Virtual Museum — The concept and transformation

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Abstract

The virtual museum is often seen as the embodiment of André Malraux's proposition for a *musée imaginaire*. The phrase, 'museum without walls', by which this proposition is known in English literature of the subject, was never used by Malraux. It was entirely the creation of the translators of his *Le musée imaginaire* (1947), who in the process altered Malraux's intended meaning, A popular dictionary of museology compiled for the International Council of Museums (ICOM) extends the understanding of virtual museum to a 'package of solutions that may be applied to museum problems, and naturally includes the cyber museum, but is not limited to it' (Desvallées and Mairesse, 2010: 60). The vagueness of the term 'virtual museum' has been noted earlier, *inter alia* by Erkki Huhtamo (2002), although his focus was on museums on the web.

Opinions concerning virtual museums have typically elaborated upon the comparison of physical and virtual collections. This relationship is becoming ever more complex. A virtual museum may be created and experienced as a digital surrogate of actual collections, as well as an entirely imaginary construct. New formats and modes of engagement are emerging. The author refers to a number of examples demonstrating how the concept has changed historically. The need for an interdisciplinary, in-depth study into the theory and practice of virtual museums was recognised through funding awarded, through the European Union's Seventh Research and Innovation Framework Programme, to several institutions across Europe, to establish the Virtual Museum Transnational Network of Excellence (2011–2015). This chapter introduces V-MusT research into the theory, practice and pedagogy of virtual museums, with a focus on the first UK V-Must School, organised by King's College London in collaboration with University College London.

Keywords: museology, virtual museum, V-MusT, digital technology, 3/4D visualisation, documentation, London Charter

In November 2015, a popular London newspaper, the *Evening Standard*, reported on a new website that showed the British Museum captured through Google Street View technology (Blunden 2015: 23). The British Museum was described as open 'all hours on Google'. The editorial was titled 'Virtual Museum' (Anon. 2015: 14).

Concurrently, the European Commission opened a call for research projects investigating 'Virtual museums and social platform [sic!] on European digital heritage, memory, identity and cultural interaction' (Horizon 2020 Call). These two examples illustrate that by 2015 the term 'virtual museum' has not only been used to stimulate research supporting European cultural policy, but also entered every-day communication. As a colloquialism, it did not seem to require explanation. Is that really the case?

The concept of virtual museum is not new. Historically, its meaning has evolved to encompass new intellectual constructs and cultural phenomena, reflecting changes influenced by technological developments in information communication. Some of these historical developments impacted museology and museum practice well before the advent of modern computers and Internet technologies. The critical reflections on the subject, presented here, stem from the author's interest in historical approaches to documentation and visualisation of cultural heritage as well as applications of electronic imaging to recording and study of art and architecture (*inter alia* 3DVisa 2006–08; COSCH 2012–16). The paper introduces applied research carried out in this area by the European Virtual Museum Transnational Network of Excellence (V-MusT 2011–15). The focus is on the scholarly methods of creating virtual collections and the pedagogy of virtual museums. How does one effectively teach virtual museums? Academic curricula are slow in adopting virtual museology and do not yet provide a ready answer.

The question concerning the place of virtual cultural heritage in the modern museum is an important one. Electronic tools for creating virtual collections are now available. World-wide-web repositories make the idea of a universal virtual 'museum without walls' that is 'open all hours', and to all, one that is particularly attractive whilst also being controversial. The vision is problematic in both cognitive and experiential terms. The newspaper editorial mentioned before described how, 'Not only will the technology allow 24-hour scrutiny of 4,500 of the [British] museum's holdings in very high definition, it will allow us to see artefacts so precious they are only on display for limited periods, thereby giving the virtual visitor the edge over real ones.' (Anon. 2015: 14). This technological determinism, which equates a digital representation of an object with the object itself, is not uncommon. The present time,

marked by enthusiasm towards digital technology, as well as apprehension of its ubiquity, is right to continue the debate on modern museology and its concepts of museum.

Digital media industries are thriving on the demand for experiences that blur the physical and virtual realities. Capitalising on this trend, many museums are working on an approach to digital simulacra that enhance direct experience of the physical object and preserve its authenticity. Despite notable examples of international collaboration, the coordination of scholarship and practice in this area is insufficient to make a universal virtual museum a reality. Access to specialist digitisation know-how, and infrastructure of the required quality, is still beyond the means of many museums. Museum collaboration with commercial partners, such as Google, is one possible solution.

V-MusT. Applied research into virtual museums

A need for interdisciplinary, in-depth research into virtual museums has been recognised by the European Union through funding allocated in 2010 to eighteen European partners to establish the Virtual Museum Transnational Network of Excellence (FP7-6-2009 G.A. 270404). The V-MusT Network (www.v-must.net) was active between 2011 and 2015. Museums and other cultural and academic institutions, as well as media companies in 13 countries, and some 50 associated organisations, undertook an extensive programme of theoretical and applied research, and training. V-MusT aimed to enhance virtual museology and digital methods of dissemination of cultural heritage. The work has benefited from international, interdisciplinary collaboration and has been informed by earlier technical innovation and research, conducted by the V-MusT partners and independently, notably in the USA and Canada. The large body of resources now available for developing and studying virtual museums consists of extensive literature, electronic tools and materials, technical standards, legal advice and good practice guides (*inter alia* Karp 2004; Styliani *et al.* 2009). Documentation summarising the V-MusT Network's contribution to the field is available online (V-

MusT Documents 2011–15; V-MusT Publications 2011–15) (http://www.v-must.net/library/documents and http://www.v-must.net/library/publications).

V-MusT pedagogy

V-MusT established a programme of training in virtual cultural heritage through a series of short-term national and international schools. A great deal of pedagogical, technical and logistic innovation was needed to design and deliver the complex, specialist curricula. The schools enabled scholars, scientists, museum professionals and educators, participating in and affiliated to the Network, to refine and disseminate interdisciplinary theory of virtual museums and applied heritage science.

The first V-MusT Summer School in the United Kingdom, titled *Virtual Restoration and Reconstruction in a London Charter Framework* (V-MusT UK 2012) was concerned with the scholarship, techniques and ethics of historical visualisation. It was organised by King's Visualisation Lab of the Department of Digital Humanities at King's College London, in collaboration with a number of academic institutions and museums in London. The syllabus of this School drew on the principles of *The London Charter for the Computer-based Visualisation of Cultural Heritage* (Figs 1 and 2).

Figure 1. London Charter for the Computer-based Visualisation of Cultural Heritage.
Screenshot of the home page, www.londoncharter.org (15 February 2016)
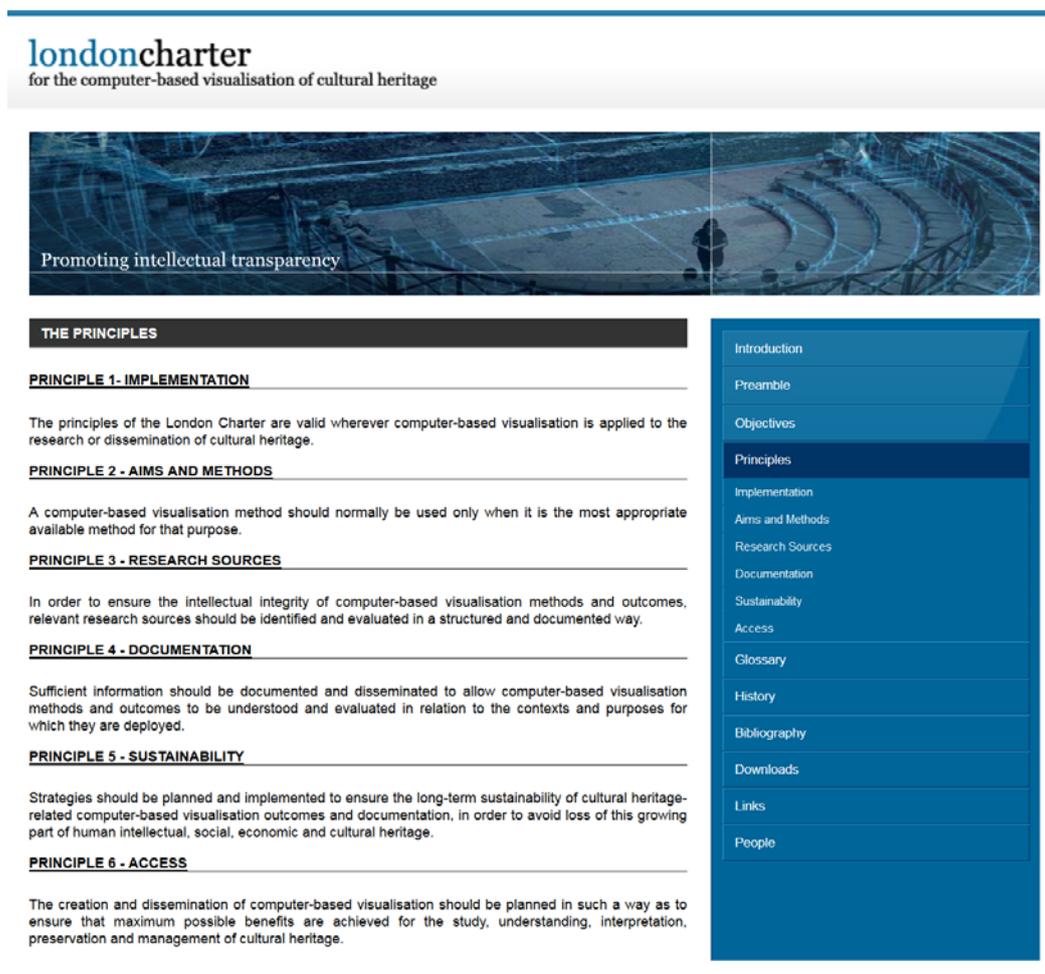
Figure 2. Principles of the London Charter for the Computer-based Visualisation of Cultural Heritage, www.londoncharter.org (15 February 2016)

Available in several languages, *The London Charter* (2006–) promotes visualisation as a method of historical, scholarly investigation, and calls for its intellectual and visual transparency (Bentkowska-Kafel and Denard 2012).

In the author's experience, teaching the UK V-MusT School seemed illustrative of some of the challenges of interdisciplinary training of virtual heritage specialists in general. The international participants — from England, Germany, Italy, the Netherlands and Iran — had different cultural, educational and professional backgrounds, as well as different expectations and ambitions. They were both academics and professionals. The group included Ph.D. students in Classics,

Archaeology and Art History. There were also media technology professionals working for a company specialising in visualisations for nuclear industries and urban planning. The doctorate candidates were equipped with specialist historical knowledge but, in some cases, lacked spatial literacy and technical skills required to record a heritage object accurately and model it on a computer. Some Information Technology professionals had poor academic research skills, no previous experience of historic primary sources; they were unsure how to interpret the documentary and material evidence, and assess the historic and artistic qualities of the studied object. All participants had to learn that three-dimensional digital visualisation of material cultural heritage requires in-depth knowledge of the subject *and* specialist technical skills such as precise recording, drawing and modelling. They had to understand that visualisation-based historical research involves archival studies and fieldwork. It is complex and laborious; requires a great deal of advance planning, as well as a good understanding of the purpose of the project and its feasibility. The scholarly objectives of historical visualisation, which favours the process of discovery over the final product, were weighed against the pressures of commercial goals. The differences in participants' backgrounds and levels of previous experience, their initial, generally uncritical, view of applications of Virtual Reality (VR) turned out to be advantageous to stirring a wide-ranging discussion. The School offered an intensive programme of fieldwork, practical visualisation labs, lectures and demonstrations of new technologies applied to heritage studies. A site in Strand Lane, London, known as Roman Bath, was chosen as a subject for a collaborative visualisation project, which the students were required to design, carry out and evaluate under the supervision of subject and technology specialists. Working in small groups, the students kept notes as they surveyed the site, examined material evidence and other sources. They sought expert advice and discussed the uncertain building history and the possible original purpose of the site. They aimed for the final 3D visualisation to show gaps in knowledge and ambiguity of sources.

Figure 3. Participants of the UK V-MusT School in the Parthenon Gallery, British Museum, September 2012. Photo: Martin Blazeby, reproduced by kind permission.

The School stressed the importance of direct study of cultural heritage. A class at the British Museum was taught in the Parthenon sculptures gallery where the advantages and drawbacks of a typical museum display are evident. Some of the surviving external decoration and fragments from the Athena temple (447–432 BC) on the Acropolis in Athens are exhibited either as freestanding pieces or on the gallery walls (Fig. 3). This is contrary to its original architectural location. The impression the figures make when positioned so as to face into an interior space, and viewed close up, at eye level, is very different from the effect intended by their creators. The display ignores the geo-spatial and socio-cultural contexts of the original architecture. The original painted decoration has not survived, resulting in the modern, incorrect perception of Greek sculpture as white marbles. Accompanying the incomplete and misrepresenting display is a kiosk showing computer visualisation of how the structure might have looked originally. The seeming completeness of the virtual object may also be, and often is, misleading — unless proper measures are put in place.

Information on how historical and technical uncertainty has been resolved in the visualisation of cultural heritage is a key factor contributing to the scholarly

credibility of the method. Paradata, a detailed record of the visualisation process, are necessary to enable future revisions of decisions and adopted solutions, if and when new evidence becomes available. Graphical representations of the physical object (extant or lost) should not be the sole aim of creating virtual heritage. Visualisation may also serve as a graphic interface to comprehensive information about the object *and* its historical, spatial and social contexts. Virtual collections have the potential of addressing the problem of fragmented knowledge promoted by museum exhibits, their detachment from the original function and actual life-cycles of the objects. The clarity of virtual visual representation (what is being represented and how) is essential. The V-MusT training aimed to foster such a transparent approach and recognition of its cognitive benefits.

In a seminar 'What is a virtual museum?", held at King's College London, on 11 November 2012, the participants of the UK V-MusT school collectively defined the virtual museum, as 'a computer-based, open-access, comprehensive, remote and interactive collection of 3D representations (or copies) of objects. It is an integrated knowledge platform'. The phrase 'integrated knowledge platform' was understood by the author's students to mean not only a multimedia repository of information with open access, but also a virtual environment for communication, collaboration and dissemination of research. The distinction between 3D representations of objects and copies refers, in this case, to the difference between creative procedural modelling (e.g. in Autodesk 3ds Max software) as compared to point clouds/polygonal meshes captured through precise, spatial and spectral measurements (e.g. with structured light or laser scanning).

The definition arrived in the course of the V-MusT School in question, reflects this group's shared expectations of the new generation of virtual visual collections of historic artefacts. It was informed by many discussions, lectures, visualisation labs and museum workshops. At the Petrie Museum of Egyptian Archaeology, University College London (UCL), the V-MusT students experienced first-hand digital 3D technologies and interactive multimedia (Fig. 4) employed in educational materials implemented across the UCL Museums and Collections. Augmented Reality (AR) applications supplement the experience of the physical object with computer imagery and other media. Some employ gesture capture techniques and enable the user to

virtually 'handle' digital surrogates of the museum objects. Such experiences
compensate to some degree for the fact that museum objects must not be touched
by visitors and can rarely be looked at all round. The UCL team was at hand to
explain the scholarly and educational aims; demonstrate how technology works and
present prototype solutions.

Figure 4. Participants of the UK V-MusT School at the Petrie Museum of Egyptian
Archaeology, University College London, September 2012. Photo: Martin Blazeby,
reproduced by kind permission.

Virtual objects on show in UCL museums result from the ongoing, inter-
departmental collaboration between curators, conservators and scientists in
geomatics engineering, photogrammetry and 3D imaging. Their notable early
collaboration was the E-Curator project: 3D colour scans for remote object
identification and assessment (E-Curator 2007–2008). Several museum objects
were scanned with an Arius3D scanner. The objects posed different conservation
and digitisation challenges. A traceable methodology for post-processing 3D colour
point clouds was developed to make the repetition of the process and future
revisions possible. The project investigated the potential of e-science technologies
(including the transfer and storage of large, 3D data sets) in the documentation and

conservation of material heritage; and for monitoring the condition of objects and facilitating their study. A dedicated Internet platform for collaborative research into the acquired data has been developed. These precise 3D colour records of objects in the UCL collections enabled the creation of virtual surrogates for use in educational resources. The latter have been made available, both within the museum, often on a tablet next to the actual object, and remotely, for use on a range of devices. In 2012, 3D Encounters (2009–) applications, developed by UCL in partnership with the media company Íomhánna Éigipteach Teoranta, were also made available at the UCL campus in Qatar. Another interdisciplinary, interdepartmental project, QRator (2011–) is an ongoing programme of interactive interventions, available at the UCL Grant Museum of Zoology and London's Museum of Brands, Packaging and Advertising. The QRator iPads, and a dedicated website, invite visitors to engage with the collections through questions about objects on display, the ethics of collecting and display, and other topical matters. Such applications of technology to the study of collections transform the museum into a place of dialogue.

V-MusT classification of virtual museums

Conceptually and technically more complex than tablet applications are some large-scale, interactive multimedia displays. One such display, the *Etruscanning* (Hupperetz *et al* 2013) was developed for the Allard Pierson Museum in Amsterdam (2011) and has since been made available at the Vatican Museums, Villa Giulia in Rome, and the Museum Formello in Veio, Italy. The visitor can interact with virtual objects placed in the virtual representation, projected onto a large screen, of the Etruscan tomb, Regolini- Galassi (Fig. 5) in Cerveteri. By stepping on sensors located in the floor, and moving naturally within this immersive VR environment, different parts of the audio-visual display are activated; objects can be brought closer for detailed, all-round viewing. The commentary, read by actors impersonating Etruscans, changes accordingly and augments the performative effect. Virtual objects are 3D records of actual archaeological finds dispersed in museums in Leida,

Amsterdam and the Vatican – virtually reunited through photogrammetry, laser scanning and other technologies.

Figure 5. Etruscanning. Computer visualisation of the Regolini-Galassi tomb developed for the Allard Pierson Museum, the Vatican Museums, the Villa Giulia in Rome and the Museum Formello in Veio, Italy, 2013. Photo: Daniel Pletinckx, reproduced by kind permission.

The Etruscanning is an outcome of interdisciplinary collaboration between subject specialists and technology professionals, some of whom participated in V-MusT. This interactive, on-site multimedia display exemplifies one of many types of virtual museums identified by V-MusT. A list compiled at http://www.v-must.net/virtual-museums/all (Fig. 6) indexes virtual museums according to a classification developed by V-MusT. The list, which is by no means comprehensive, aims to demonstrate the variety of types and formats of virtual museums. Amongst the museum listed alongside the *Etruscanning* are several visualisations of ancient Rome; an interactive computer model of the Cathedral in Santiago de Compostella; 3D records of capitals in selected Romanesque cloisters of France, Spain and Italy. A virtual museum of Bologna shows domestic interiors in the twentieth century. The Virtual Museum of Iraq consists of 3D digital records of selected objects in the National Museum in Bagdad. It was created in the 2000s by Italian heritage

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technology specialists to draw attention to the cause of protecting cultural heritage of ancient Mesopotamia, at risk of destruction during the ongoing war. On the list is also the haptic museum (simulating touch) of Pure Form, housed in the Cathedral in Pisa. The last example to be mentioned here is the *Locis Imaginis*, a crowd-sourced online platform, supported by the French Ministry of Culture and Communication, where personal photos of a monument can be superimposed onto its 3D model in the national database of national heritage, for interactive study as well as collective memory. As illustrated by the list, the broadness of the term 'virtual museum', applied by V-MusT to such a wide range of content and formats is likely to be questioned, thus encouraging the wider debate on what constitutes a virtual museum more generally.
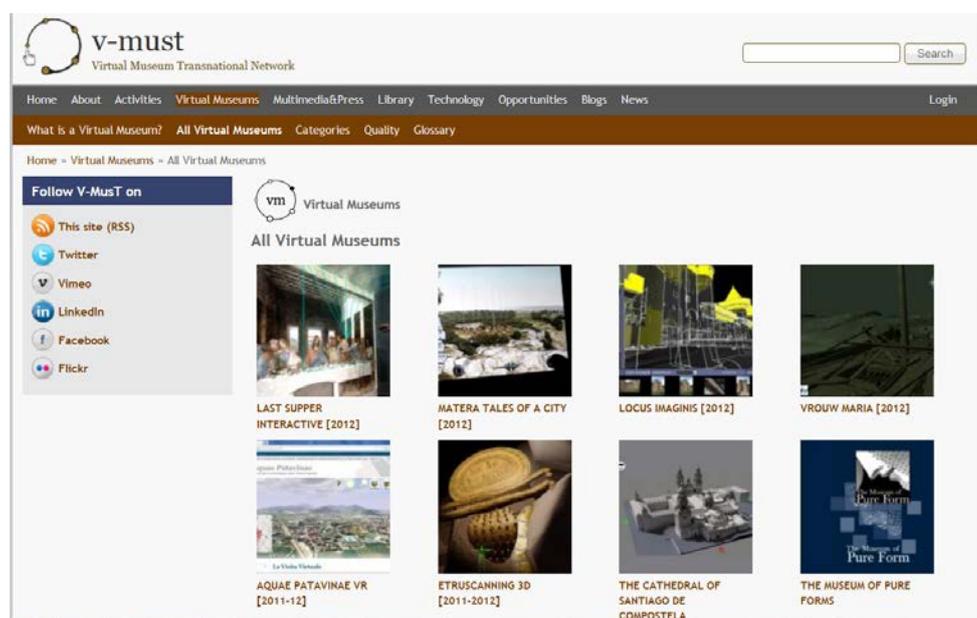
Figure 6. Virtual museums listed on the Virtual Museum Transnational Network website at http://www.v-must.net/virtual-museums/all (12 October 2013).

The classification underpinning the V-MusT selection is based on criteria that bridge traditional museology and information communication technologies. V-MusT defines virtual museums according to the content and subject (e.g. ethnographic museum; museum of the Thermopylae Battle), purpose (e.g. research, an enhanced visitor experience, edutainment), interaction technology (e.g. device-based or natural, gesture-based) and level of immersion (low, medium, high), the form of communication (e.g. narration, dramatisation), duration (temporary or permanent)

and sustainability of digital tools employed (e.g. reusable, archived non-reusable) (V-MusT Deliverable Report 2.1c. 2014: 12–25). In the V-MusT typology, virtual archaeological museums include visualisations of historic architecture that has not survived. The traditional roles of the museum are augmented to include provision of entertainment — mainly in the form of serious, or critical (Champion, 2015) computer games — and promotion of cultural heritage through advertising.

Online access to virtual museums, via desktop and mobile platforms, has become standard, contributing to ever new forms of engagement and collaboration. *Keys to Rome* (2014), which was an exhibition curated by several V-MusT partners, opened simultaneously in Alexandria, Amsterdam, Rome and Sarajevo. Selected ancient artefacts on show were accompanied by their 3D printed, scaled models. Visitors could interact with these smart objects (fitted with sensors). For example, by employing Natural Interaction AR, one could reveal the colours of original painted decoration that has not survived in the actual historic object on display (Fig. 7; Keys to Rome video 2014).

Figure 7. Details of an interactive, Augmented Reality computer simulation of the original colour scheme of an oscillum, shown in the Keys to Rome exhibition, the Allard Pierson Museum, Amsterdam, 2014. Screenshots from the video showing the use of smart objects, available at http://www.allardpiersonmuseum.nl/en/exhibitions-at-events/keys-to-rome.html. Reproduced by kind permission.

This kind of multimodal museum curation, *in situ* and online, should not be dismissed outright as 'mere' educational guides for the general public. This kind of multimedia are often used as research tools and means for communicating the latest

scholarship. Therefore, the definition, as agreed by the participants of the UK V-MusT School, of the virtual museum as a complex, computer-based system of knowledge, reflects the developments in museum practice. It involves new forms of engagement with the museum object and its story, and ever expanding modes of communication, both scholarly and popular, enabled by digital technologies.

The virtual museum. The concept and transformation

'A Museum without Walls. Let's go to explore the city' is a guided tour of Nowa Huta, an exemplar Socialist city of the 1950s, built for the workers of the Lenin Steel Works on the outskirts of Kraków. The tour starts at the Kraków Historical Museum with a talk on Polish Social-Realist architecture and design of the Communist era (Kraków Tours 2012). The Association for Public Art active in Philadelphia, USA, offers 'Museum Without Walls Public Art Bike Tours' (Philadelphia Bike Tours, 2015). The tour is of 65 pieces of public sculpture. Claes Oldenburg's *Clothespin* (1976) expands an everyday object into a soaring, 14-metre steel sculpture. The artist's and local curators' talks, available on the accompanying 'audio programme with slides and maps' for smartphones and other devices, reveal the *Clothespin* as two figures kissing.

The concept of museum — broader than a building that houses a collection of historic objects and the institution responsible for their safeguarding — is well established. The phrase 'a museum without walls' is used both in the literary sense and figuratively. Although it does not appear in Malraux's original writings (1947; 1951; 1952–54; 1965a; 1965b), it is often seen as his legacy (*inter alia*, Battro 1999; 2009: 136–147). Edwin Coomasaru (2014) goes as far as inferring 'André Malraux's 1947 plans for a "museum without walls"'. The phrase has persisted since the English edition of Malraux's *Le musée imaginaire*, which first appeared in 1949 in Stuart Gilbert's translation, under the title 'Museum without Walls'. Frequently misinterpreted (*cf.* discussion in Allan 2010), the phrase narrows Malraux's concept of the imagined museum (*le musée imaginaire*), which is primarily an intellectual and spiritual construct concerned with personal appreciation of art. Malraux extends the concept of art museum to include wide-ranging knowledge of artefacts known

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through photographic prints. Malraux saw in the printing press (*l'imprimerie*) a realisation of universal access to world visual arts (Malraux 1947; 1965a, 16). This vision contrasted with, and was arguably in response, to Walter Benjamin. Benjamin's (1936) concerns over the loss of authenticity and aura of art, through its mechanical reproduction, were expressed in an essay that was to become seminal to later debates over print/digital surrogates of art. Malraux's discussion of the subject (1947) is free from a scholarly apparatus and makes no explicit reference to Benjamin's text. There is, however, indirect evidence of communication between the two scholars (Benjamin 1910–1940: 529). Later, Malraux's own explicit argument (1965b: 232) on the value of art reproduction, compares it to spiritual intermedium. Famously photographed by Maurice Jarnoux with an array of photographic prints of world sculpture arranged on the floor, Malraux (1965b) challenged and augmented the established, strict canon of Western art by noting its relationships to other cultures. Free from constraints that often affect a selection of objects for museum displays, he juxtaposed images of major works of the Italian Renaissance with little known ethnic objects from faraway lands; he crossed artistic genres and media, geographical and chronological boundaries.

Many of Malraux's observations and arguments remain relevant today: real museums (*les vrais musées*), even the largest, such as the Louvre, impose an incomplete and fragmented experience (Keene 2005). Museums show only a fraction of their collections. The UCL Petrie Museum (http://petriecat.museums.ucl.ac.uk/), for example, displays approximately 10 percent of its holdings, keeping the rest in store (Gardner 2007). Exhibited objects are, necessarily, dislocated from their original context and the purpose for which they were created. A first-hand experience of art and architecture is not always sought or possible. Malraux noted that Charles Baudelaire and other prominent art critics of the twentieth-century visited only a handful of museums; some of the most significant and persisting critiques of Western art were pronounced based on printed reproductions of art, not direct observation.

In the 1960s, at the time of publication of Malraux's *Le musée imaginaire* in English (1965) and its American edition (1967), Everett Ellin explored the feasibility of a USA-wide, networked, computerised museum system. Appointed to direct the

American Museum Computer Network, he envisaged the system to be used 'to deliver electronically, upon request, museum lectures and simulated exhibitions (in audio/visual form), to a classroom console or even to the home'; and to be capable of answering 'specific questions from amateur and expert alike' (Ellin 1969: 25). Ronald Stenvert (1992: 21) interpreted this innovative proposition as 'worldwide databases', which he termed an 'electronic museum, or a digital virtual museum'. Ellin's concept encompassed more than the virtual counterparts of physical objects in museum collections. The questions concerning the scope and functions of the virtual museum have dominated the debate ever since (Keene 2005: 25).

Examples of noteworthy concepts of virtual museums range from the seventeenth-century paper museum (*museo cartaceo*) of Cassiano dal Pozzo, to the twenty-first century virtual feminist museum proposed by Griselda Pollock (2007) and, questionably, Jonathan Meades's (2012b) idiosyncratic discussion of the spirit of place. Cassiano dal Pozzo (1583–1657) undertook large-scale documentation of heritage, both material and intangible, by commissioning artists to draw and paint in great detail architecture and antiquities, spectacles and religious ceremonies, arms and costumes, and various other subjects, including flora, fauna and geological specimens. Engravers were employed to make prints after these records. After Cassiano's death, his brother Carlo continued the work. The name, Paper Museum, given to this unique collection may be justified due to the artistic and scientific practice of recording on paper the examination of the studied objects; with annotations; as well as the systematic, chronological and subject classifications of the assembled works on paper. Over 7,000 of these records have survived and are dispersed between the British Museum and other collections (MacGregor and Montagu 1996–).

What is a virtual museum of the digital age? Although Erkki Huhtamo (2002) only looked at museums on the web, he noted the vagueness of the term. Research into media archaeology (Bowen *et al.*, 2005–) has unearthed numerous virtual museums created in 1990s; these examples claimed to be virtual museums by the virtue of disseminating information about heritage in the form of webpages. The Virtual Museum of Computing, founded by Jonathan Bowen in 1995, presents a history of computing and consists of a basic page in HTML with hyperlinks (VMoC,

1995–). Numerous similar compilations of information and resources, some of sizable content, some being the outcome of a labour of love, have since appeared online. Many virtual museums make reference to Malraux, or an explicit connection between his thought and the Internet (Musée Imaginaire Virtuel, 2008?–). Some continue to develop while others have fallen victim to the transience of the web and the notorious, '404 Not Found' error.

Aware of the danger of the virtual museum being 'a buzzword used indiscriminately', Werner Schweibenz (2004: 3) defined the virtual museum as

> '[...] a logically related collection of digital objects composed in a variety of media which, because of its capacity to provide connectedness and various points of access, lends itself to transcending traditional methods of communicating and interacting with visitors [...]; it has no real place or space, its objects and the related information can be disseminated all over the world.' (*cf.* earlier versions in Andrews and Schweibenz 1998: 24; Schweibenz 1998: 191)

Schweibenz emphasises communication and interaction with visitors. The fulfilment by virtual museums of other important roles and characteristics also needs to be considered, starting with the legal status and organisational framework. Whether institutional or deinstitutionalised, these are often difficult to formalise, as the story of the Museo Virtual de Artes MUVA demonstrates (Haber 1998: 2001). Opened in 1997, MUVA is believed to be the first entirely synthetic museum: it exists solely online in a purpose designed, seven storey virtual building. Mario Buchichio created an interactive 3D, architectural, computer model, based on the plans drawn by Mezzotoni-Scheck & Partners architects (MUVA 1997–). The museum houses a collection of images of art by Uruguayan artists. It was conceived with the aim to compensate for the absence of, in Schweibenz's words, 'real museum' of contemporary art of Uruguay that has been proposed for the capital, Montevideo, but has never been built. Supported and hosted by the newspaper, *El Pais*, the virtual museum is a legal entity and has a board of directors.

With this complexity of virtual museums in mind, the V-MusT Network concluded,

'A virtual museum is a digital entity that draws on the characteristics of a museum, in order to complement, enhance or augment the museum experience through personalization, interactivity, and richness of content. Virtual museums can perform as the digital footprint of a physical museum, or can act independently, while maintaining the authoritative status as bestowed by ICOM [the International Council of Museums] in its definition of a museum. In tandem with the ICOM mission of a physical museum, the virtual museum is also committed to public access; to both the knowledge systems imbedded in the collections and the systematic and coherent organization of their display, as well as to their long-term preservation.' (Hazan *et al.* 2014: 39)

Virtual museology

The International Council of Museums (ICOM) recognises that the virtual museum 'is a key concept of museology; it refers to a practice "likely to have a considerable impact on the future of museums in the long term"' (Desvallées and Mairesse 2010: 19). While recognising the significance of the virtual museum, ICOM struggles with its ontological status, defining it as 'existing in essence but not in fact', 'on the margin of institutional reality' (Desvallées and Mairesse 2010: 44 and 59). More recent research, by V-MusT and others, highlights the need for ongoing revision of the ICOM definitions of the virtual museum and the preferred concepts of 'digital or cyber exhibitions' (Desvallées and Mairesse 2010: 37–38).

The critical discussion of virtual museums has grown in complexity since Schweibenz (1998: 191) characterised it as having 'no real place or space' and therefore considered the concept to be an oxymoron (Schweibenz (1998: 185). ICOM reminds one that '"virtual" is not the opposite of "real"' and criticises Schweibenz's definition as 'something of a misinterpretation' (Desvallées and Mairesse 2010: 59). The distinction between the virtual and physical realms characterised early experiences of digitised collections but, as evidenced by the examples chosen to illustrate this text, is becoming blurred. The term 'virtual museum' is no longer considered contradictory. This transformation is primarily a result of cognitive and experiential shifts in human perception due to the acquired or native familiarity with digitised and digital objects. Pervasive computing and a range

of simulation technologies (immersive VR, AR, machine haptics, amongst other technologies) contribute to life-like virtual experiences. Some critics continue to approach such digital multimedia in museum with contempt, irrespective of their quality and scope. These forms of interpretation and communication are sometimes seen as edutainment, even 'disneylandisation', degrading the traditional status and mission of Western museums (Borusiewicz 2012: 122). Others draw the opposite conclusion from the profusion of virtual simulacra and popularity of virtual worlds. Discussing mobile art apps, Poprzęcka (2013: 29) expresses a concern that is commonly heard, namely the risk posed by digital objects, particularly those of the highest quality, that are surrogates for art and a possible substitute for the experience of original art. She hopes, however, that the fascination with the virtual induces longing for 'the actual reality'. Malraux (1965b: 232) would probably have agreed: 'Reproductions but increase our esteem for the work, because we feel a need to rediscover the [...] real or imagined soul that belongs only to the original'. The need is, Malraux argued, for the presence of the work of art, its 'voice', the spiritual or even mystical experience. With the advent of the digital image, this view resonates with some scholars in a new way: 'Not unlike the availability of printed copies of works of art, the digital image is a surrogate that attracts rather than repels, that creates interest rather than diminish it.' (Hamma 2000, no pagination). The significant increase in museum visits in the UK between 2005/06 and 2011/12 (DCMS 2015: 25) indicates the benefits to be drawn, among others, from greater digital presence of museums. While capitalising on this interest, virtual museology must not develop in isolation from best conventional scholarship and practice.

Digital technology-driven developments in the world of museums and museum studies do not call for another 'new museology' (Vergo 1989; Ross 2004); a separation of critical museology from operational museology (Shelton 2013); the embracement of neuromuseology (Onians 2015); and nor do they justify a need for discrete information communication museology and specialist digital preservation. Digital technology has opened instead unprecedented creative opportunities for an inclusive, collaborative fulfilment of key museum functions by bringing different aspects of museum work closer than ever before.

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