

# Digital 3D models of heritage artefacts: Towards a digital dream space



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## ARTICLE INFO

### Article history:

Received 17 April 2015

Received in revised form

8 October 2015

Accepted 2 November 2015

Available online 10 November 2015

### Keywords:

Digital 3D

Liminal

Creative engagement

Museum dream space

Case study

## ABSTRACT

This paper explores the use of digital 3D models of museum artefacts in a creative context. It investigates how creative engagement with digital 3D models of heritage artefacts can stimulate learning and foster new forms of engagement with digital heritage artefacts. This paper is illustrated with examples of creative works from a case study undertaken in collaboration with the National Museum Cardiff.

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## 1. Institutional practice

Digital media are increasingly incorporated in museum exhibitions (Lovejoy, 2004) and an increasing number of museums and other heritage institutions are now undertaking 3D digitisation of their collections. Digitisation is used to support museums' core duties of collection, preservation and display; 'the collection and creation of digital objects is seldom a goal in its own right, but rather a consequence of other institutional activity' (Newell et al., 2012: 291). Digital 3D models of heritage artefacts are used in a continuation of the traditional activities, which scholars and professionals in cultural heritage institutions have been pursuing for centuries; to document museum artefacts, heritage sites and archaeological finds, to study heritage materials without the need for physical access, to simulate real-world scenarios and to test restoration and hypothetical reconstructions. Furthermore, digital reconstruction from photographic data can 'restore' lost heritage; the Buddhas of Bamiyan, for example, were digitally reconstructed from photographic images by a team of researchers from the Swiss Federal Institute of Technology, following their destruction in 2009 (Gruen et al., 2004). Whereas museum artefacts are perceived as a part of the past, 'digital historical objects are usually conceived as tools for understanding the past' (Newell et al., 2012: 291). Within the context of documentation and restoration, it is of key importance that digital 3D models are as historically accurate as possible. At the same time, a certain amount of objectivity is unavoidable in the preparation of digital 3D models. There are on-

going debates concerning the accuracy of digital heritage materials.

Many researchers and practitioners in the field of museums, heritage and archaeology see the creative use of digital 3D models of heritage materials as anathema to the established uses of digital heritage materials to assist in research and education. The open and creative use of digital copies continues to be seen as a threat to museum culture and practise, based on the long-held fear that simulations could render physical collections of authentic artefacts obsolete<sup>1</sup>. Another common fear in the heritage sector is that open engagement with digital heritage materials will distort the context and meaning of the original artefacts. These fears are heavily debated, with some arguing that multiplication of an object can increase its fame and lead to increased awareness and interest in the original item itself; 'the intensity of the search for the original depends on the amount of passion and the number of interests triggered by its copies' (Latour and Lowe, 2010: 4); 'Benjamin has the aura of art exactly the wrong way around. It is the (...) reproduction that created the aura of the original' (Walsh, 2007: 29).

## 2. Liminal 3D models

The digitisation of heritage artefacts is not as objective as the use of hands-free technologies might suggest. Digital 3D models have to be edited in many small and often imperceptible ways. There is no fixed point at which a digital model of a heritage

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<sup>1</sup> In his seminal piece *The Work of Art in the Age of Mechanical Reproduction* Walter Benjamin argued that the 'aura' of original objects would be lost through their reproduction and distribution. Jean Baudrillard further suggested that the shift from perceiving real objects to perceiving copies and simulations would result in a loss of reality.

artefact can be said to be 'complete'. Consequently, the choices and decisions of the editor play an important but often downplayed role in their creation. Digital 3D models look real, even though they are just a hypothesis of an artefact or space. However, while digital copies are not necessarily 'truthful' to the original objects, they can be seen to possess a different kind of authenticity. In *Languages of Art*, Goodman (1969) argues that any performance of a piece of art, which corresponds suitably to its notation (such as musical scores or code), can be counted as authentic. Digital 3D models are stored in bits, as ones and zeros. Bits lack intrinsic meaning until they are read and performed as, for example, a visual image or a physical print. Such performances exist as entry points to different perceptual planes, or interfaces, that render data into recognisable representations. Digital 3D models of museum artefacts are perceived 'in an unreal, virtual space that opens up behind the surface' of the computer screen (Foucault and Miskowiec, 1986: 24).

Digital 3D models are not fixed; they remain open to exploration and transformation. Digital 3D models can be accessed online all over the world. In this way they exist in multiple locations and states at the same time. However, digital models of physical artefacts remain embedded in the physical world and continue to share a meaningful relationship to the physical originals. The relation between digital 3D models and physical objects is not a duality between virtual and real, as 'human activity takes part in both' virtual and real spaces (Dziekian, 2011).

Digital 3D models are liminal objects located on the threshold between external reality and our own minds. Turner (1969) defined the liminal condition as 'the state and process of mid-transition in a rite of passage'; a 'moment in and out of time' (Turner, 1969: 96), the liminal phase of a transition represents an instance of incompleteness, when the liminal subjects 'elude or slip through the network of classifications that normally locate states and positions in cultural space' (Turner, 1969: 95). Although Turner locates liminality within ritual action the concept of liminality can be applied more broadly.

The liminal object has its origins in Winicott's notion of the transitional object (Winicott, 1971), and appears in discussions of technology and virtuality by Lévy (1998). A liminal object can combine seemingly irreconcilable binary oppositions, such as subject and object, mind and body, digital and physical. Digital 3D scans are such liminal objects; they exist on the threshold of reality and imagination. Interaction with digital 3D can also be considered to be liminal; when a user operates a conventional mouse and keypad to edit 3D files, pushing a button can be regarded as a metaphor for sculpting an artefact, which exists in a removed space (see Woo et al., 2011).

Liminal objects exist midway between two identifiable states, in 'a realm of pure possibility whence novel configurations of ideas and relations may arise' (Turner, 1969: 97), they are the 'basis of symbolism and creativity' (Turkle, 2011: 228). Liminal objects provide a 'basis of symbolism and creativity'; people frequently use liminal objects to weave 'a continuing narrative of caring and relationships as well as self-identity' (Fitzpatrick, 2012: 89). Liminal 3D models of heritage artefacts thus hold the potential to enable engagement with heritage artefacts that takes place on a personal and narrative level.

### 2.1. Fluid artefacts

Frequently museums and other heritage institutions respond with a certain alarm to the questions of interpretation and authenticity raised through 3D digitisation. However, heritage objects and museum artefacts can also be considered as a fluid medium. Without the knowledge and contextual material that give meaning to an object they possess little fixed content. Annis

(1986) identifies three conceptual realms in which visitors interact with museums; the cognitive space, the social space and the dream space. The cognitive space engages with factual information, it is supported through museum signage and other contextual data. The social space describes the socially interactive nature of the museum visit. The dream space, on the other hand, describes personal and subrational responses to museum objects. In the museum dream space loose associations, memories and emotions, popular media, personal experiences and thoughts can all influence how viewers make sense of our cultural heritage (Annis, 1986; Kavanagh, 2000). The thoughts and states of mind, which they carry into the museum influence how visitors see museum artefacts. This paper proposes that 3D technologies create a liminal space, somewhere between the tangible and the imaginary, with the potential to enable creative engagement with the experiential realm of the museum dream space.

Artefacts are useful devices to facilitate creative processes and museums frequently provide artists with rich material to inspire their art making. Creative thinking involves a number of processes in which sensory and cognitive stimulation impacts on thought patterns in order to generate novel concepts (Treadaway, 2009). Access to museum objects provides them with cues that can, for example, inform the use of colour, texture or form in new artworks. Memories of personal or cultural stories that are linked to prior knowledge or experience can be stimulated by physical characteristics of objects (Annis, 1986; Kavanagh, 2000). In this way museum objects can generate a wealth of associated ideas; these can be synthesised to produce completely new concepts (Smith et al., 1995). Digital 3D models of museum artefacts can inspire creative processes and promote the exchange of ideas in a similar fashion. Digital 3D models of heritage objects can provide a means of rapid interaction and translation from physical form to malleable virtual form that can help synthesise imaginative thought.

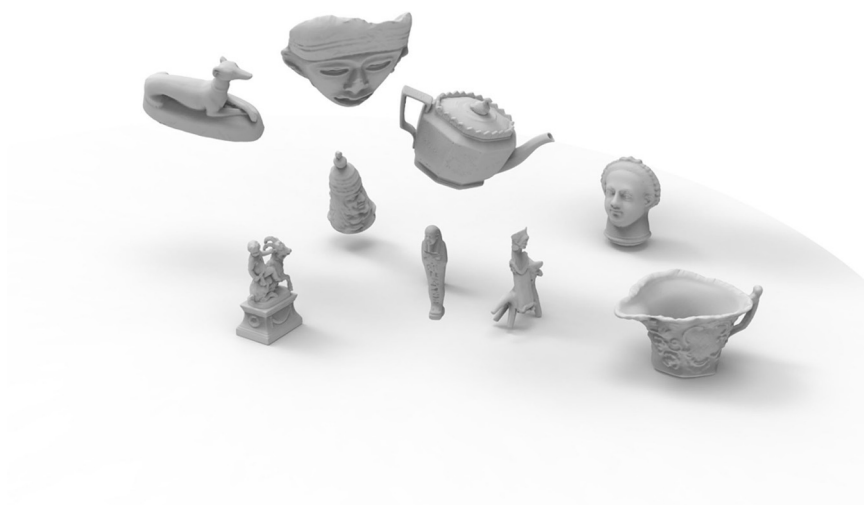
The creative engagement with digital heritage materials can be understood as a form of cultural 'poaching' (Certeau and Rendall, 2002). In his seminal work *The Practice of Everyday Life* De Certeau proposes, that human consumption is itself a creative act. During consumption, he argues, users recontextualise products, alter them and find unexpected uses for them. Certeau compares this to poaching; illegally hunting or catching game or fish on land that is not one's territory. Digital cultural materials can be 'poached' and recontextualised in ways that move beyond the control of the museum and other heritage institutions. This goes against the notion that there are appropriate and inappropriate ways of understanding and engaging with digitised historical materials.

### 3. From audience to users

For this research, a case study was undertaken in collaboration with the National Museum Cardiff, during which a range of artists was given access to digital 3D models of museum artefacts (Fig. 1). These artists were invited to create new work from the digital 3D models and the resulting artworks were presented in the National Museum Cardiff and online<sup>2</sup>. This project follows a larger trend; the digital 'poaching' of heritage artefacts (see Section 2.1. Fluid artefacts). For this study, data was gathered through interviews with artists and through a visual analysis of the remixed artworks.

Increasingly, digital 3D models of museum artefacts, as well as digital tools and tutorials are available online. These resources enable larger audiences to engage creatively with digital 3D

<sup>2</sup> For more information see (<http://immaterialartefacts.blogspot.co.uk>), (accessed 09.04.2015).



**Fig. 1.** 3D models of ceramic artefacts from the National Museum Cardiff, rendered image of 3D scans; 2014 © Sarah Younan.



**Fig. 2.** Postcards from Mexico, Jason Rouse, screenshot from game and overview of game map; 2014 © Jason Rouse.



**Fig. 3.** *Cupid Goat*, John Rainey, rendered image of digital sculptures; 2014 © Sarah Younan.

models of heritage objects. Online 3D repositories, such as Thingiverse<sup>3</sup> or Autodesk<sup>4</sup> allow users to share and download free and premium 3D models for further use. Some websites also offer software tools and cloud services, including free photogrammetry software, which allows users to create their own digital 3D models using digital cameras or smartphones. Hundreds of user-generated 3D models of museum and heritage artefacts can now be found online. Museums are beginning to embrace the creative use of digital material from their collections. Some museum institutions, primarily in the United States, and to an increasing extent in the

UK and across Europe, have begun to foster creative digital engagement with their collections through hackathons<sup>5</sup> and similar projects. Museums are beginning to contribute digital 3D models to online repositories<sup>6</sup>, and some museums offer access to 3D models from their collections on their own websites<sup>7</sup> or via shared

<sup>3</sup> See (<http://www.thingiverse.com>), (accessed 13.04.2015).  
<sup>4</sup> See (<http://www.123dapp.com>), (accessed 13.04.2015).

<sup>5</sup> Hackathons (also referred to as hack days, hackfests or codefests) are events in which computer programmers, graphic designers, hackers, media artists and others involved in digital media develop intensive software collaborations, often in a short period of time.

<sup>6</sup> The Metropolitan Museum of Art, for example, shares digital 3D models from its collections via a Thingiverse profile, see (<http://www.thingiverse.com/met/about>), (accessed 09.04.2015).

<sup>7</sup> The Smithsonian museum, for example, provides access to digital 3D models





**Fig. 4.** *Teapot Trainfortress*, Ian Cooke Tapia, stereolithography 3D print; 2014 © Sarah Younan.



**Fig. 5.** *Monkey Heaven*, Katie Parker and Guy Davis (Future Retrieval), rendered image of digital sculpture; 2014 © Sarah Younan.

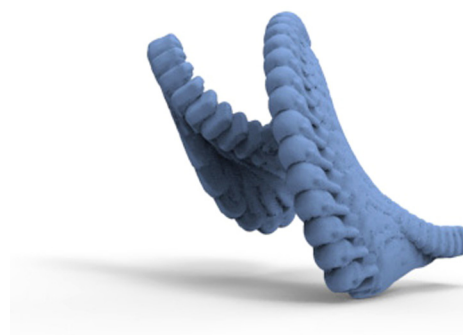
databases<sup>8</sup>.

Users of digital heritage content form interest groups, share materials and communicate online. The phrase “user-generated

(footnote continued)

from its collections on the museum website. See <http://3d.si.edu/browser>, (accessed 09.04.2015).

<sup>8</sup> For example *Europeana*, a cultural foundation with the aim of disseminating digital content from museums and other cultural institutions across Europe. The Europeana website now provides access to digital 3D models from a number of European museums. See <http://www.europeana.eu/portal/search.html?query=3d&rows=24&qf=TYPE%3A3D&qf=false>, (accessed 09.04.2015).



**Fig. 6.** *WsB-Transforma*, Mohamed Hossam rendered image of digital sculpture; 2014 © Sarah Younan.

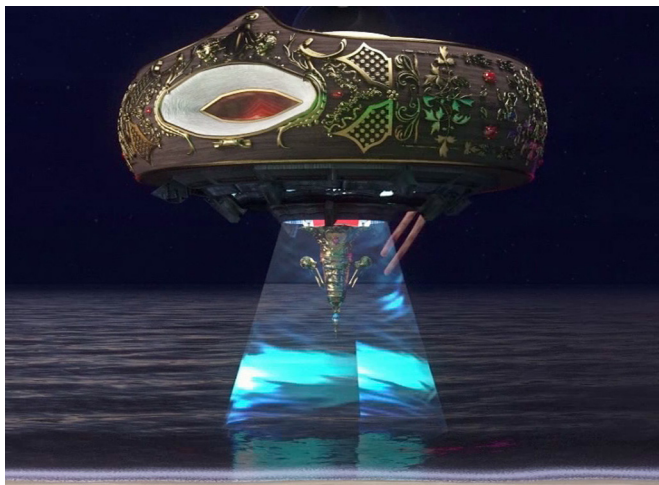
content” (...) really describes not just personal but also social acts (...) the sharing, in fact is what makes the making fun’ (Shirky, 2010: 19). The independent sociologist Etienne Wenger coined the term ‘communities of practice’ to describe groups of people that voluntarily share knowledge, help members learn and practice skills and shape the identity of their members (Wenger, 2000). Digital 3D models of museum artefacts provide a way for users to share knowledge online and to teach and practice digital editing skills.

#### 4. Memory objects

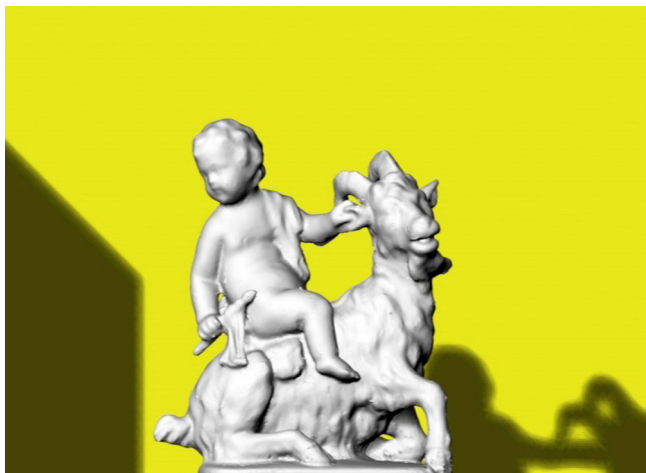
The chief personal use for digital 3D models of heritage artefacts, created by users or accessed online, is 3D printing. The size and material of 3D prints executed privately is usually limited by the capacity of home 3D printers. Most commonly, the 3D printed reproductions are plastic miniatures. Users, both prior to and after 3D printing, frequently customise the forms further. The closest comparable cultural artefacts that can help us to understand digital models of heritage objects are memory objects, such as keepsakes, heirlooms and souvenirs. Like the digital 3D model and they are portable reproductions of particular cultural, natural or historical objects or places. They are seen as low culture, as inauthentic and of little value. While most souvenirs are bought during a tourist visit, digital 3D models of heritage artefacts can increasingly be downloaded from the Internet. On the Internet digital 3D models are accessible anywhere at anytime and are no longer necessarily connected to the experience of visiting a place or seeing an original object. They are souvenirs of visits not experienced but substituted through surrogate engagement with the heritage models. In one sense they offer nothing but virtual superficiality, but in another sense they can artificially widen the user’s experience of and engagement with heritage. After all, museum exhibitions are also simulations; substitutes for understanding and experiencing heritage in its original, historical context.

Unlike souvenirs, digital 3D models of heritage artefacts can be edited and personalised. The kind of digital souvenir users create depends on the experiences, associations or memories the heritage material triggers for them. With the necessary editing skill users are able to transform digital 3D models of heritage artefacts into souvenirs of the dream space. Users can leave a personal mark on digital 3D models of heritage artefacts and forge personal connections.

New artworks created from digital models of heritage objects can function as memory objects. However, instead of simply serving as a reminder of a place or time, as the traditional souvenir and other memory objects do, memories can be integrated directly in digital artefacts. Jason Rouse’s *Postcards from Mexico*, for example, blends the artist’s personal responses with the digital 3D



**Video 1.** Vid.1 *Alien Fanfare*, Jonathan Monaghan, excerpt from animated film. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.



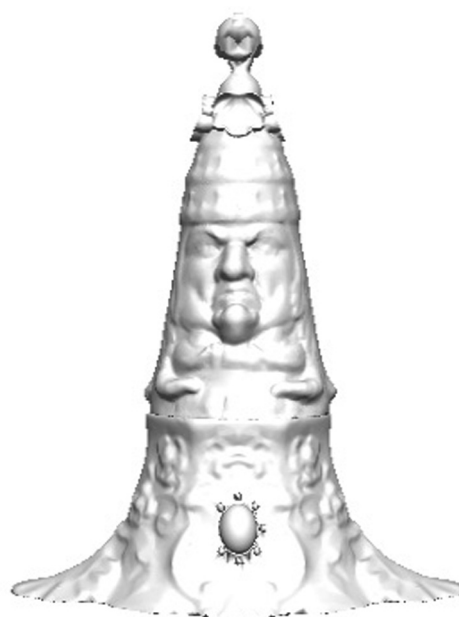
**Video 2.** Vid.2 *Cupid Goat – Interlude*, John Rainey, excerpt from animated film. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.



**Video 3.** Obj.1 3D scan of Mexican mask from the National Museum Cardiff. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.

model that triggered them. *Postcards from Mexico* is a video game<sup>9</sup>.

<sup>9</sup> The game can be downloaded for Windows and Mac from the Rouse's website. See (<http://www.jasonrouse.co.uk/#/mex/>), (accessed 09.04.2015).



**Video 4.** Obj.2 *Cornucopia*, Jonathan Monaghan. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.



**Video 5.** Obj.3 3D scan of ceramic figurine from the National Museum Cardiff. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.

The field of vision of *Postcards from Mexico* resembles the style of popular first-person shooter games. However, in *Postcards from Mexico* there are no enemies to shoot. The only objective is to discover the landscape. The game map of *Postcards from Mexico* (Fig. 2) is based on the 3D model of a pre-Hispanic Mexican mask from the National Museum Cardiff (Obj.1). Rouse visited Mexico



**Video 6.** Obj.4 3D scan of teapot from the National Museum Cardiff. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.



**Video 7.** Obj.5 3D scan of dog ornament from the National Museum Cardiff. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.

the year before he created *Postcards from Mexico*, and he referred to his holiday photographs when he designed its landscape. Rouse described his mask island as an 'imaginary Mexico'; anyone can now visit his memories of Mexico through the digital artefact.

#### 4.1. The influence of media

Present-day experiences, popular culture and media have become sources of information that feed into our historical imagination. Popular media, such as video games and movies have a great impact on younger generation's conceptualizations of the past. The work of American artist Jonathan Monaghan embraces the aesthetics of video games. Monaghan modelled a digital vessel from digital 3D models of ceramic museum artefacts (Obj.2). This cornucopia is expelled from a spaceship in his animation *Alien Fanfare* (Vid.1). Monaghan's work contains many references to gaming culture, from its bleepy soundtrack to the inclusion of video game characters like Mega Man. The animation also carries a touch of consumerism and paranoia; behind a golden Mercedes



**Video 8.** Obj.6. 3D scan of rider figure from the National Museum Cardiff. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.

star, the giant observation camera of the spaceship rolls in its socket like a roving eye.

The Irish artist John Rainey made the transformation and migration of digital data the theme of his work. Rainey remixed the digital 3D model of a ceramic figurine of cupid riding a goat from the National Museum Cardiff (Obj.3). Rainey used digital manipulation to render the sculpture into a series of individually distorted pieces (Fig. 3) and created a digital animation film, which shows the 3D model twist and distort into new shapes (Vid.2). Rainey explained, that he was searching to navigate the 3D models as a new territory opened up by 3D technologies;

*'When entering the virtual environment through 3D scanning, the traditionally static object makes certain compromises in terms of its colour and surface texture, but in return it is subsequently introduced to a catalogue of new possibilities. These include the transformative power of scaling, the ease of duplication, particularly relevant in the story of industrially mass produced objects, the potential of form manipulation, and the ability to behave in ways that are essentially anti-material.'*

Today, it is important that audiences and users are able navigate the digital visual information they receive. Digital images, and increasingly also 3D objects are in a constant state of motion; they may migrate through different states and media and change in the process. Insight into these processes of migration and transmutation can be gained through the creative engagement with digital 3D models. The informed engagement with digital materials, competence known as 'digital literacy' is now a critical skill. Digitally literate audiences understand that digital materials are always a form of interpretation, rather than objectively accurate historical fact (see Section 2. Liminal models). Furthermore, digital literacy 'increases the size of the community that can make use of any given bit of knowledge' (Shirky, 2010: 140) and allows wider audiences to engage with digital heritage materials.

#### 4.2. Identity

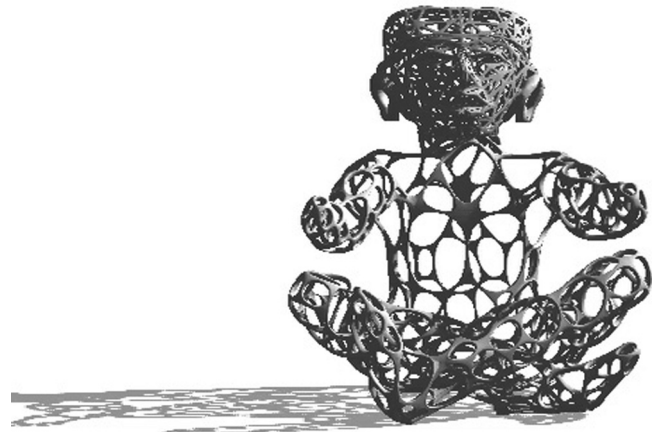
In the dream space, museum objects function as evocative focal points, to which visitors connect personal memories, emotions and associations. Dream space experience can also shape the ways in which users experience digital 3D models of heritage artefacts. Furthermore, liminal digital 3D models are well suited to the articulation of liminal dream space experiences, 'where our inner experiences find a mesh with the outer experiences which museums provide' (Kavanagh, 2000: 175). Cooke Tapia created *Teapot Train Fortress* (Fig. 4) from the 3D scan of a teapot from the





**Video 9.** Obj.7 3D scan of ushabti from the National Museum. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.

National Museum Cardiff (Obj.5). The artist reported experiencing a 'flashback' to his childhood while editing the 3D model; 'It was almost like a flashback; as a kid I would always take old items or kitchen utensils, and make them into toys'. Personal memories and stories triggered by digital heritage models can lead people to engage with questions of identity. Frequently users of digital 3D models of museum artefacts identify with the digital materials to



**Video 10.** Obj.8 Cantli, Mario Padilla. A video clip is available online. Supplementary material related to this article can be found online at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.

some degree. The artist duo Katie Parker and Guy Davis, who go under the name of Future Retrieval, created *Monkey Heaven* (Fig. 5) from 3D models of museum artefacts from the National Museum Cardiff (Obj.6–8). They described a feeling of identification with the (digital) heritage artefacts they were working with;

'We have respect for the material and subject matter we work with (...) maybe I'm the monkey, and I'm in heaven, juggling with these objects, celebrating these things from the past.'

Mohamed Hossam, an Egyptian artist, creatively expressed his cultural heritage and identity using the 3D model of an ushabti figurine from the National Museum Cardiff (Obj.7). Hossam saw his artwork (Fig. 6) as a way of taking ownership of his cultural heritage;

'I am proud of my country's heritage and culture (...) I wanted to incorporate the idea of movement, continuation and transformation, the pieces also represents a balance between life and the afterlife.'

The Mexican artist Mario Padilla, who remixed the 3D model of a Teotihuacan artefact from the National Museum Cardiff (Obj.8), expressed similar thoughts;

'I have a cultural relation with it (the artefact) I feel like I am keeping something going.'

In times of rapid cultural change and increasing cultural diversity it is important to understand the processes of cultural change and development. Creativity, culture and identity are dynamically related. By enabling users to engage creatively with digital heritage materials museums can enable people to engage positively with cultural change and diversity.

## 5. Conclusion

'The best learning experiences come when people are actively engaged in designing things, creating things, and inventing things (...) it requires people to get involved as makers-to create things.' (Resnick, 2011). In this sense, the remixing of heritage artefacts can foster self-directed learning. Furthermore, digital technologies can be used to feed heritage materials into popular culture. Creative digital engagement can reveal contemporary readings of museum artefacts, personal memories and identities and engage with museum dream space experience. Not every remixed version of a digital heritage artefact is an original masterpiece, but even the 'stupidest

creative act is still a creative act' and can trigger new levels of interest in museum collections and heritage; 'the real gap is between doing nothing and doing something' (Shirky, 2010: 19). Digital media open up new ways of engaging with shared cultural heritage, but they also raise questions about property, ownership, freedom of expression and the extent to which the past is distorted by the tools that mediate experience. The gains and losses of public creative access to digital reproductions of heritage artefacts need to be weighed up; museums and heritage institutions stand to lose some authority over their intellectual property and there is a risk that digital heritage content might be used in ways that are confusing or offensive. At the same time, shared cultural heritage becomes more open to new interpretations and points of view.

Popular culture and media have become a source of information that feeds into the historical imagination. If digital heritage materials are more widely used in popular culture, they remain in the public eye and the public mind and thus inform public historical imagination. Users stand to learn from the creative interaction with digital heritage materials, to develop a more informed historical imagination and gain greater digital visual literacy. Communities of practice can emerge around digital content (Wenger, 2000), this leads to the sharing of ideas and knowledge. There is growing public interest in access to digital 3D models of heritage artefacts and spaces. Today, users expect 'access' to mean more than 'a view through the portal of a web-browser's window' (Blackwell and Blackwell, 2013: 162); they want to be able to copy, manipulate and recontextualise data, and to share publicly the fruits of their labour.

Digitisation can be expensive for museums and it is unrealistic to propose that museums digitise and share online the entirety of their collections. Instead, the author suggests that heritage institutions undertaking 3D digitisation opt to share their digital 3D models under creative commons licences whenever possible. Furthermore, it is recommended that they collaborate with artists, with open culture and digitisation initiatives<sup>10</sup> and with online 3D platforms<sup>11</sup> to create and experiment with digital 3D models.

While heritage artefacts are unique and valuable objects that need to be protected and kept safe their digital 3D reproductions can be infinitely reproduced and shared without further cost or damage to the original. Digital 3D models only become exclusive if museums are resistant to their open and creative use; when they are withheld or when access to them is restricted. It is not enough to create digital heritage content, museums also need to be prepared to think about the use of these digital materials in new ways. In order to use these technologies to their fullest potential more research is necessary to develop policies that enable audiences to digitally 'poach' museum artefacts.

## Artists

Future Retrieval; (<http://www.futureretrieval.com>)  
 Ian Cooke Tapia; (<http://cookecanvas.com/tag/ian-cooke-tapia/>)  
 Jason Rouse; (<http://www.jasonrouse.co.uk>)  
 John Rainey; (<http://www.johnrainey.co.uk>)  
 Jonathan Monaghan; (<http://jonmonaghan.com>)

Mario Padilla; (<https://www.behance.net/mariopadilla>)  
 Mohamed Hossam; (<https://eg.linkedin.com/in/mohammedhossam6>)

## Acknowledgements

This research has been made possible through the kind support of the Welsh Institute for Research in Art and Design, Cardiff Metropolitan University, the Welsh Arts Council and the Arts and Humanities Research Council UK and the support of the National Museum of Wales.

## Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at <http://dx.doi.org/10.1016/j.daach.2015.11.001>.

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<sup>10</sup> Such as *Scan the World*, who are engaged in digitising museum collections in 3D and sharing models online for free, see (<https://www.myminifactory.com/users/Scan%20The%20World>), (accessed 15.06.2015).

<sup>11</sup> Such as Sketchfab, who are presently collaborating with the British Museum, see (<https://sketchfab.com/britishmuseum>), (accessed 15.06.2015).