas. In some cases, the detail was too minimal to be useable. Although ideas were presented at the workshop, at times lack of documented detail, meant that some designs had to be excluded from our data analysis. This is however, potentially inevitable within this kind of open, relatively informal, participatory process.

Some of our workshops were also inherently less interdisciplinary, focusing on a single stakeholder group (for example workshop 6 contained only architects). In these situations, there was a lack of plurality in discussion, with participants often drawing from their discipline (for example, memoryscape designs developed from workshop 6 containing only architects were architecturally focussed). This is probably not surprising, but it is perhaps not as helpful in developing more variation in memoryscape designs. In some respects, both this issue, and the previous, could be addressed by enforcing, as a strict rule, the construction of interdisciplinary groupings. We are cognisant that there are multiple ways in which one might configure participation in a co-design process (Vines et al., 2013). However, this might help to provide a resource, which would support documentation, if we were to ensure that all groups contained at least one person with the confidence to document design ideas (perhaps visually). In this setting participants from the architectural firm would have been ideal. Of course, this function could also be supported by professional documenters or facilitators.

We also felt that there was often a lack of practical experience and awareness of certain kinds of immersive technology. This was noted in Maye et al (2017) with regards cultural heritage professionals, but we saw this across the stakeholder spectrum (even amongst technologists who often had quite specific interests e.g. developing apps versus fully immersive VR). Where Maye et al (2017) have suggested techniques to

support exposure to some technologies, we would concur that this would benefit the co-creation process. However, there is a tension between ensuring that the ideation process is not ‘technology-led’ and ensuring that participants have adequate knowledge of the technological possibilities. For the purposes of the memoryscapes workshops we prioritised an approach focussed on considerations of heritage, narrative, immersive engagement and place rather than technology. A further development of the workshops would be to include later testing of ideas against further constraints such as budget, management considerations and technological delivery. As noted above, given the nature of our project, with memoryscapes, and effort to move beyond the institutional boundaries into public settings, there are diverse stakeholders present in the co-design, including technologists. In this context there is potential for technology experts to provide ‘experience support’ for those who might not have encountered certain immersive technologies before, but this then raises an inherent tension in how technology participants may choose to present their own preferred technology ‘solutions’ and the extent to which they feel able to critique the technology honestly (see Swords et al., 2020 for more). It is also worth noting an important caveat that where Halloran et al (2006) have pointed to the importance of in situ design, we had the advantage that our process of memoryscape design was very localised from inception. Our participants were local, in various ways (usually from local institutions) and therefore in discussing the impacts of the proposed interventions the participants well understood the contexts of the local city for which they were designing. This is evidently a significant bonus to the co-design process as Halloran et al (ibid) suggest.

We see opportunities for the toolkit to be adapted for use in other contexts. The most obvious is to apply the toolkit to the design of immersive experiences for urban spaces in other cities. This requires adaptation of the context-specific elements

developed for our memoryscape project to the particular context to be investigated. This will include: definition of the problem space (such as, what is the intention of the intervention, what benefits are sought from the design); identification of suitable physical or virtual prompts (the equivalent of the ‘Boxes of Delight’); development of context-specific place cards, including analysis of the existing and potential key characteristics. There is scope to adapt the toolkit to consider other form of content such as literature, theatre or entertainment and other locations such as exhibitions or events.

### ***6.3 Insights on memoryscapes and immersion in heritage***

Our analysis of the workshops and the ensuing designs also raised a number of specific insights for designing memoryscapes. Below we highlight some of the more interesting and useful implications of these insights. The major caveat to these findings is that they are themselves heavily situated in narratives of place and the heritage of that place – they belong to Newcastle City, they are crafted with this context in mind (as noted above). Inevitably, this may restrict their transferability, and should someone desire to develop memoryscapes for another city we would advocate following the design process and using the toolkit (using place cards and heritage associated with that city) as we have discussed above. However, our observations may serve to offer design inspiration for those working to develop new kinds of immersive experience, utilising cultural heritage resources.

*Trail and link experiences across the city* – Our analysis suggested the most popular experiences were those beginning at a single location, whilst a person is pausing at a location, which then engage follow-on activities taking a visitor throughout the city. This finding may not be surprising given that our intention was to develop city-scale immersive experiences, however, at no point did we suggest that experiences

should be linked or interrelated across the city. Most follow-on activities involved some sort of trail throughout the city, often using mobile technology to augment experiences at various locations.

*Productively appropriate 'transition' spaces* – Transition spaces and behaviours were considered in multiple memoryscape designs, although these were designed as a constraint created through the place card provided, rather than as a constraint of the activity being designed. Transition spaces were deliberately used as they featured as places within the city masterplan for which the local council wanted to enhance. This was a specific feature of applying the toolkit to the context of this study which was to co-design experiences that encouraged regeneration of specific spaces in the urban realm. Nonetheless, the use of these challenging spaces was seen as particularly engaging for many of our participants.

*Keep experiences short* – The preferred length of experience involved more than 10 minutes of activity but the length of time most experiences required was dependent on user availability at the site of the activity and there was a clear sense from participants that engagement should be focused but relatively short-lived.

*Augment Tangible Artefacts* – Museum exhibitions offer multi-sensory embodied experiences offering a sense of place for visitors to connect with heritage. Our findings reveal that tangible physical objects augmented with multi-modal sensory interactions and embedding technology where appropriate to enhance the experience such as for sound or visual experiences, were preferable features selected for designs within the ideation workshops. This finding supports existing research which suggests that augmenting physical objects with digital technology facilitates user engagement with memory-based objects. Furthermore, digital technology encourages curiosity and engagement with the objects (Ciolfi & McLoughlin, 2012). This is a useful point to

remember given the preponderance of mobile-based experiences designed for the digital heritage sector.

*Go mobile* – However, mobile devices were the second preferred method of interaction, although it is recognised that this may be influenced by participants' understanding of the available technologies. Many of the transactions between the participant and experience involved participants extending their interaction by contributing their own visual and textual content to the exhibition (mobile devices do offer a light-weight platform for supporting this kind of participation).

*Support group interaction* – Shared experiences either with a group or through multiple interacting participants as single users were popular (again potentially supported through mobile devices). This was followed by onlooker or observer roles which replicate similar ways in which visitors view content in traditional museum and gallery spaces (see also similar discussions of the importance of observer roles in other touristic activities in Durrant et al. 2011; Durrant, Kirk, Benford, & Rodden, 2012).

*Drive immersion through multisensory engagement* – Highly immersive experiences embedded with sound were the most popular type of interaction, whilst the use of sound may cause some accessibility issues these can be overcome through the use of highly accessible tangible interactions. As suggested in the literature a combination of sensory inputs contributes to higher levels of immersion. Multi-sensory interventions involving sight, sound and in some cases smell and touch all contributed to providing a high level of immersion.

*Utilise multi-stakeholder input and evaluation* – Stakeholders from the heritage and creative sectors were more inclined to focus on designing an experience around a physical representation of the artefact such as the glove stretcher, lamp post or tie press seat shown in figure 4. This is unsurprising as many heritage and often arts-focused

people have tangible objects central to their practice. Furthermore, being presented with physical objects from the 'Boxes of Delight' helped participants appreciate the power of tangible objects in enhancing the heritage experience. Such observations underline the importance of having multi-stakeholder representatives in the design process for creating digital-cultural immersive heritage experiences, ensuring there is a balance between the technically feasible, creative imagination and expertise on user experience and curation of pasts.

## **7. Limitations and Future Work**

Our current explorations have paused at the design stage (the 'discover' and 'define' stages of the Double Diamond model). We have productively demonstrated a co-design process for the design of memoryscapes. Future work should explore the development of prototypes evaluated in-the-wild to evaluate critically the benefits they bring to increasing further engagement with local cultural histories and places. This would extend the toolkit and research into the 'develop' and potentially 'deliver' stages. Further extension could develop guidance and a set of generic toolkit templates to support adaptation to different contexts or locations. This could include:

- Boxes of Delight; guidance on the nature of artefacts that most effectively stimulate discussion and story-telling in order to assist in the selection and documentation of artefacts for use in a new context.
- place cards; guidance on the analysis of the qualities and characteristics of a place and identification of potential future characteristics that interventions might support. Development of a generic template to capture and present this information to workshop participants.

Environment, persona and evaluation cards are designed to be generic, but



guidance and templates may be of value to the definition of new cards or adaptation to particular contexts.

Our project specifically explored memoryscapes as contextualised, location-based immersive experiences based around heritage content. Further research could explore the use of the toolkit for other contexts such as location-based immersive experiences based around literature, theatre, sport or other entertainment. This would require adaptation and careful consideration of the content of the ‘Boxes of Delight’ prompts. Research is required to establish whether the ‘Boxes of Delight’ concept is an effective approach to generating discussion, storytelling and ideas in these contexts. Further research could also consider application of the toolkit to design of immersive experiences for different location types such as exhibitions or events and use within design processes for the creation of new environments rather than adaptation of the existing urban fabric.

The toolkit presented would also benefit from further validation in other contexts such as promoting discourse around civic matters between a range of stakeholders.

## **8. Conclusions**

We set out to develop knowledge in the field of HCI around facilitating co-design practice for creating immersive experiences that recontextualise heritage assets and reimagine and reinvigorate public spaces in cities. We aimed to explore and develop guiding principles and methodologies for encouraging and facilitating the multi-stakeholder co-design of memoryscapes. We have presented a detailed case study of our design-led process. We have offered a critical discussion of our design toolkit which utilised tangible heritage artefacts, alongside scenario cards representing place,

environment and audience. Through ideation workshops, utilising the toolkit, we have demonstrated that the approach can facilitate the co-design of immersive heritage experiences or ‘memoryscapes’, as we frame them between stakeholders. Additionally, we have demonstrated how the use of tangible heritage objects in a co-design process can support discourse around heritage content. Finally, we have contributed a set of specific sensitising concepts and structures, for the future design of urban memoryscapes.

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Dr Kay Rogage is a Senior Lecturer in Digital Living in the School of Computing



Information Sciences at Northumbria University. She is an applied researcher, who's work spans across the disciplines of computer science and the built environment, with a focus on the design and development of interactive digital solutions.

David Kirk is a Professor of Human-Computer Interaction and Director of Open Lab. His work focuses on the design of interactive computational technologies. He is interested in design research methods and the ways in which technology design can be centred on the rich understanding of user experiences, cultures and contexts.

Dr James Charlton is a Senior Lecturer in the School of Architecture and the Built Environment at Northumbria University. James' research interests include performance analysis and visualisation within architecture and urban design, data management and utilisation within the fields of BIM and smart cities.

Dr Claire Nally is an Associate Professor in English Literature in the Department of Humanities of Northumbria University, with an interest in dark tourism, heritage, subculture and popular culture.

Richard Watson is a Senior Research Fellow in the School of Architecture and the Built Environment at Northumbria University. He is also an architect with an interest in the application of digital technologies to the design, and improvement of the built environment.

Dr Jon Swords is a Research Fellow in the department of Theatre, Film, Television and Interactive Media at the University of York. He works on the XR Stories creative industries cluster partnership, is an economic geographer with research interests in relation to the geographies of creative industries and visual methodologies.

Fig 1.



Fig 2.



Fig 3.



**Seating:**

Placed throughout urban spaces, acting as a destination, where users dwell for a period of time. They can take the form of primary (dedicated) seats, that are either open or provide a sense of enclosure, or secondary seating (i.e. steps). They can be considered as an individual element, or part of a larger system. They can be powered, or unpowered, stand alone, or be part of other urban elements (bus stops, planting, lighting, etc.)

Fig 4.

Group of youths

**Personal Information:**

Age: 14 - 16	Main interests: Skateboarding
Marital status: Single	Job title: High School
Number of kids: None	Level of English: High
Location: Newcastle	



**Narrative:**

*Experience: Tourist or Local / Reason for visit / Visiting with / Length of visit / Dwell time*  
 John, Sammy, Cherry, Rosie and Tim are in town for the afternoon to go skateboarding near the Laing. They have met up with some friends on Eldon Square, and might visit Forbidden Planet later in the day. They will have to be home by 10pm but otherwise they are free to do as they please.

*Heritage engagement: previous experience / likelihood to actively seek experience*  
 John and Sammy are both really interested in street art, but they find galleries and museums to be snobby and boring. Cherry, Rosie and Tim are more interested in science than heritage. They've all visited museums with school, but don't really bother otherwise.

*Considerations: mobility / sensory*  
 Tim has hearing issues and suffers from memory loss (he had a head injury as a child). He is fluent in sign language, but can't always pick up what people are saying if they speak quickly, or cover their mouths.

*Technical experience: rating / previous experience / what is on their person*  
 All of the group have mobile phones. Tim also has a Kindle.

Fig 5.

Memoryscape Evaluation Card

Title of your experience/memoryscape:  
**What am I?**

Heritage type(s):

Place: **Brunswick place**

Object/Medium: **various**

Description of experience:

What's the hook to engage people in the experience?  
**FUN + CURIOSITY + PLAYING WITH SCALE**

Length of experience:  under 1 min  1-2 mins  2-5 mins  5-10 mins  more than 10 mins Further details:

How might participants add to, edit, respond to the experience/narrative/heritage?  
**Interactive mark collected at museum encouraging visits**

Fig 6.

SANDY/MONDAY

Football fashion, branding, history of football fashion - narrative about big designers that design sports kit & AR exhibition - V&A pops.

like walking onto pitch, crowd cheers see goal & goal misses over the years.

conveyor belt like take grant.

crisis.

Tunnel.

Library.

bank of vox pops available at match memorabilia - people could record & submit an memories via mobile - personal contacts, programs etc.

vinyl fashion - narrates around cost of kit & tickets & boots & how do people manage the change in seasons & cost

Sculptures e.g. Giant boot you could sit in for photo taking.

Crease statue photo trail like he new days wait where you take a

Arrival via introduction along AD & football kit on metro narrating journey to match

Fig 7.

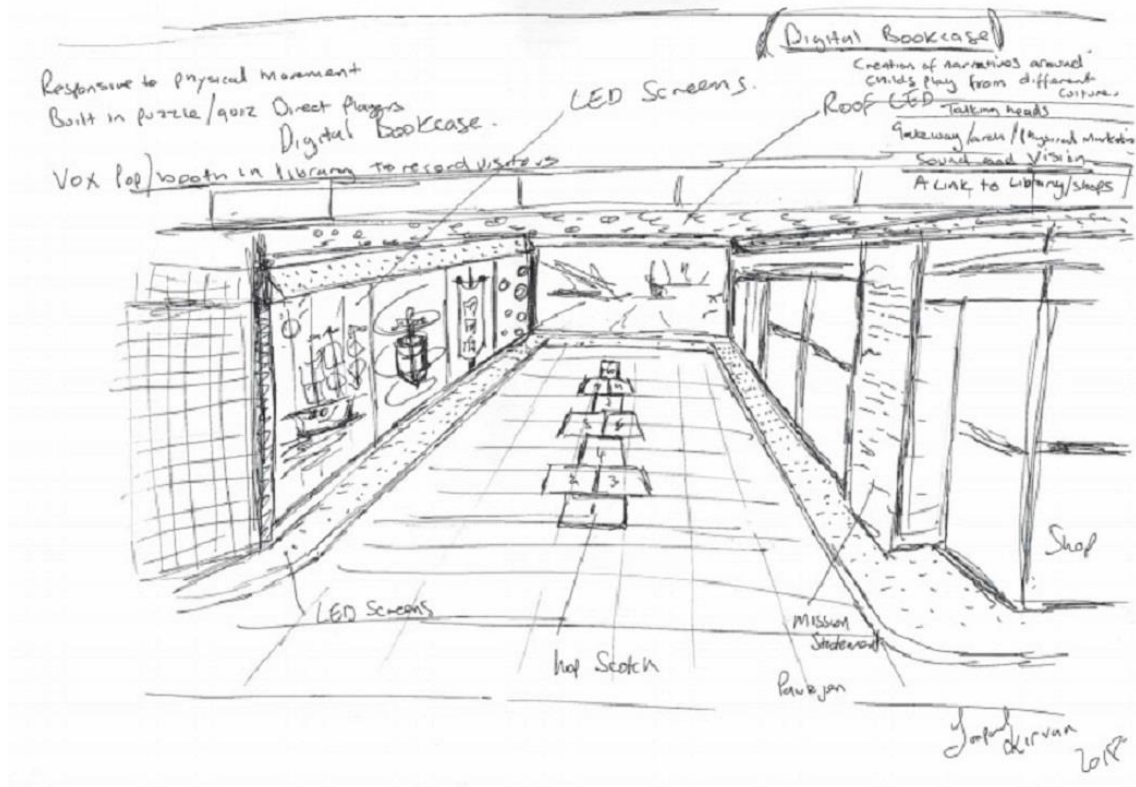


Fig 8.

Description of experience:

The square would be covered by a canopy. The canopy would have an image of St James's Park projected on it - high res. 3D. This would give visitors an oriented view of the ground - sound, vision, total immersion. Like the sun at Tate Modern.

However, to avoid dizziness or accidents the audience could lie on the grass or sit in reclining chairs looking up

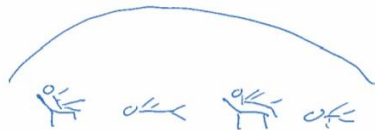


Fig 9.

Memoryscape Evaluation Card

Your title: Tunnel of curiosity.

Heritage type: mixed historical  
 Place: Tunnel from Swille Row  
 Object/medium: process square game  
 Installation: with game  
 Description of experience: with game  
 → Spelling  
 → playing  
 → taking head.

Tunnel is escape room.

Clue 1 is hidden in camera once you figure it out - go to next clue.

Who can I next clue

carpet header

carpet board dust to reveal next clue.

carry egg so the hidden dropping

paper footprints

egg combination lock

So the mission is to release whoever has the gag from the gag by figuring out the combination lock. Oliver Cromwell puts the gag prisoner in the gag. for each item here is a physical task to reveal another number in the combination lock. This incites curiosity, play & learning for figuring out what each item is for.

What's the hook to engage people in the experience?  
 The Game.

How might participants add to, edit, respond to the experience/narrative/heritage?  
 N/A.

Length of experience:  under 1 min  1-2 mins  2-5 mins

Fig 10.



Fig 11.

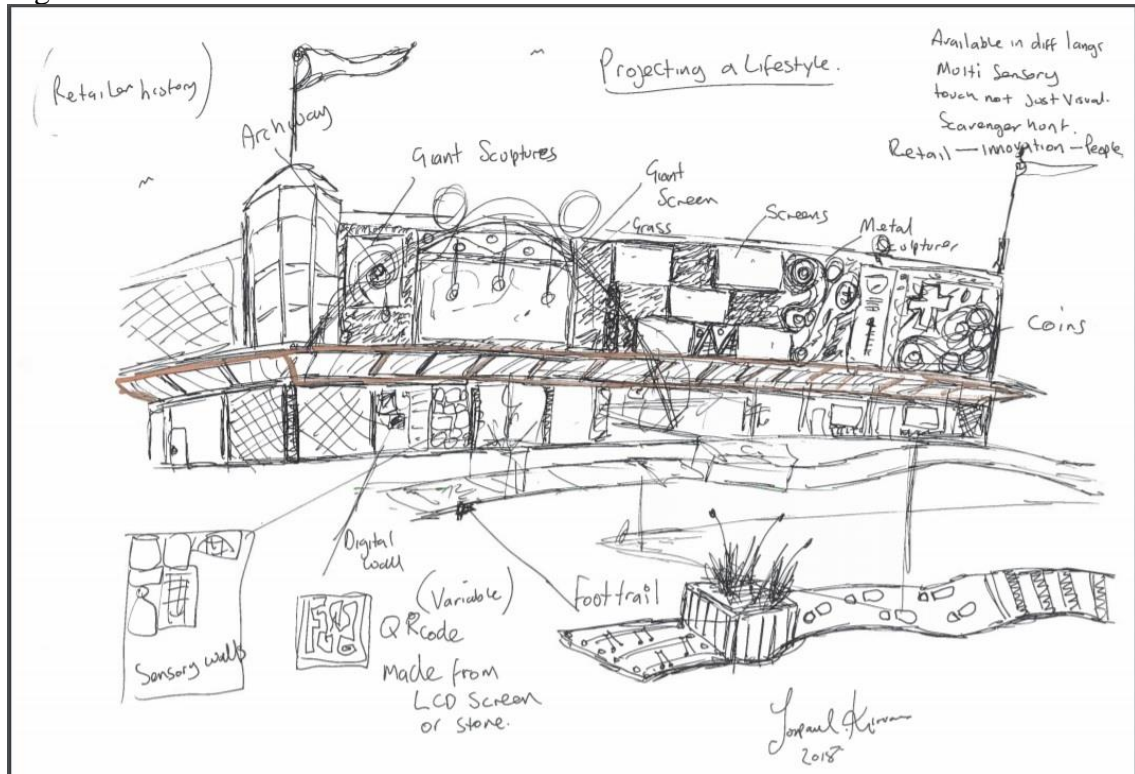


Fig 12.

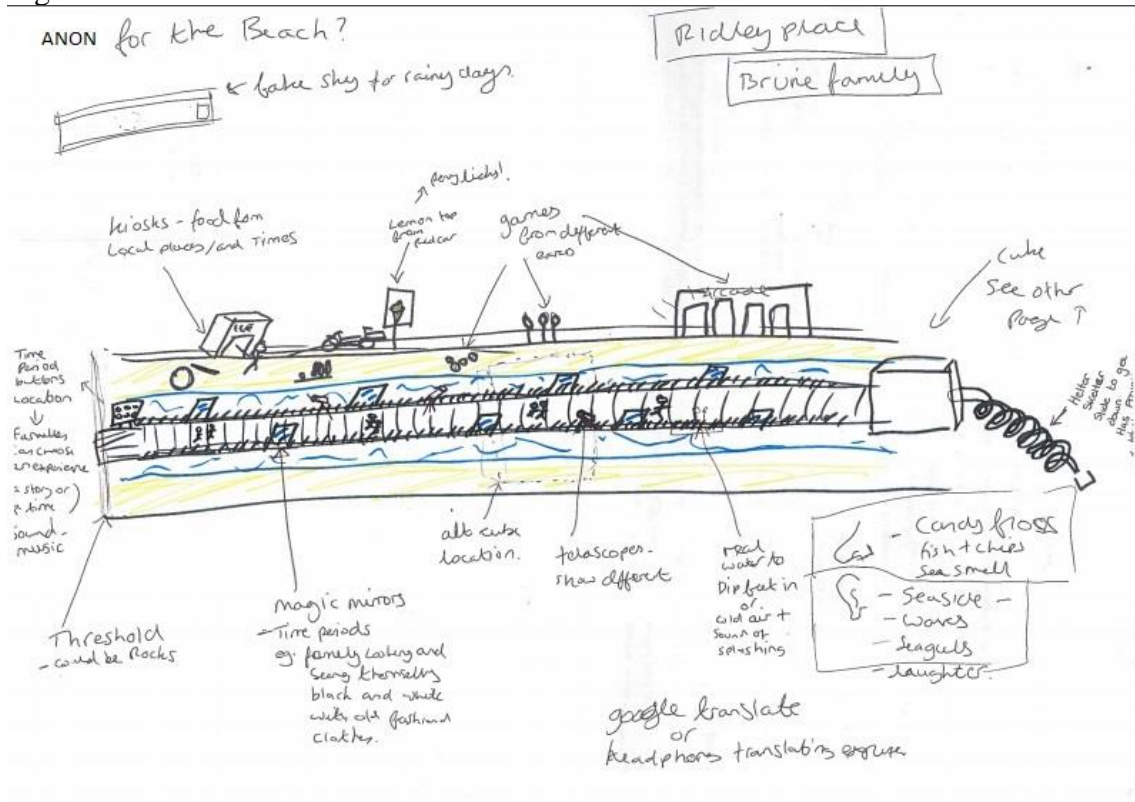


Fig 13.

