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STUDIE/ARTICLES

DIGITAL MATERIALITIES AND "REAL THINGS"– SOME THOUGHTS ON DIGITAL OBJECTS AND THE MUSEUM

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ABSTRACT/ABSTRACT:

The relationship between museums and digital materialities is complex. According to museological theory, artefacts have physical dimensions and informational ones. The latter can be digitised, adding virtual properties to physical ones. This is important for museums as primarily visual institutions and "don't-touch places" with materiality currently holding centre stage in museological discussions. Recently, there has been a tendency to replace physical objects with effects produced by information and communication technology that offers possibilities to present digital representations of objects in contexts that are inaccessible for "real things". This paper considers some theoretical aspects of digital materialities and how they relate to the physical objects and the museum. It presents eight theses to foster the discussion on digital materiality and its consequences for museums.

KEYWORDS/KLÍČOVÁ SLOVA:

digitisation – digital materialities – digital object – physical object – museological theory
digitalizace – digitální materiality – digitální objekt – fyzický objekt – muzeologická teorie

Digitální materiality a „skutečné věci" – několik úvah o digitálních objektech a muzeu

Vztah mezi muzei a digitálními materialitami je složitý. Podle muzeologické teorie mají artefakty fyzické a informační rozměry. Informační rozměry lze digitalizovat a přidat tak k fyzickým vlastnostem i vlastnosti virtuální. To je důležité pro muzea, která jsou především vizuálními institucemi a „bezdotykovými místy", kde materialita je v současnosti velmi častým předmětem muzeologických diskusí. V poslední době se objevuje tendence nahrazovat fyzické objekty různými efekty produkovanými informačními a komunikačními technologiemi, které nabízejí možnosti prezentace digitálního zobrazení objektů v souvislostech, které jsou pro „skutečné věci" nedostupné. Tento článek se zabývá některými teoretickými aspekty digitálních materialit a jejich vztahem k fyzickým objektům a muzeu. Předkládá osm tezí, které mají podpořit diskusi o digitální materialitě a jejích důsledcích pro muzea.

Physical and digital materialities in the museum

The relationship between museums and digital materialities is quite complex. Traditionally, museums have been associated with collections of physical objects. The "real thing" has been the distinctive criterion for separating museums from other memory institutions such as libraries and archives. While, according to museological theory,[1] the collections of the latter can be transferred into the digital sphere, the physical aspects of museums and their objects resist digitisation.[2] However, this only holds true for the physical dimensions but not for the information dimensions of objects and collections.[3] These dimensions can be digitised, adding virtual properties to the physical ones. This is especially important as museums are primarily visual institutions, focussing on a single sense, the visual one. They are "don't-touch places"[4] or "noli me tangere" spheres.[5] Nevertheless, materiality currently holds centre stage in museological discussions influenced by the so-called

1 Cf. SCHWEIBENZ, Werner. *Vom traditionellen zum virtuellen Museum. Die Erweiterung des Museums in den digitalen Raum des Internets*. Frankfurt am Main: Deutsche Gesellschaft für Informationswissenschaft und -praxis, 2008, pp. 126–129.

2 Cf. ibidem, p. 94 f.

3 KEENE, Suzanne. Becoming Digital. *Museum Management and Curatorship*, 1997, vol. 15, no. 3, p. 301; KEENE, Suzanne. *Digital Collections: Museums and the Information Age*. Oxford: Butterworth-Heinemann. 1998, p. 23; SCHWEIBENZ, Werner. *Vom traditionellen zum virtuellen Museum. Die Erweiterung des Museums in den digitalen Raum des Internets*. Frankfurt am Main: Deutsche Gesellschaft für Informationswissenschaft und -praxis, 2008, pp. 94–97.

4 DUDLEY, Sandra. Museum Materialities: Objects, Sense and Feeling. In DUDLEY, Sandra H. (ed.). *Museum Materialities. Objects, Engagements, Interpretations*. London: Routledge, 2010, p. 11.

5 BRÄUNLEIN, Peter J. Material Turn. In *Dinge des Wissens: Die Sammlungen, Museen und Gärten der Universität Göttingen*. Göttingen: Wallstein-Verlag, 2012, p. 32.

material turn.[6] At the same time it is important to realise that "*almost all object presented without information are mute in terms of their earlier contexts and context-dependent meanings*"[7] which cannot be properly communicated by their materiality alone. Information and communication technology (ICT) can be a suitable and convenient tool to convey these contexts and meanings.[8] What is more, in the past decade, there has been a tendency to replace the physical object with effects produced by ICT.[9] The reason is that ICT offers possibilities to present digital representations of physical objects in contexts that are inaccessible for the "real things" due to their materiality. For example, a physical object cannot be in two places at the same time – while its reproduction, be it mechanical or digital, can "*meet the beholder or listener in his own particular situation*" as it "*is more independent of the original*" – an aspect already mentioned – but hardly quoted – in Walter Benjamin's well-known essay *The Work of Art in the Age of Mechanical Reproduction*.[10] From a museological point of view, this has serious implications: "*A museum thing can unite innumerable meanings, but its place in the room is indivisible and cannot be occupied by another object at the same time. It thus creates meaningful potentials through its presence in space, while at the same time it excludes the presence of other nouophors in the same place. Digitally simulated things, on the other hand, can occupy the same 'place' because their 'space' is purely semantic.*"[11]

So, on the one hand, digital representations can help museums to establish contact with real objects using virtual ones to add context for the visitors in order to allow them to better connect to artefacts. On the other hand, digital objects can not only be bridges to understanding, but could also be obstructions to it. This is because the transformation of the physical thing into a museum object by means of museification and through digitisation into a digital object is a process of change. This creates a further level of abstraction as will be shown later. But beforehand, it is necessary to introduce some basic concepts of digital materiality.

Some basic concepts of digital materiality

"*It sounds rather odd to say that digital artefacts – like software – have material properties because people generally think of materials or materiality as physical substances such as wood, steel, and stone. Yet scholars increasingly talk about the 'materiality' of digital artifacts.*"[12] With these sentences, Paul Leonardi, a communication and technology scientist, starts his seminal article on *How artifacts without matter, matter.* According to Leonardi, materiality can be defined as "stuff" because a definition of materiality as "object" would imply tangibility, a characteristic that is only inherent to physical objects but not to digital ones that are mediated by technical devices. Therefore, when applied to technology, "'*materiality' does not refer solely to the materials out of which a technology is created and it is not a synonym with 'physicality'*".[13] Rather, the term "materiality" identifies "*those constituent features of a technology that are (in theory) available to all users in the same way*" and "*do not change from one moment to the next or across differences in location*".[14] For digital artefacts, materiality can be defined "*as that which matters to users*".[15] The reason why it matters is that "*technology has a materiality that makes certain actions possible and others impossible, or at least more difficult to achieve*".[16] This means that technology has to be used in one way or another to take on "materiality". When technology is applied, social actions, social practices and social contexts shape the materiality of a technology and its effects.[17] This process creates what Leonardi calls "sociomateriality". This implies "*that materiality acts as a constitutive element of the social world, and vice versa*"[18] as materiality is a property of a technology while sociomateriality refers activities that meld materiality with the "social"

6 Ibidem.

7 DUDLEY, Sandra. Museum Materialities: Objects, Sense and Feeling. In DUDLEY, Sandra H. (ed.). *Museum Materialities. Objects, Engagements, Interpretations*. London: Routledge, 2010, p. 11 f.

8 Cf. *Das erweiterte Museum: Medien, Technologien und Internet*. München: Deutscher Kunstverlag, 2019.

9 KOMPANOWSKA, Anna. The Non-Existent Object. An Inspiriting Technology. *Uncommon Culture – Journal of the ATHENA Project*, 2018, vol. 7, no. 1, p. 153.

10 BENJAMIN, Walter. The Work of Art in the Age of Mechanical Reproduction [1936]. In ARENDT, Hannah (ed.). *Illuminations. Walter Benjamin – Essays and Reflections*. New York: Schocken Books, 1985, p. 220 f.

11 „*Ein Museumsding kann unzählige mögliche Bedeutungen in sich vereinen, aber sein Platz im Raum ist unteilbar und kann nicht zur gleichen Zeit von einem anderen Objekt belegt werden. Es schafft also durch seine Präsenz im Raum Sinnpotentiale, während es zugleich die Anwesenheit anderer Nouophoren am selben Ort ausschließt. Digital simulierte Dinge hingegen können durchaus denselben ‚Ort' belegen, weil ihr ‚Raum' ein rein semantischer ist.*" NIEWERTH, Dennis. *Dinge – Nutzer – Netze. Von der Virtualisierung des Musealen zur Musealisierung des Virtuellen*. Bielefeld: transcript Verlag, 2018, p. 131. English translation provided by the author.

12 LEONARDI, Paul M. Digital materiality? How artifacts without matter, matter. *First Monday – Peer-reviewed Journal on the Internet* [online]. 2010, vol. 15, no. 6-7 [accessed 2024-10-06]. Available from www: <https://firstmonday.org/ojs/index.php/fm/article/view/3036/2567>.

13 LEONARDI, Paul M. Materiality, sociomateriality, and socio-technical systems: What do these terms mean? How are they different? Do we need them? In LEONARDI, Paul M., Bonnie A. NARDI and Jannis KALLINIKOS (eds.). *Materiality and organizing: Social interaction in a Technological World*. Oxford: Oxford University Press, 2012, p. 29.

14 Ibidem, p. 29.

15 Ibidem, p. 31.

16 Ibidem.

17 Ibidem, p. 32 f.

18 Ibidem, p. 34.

(institutions, norms, discourses, etc.). To sum it up, the social and the material become "entangled" as the materiality of a technology allows people to do something.[19] In this way, a social practice emerges in which a technology is embedded as an indispensable component of the process creating digital materiality in a social context like for example social networks. This phenomenon is called sociomateriality. The concept of sociomateriality is central when we talk about digital materiality. The reason is that the material relevance is not physicality which is not inherent in digital objects but their actual use in a social process or context that creates sociomateriality. With these arguments in mind, we turn to the process of digitisation. In doing so, we will also deal with expectations and social practices of users.

Digitisation as a process of change

The museum object, the "real thing", is usually an artefact or a naturafact that can be encountered bodily. In the process of digitisation, a digital representation of the physical object is created and the characteristics of the former physical object is subjected to a series of changes in order to create a digital object:

- Change of form and materiality;
- Change in accessibility and availability;
- Change of context: isolation vs. integration into knowledge schemes;
- Change of expectations and social practices of users;
- Change of authenticity;
- Change of aura.

19 Ibidem, p. 35.

The change of form and materiality:

The change of form and materiality is obvious as the digital representation has no matter but consists only of coded ones and zeros. Therefore, "*it may seem odd to say that information technologies have 'material properties'*".[20] However, the key point is that digital objects – in contrast to physical objects – are not experienced directly, but via media, i.e. it is not a direct experience but always a mediatised one. Therefore, the nature of the digital object is often referred to as "virtual", a word that can be misleading in this context, as the British museum researcher Devorah Romanek[21] points out. Romanek emphasises that "*it is important to observe how the digital object is or will be encountered, which will be in a real way, and not virtually. Users will be sitting in real chairs, in real spaces, using real devices to view or experience the actual transference of coded ones and zeros through various mediums and technologies to encounter the digitised object. All of this has meaning and is contextualising, as none of this, the chair, the space, the device, the digital coding, is without meaning, although it is naturalised and overlooked in most instances*".[22]

This means, according to Romanek,[23] that the digital object is a nexus of multi-layered relationships and negotiations and that these negotiations have implications that impact both the institutions and the virtual visitors. In this context, humanities librarian Marlene Manoff[24] provides some interesting thoughts on libraries and texts in different forms of representation that are also of interest for the museum field. Her conclusion is that "*we must understand that works or texts are not immaterial essences that exist independently of the media in which they are instantiated*"[25] and that "*medium shapes content*".[26] This is certainly the case for technology-mediated digital objects as devices determine the way they are perceived.

20 LEONARDI, Paul M. and Stephen R. BARLEY. Materiality and change: Challenges to building better theory about technology and organizing. *Information and Organization*, 2008, vol. 18 no. 3, p. 162.

21 ROMANEK, Devorah. Digital Curation. Theorising The Digital Object. In *Proceedings of the 2008 Annual Conference of CIDOC "The Digital Curation of Cultural Heritage", Athens, September 15-18, 2008* [online]. p. 8 [accessed 2024-10-06]. Available from www: <https://cidoc.mini.icom.museum/archive/past-conferences/2008-athens/>.

22 Ibidem, p. 8.

23 Ibidem, p. 16 f.

The change in accessibility and availability:

An important implication is the change in accessibility and availability: The digital object is no longer space/place-bound and thus accessible to anyone with a corresponding device and access to the Internet which increases the potential audience massively compared to the restricted physical audience inside the museum building. The theoretically limitless availability makes the digital object virtually ubiquitous. Nevertheless, it can only be used in combination with a device that creates its representation for further use. This device creates the context of experience as described in the paragraph above. The contextual aspect will be elaborated further in the following paragraph.

Change of context:

Another implication is the change of context: The digital object can easily be separated from its

24 MANOFF, Marlene. The materiality of digital collections: Theoretical and historical perspectives. *Portal: Libraries and the Academy*, 2006, vol. 6, no. 3, pp. 311–325.

25 Ibidem, p. 314.

26 Ibidem, p. 313.

material counterpart and acted upon in ways that would not be open to the physical object. Its characteristic feature is that it can be easily manipulated, combined, rearranged, remixed and recreated by exhibition designers.[27] Therefore, it is important not to consider it in isolation but to integrate it into knowledge schemes of relevant domains by providing contextual information. This holds particularly true because the digital object in its virtual environment requires a specific perception and evaluation by the recipients,[28] for example a 3D object allows more interaction than a 2D object. In addition, the computer interfaces of the presenting devices have to be taken into account as they influence how we experience and interact with reality in the context of use. This reality is reconfigured through the computer, as Manoff[29] emphasises: Technology affects users' experiences. However, these interfaces are not transparent windows but designed mechanisms that work in certain ways and can have certain effects, for instance, it makes a difference whether you are viewing an online exhibition on the screen of a smartphone or a 15.6-inch screen. These are issues that have to be considered as a context of use which leads us to expectations and practices on the side of the users of the technology.

Change of expectations and social practices of users:

The changes mentioned above have also an impact on the following aspects: The expectations of both physical and virtual visitors, their behaviour and practices of handling objects and their digital counterparts in social contexts. It would carry things too far beyond the scope of this paper to describe expectations and (information) behaviour of users.[30] Therefore the focus will be on social practices: Of specific interest are the sociotechnical practices as described in an ethnography of visual effects productions by Ronja Trischler whose theoretical approach is similar to that of Leonardi but has an emphasis on digital practice. Trischler[31] points out that the sociological understanding of the digital is influenced by technical devices such as computers or smartphones as well as software and files but also by the way they are put into practice, i.e. how they are used in real life. According to Trischler,[32] there is a strong relation of practice and materiality: Material things or artefacts are prerequisites of practice. However, in practice there are materialities that are more difficult to grasp and contain, such as discourses, but also such materialities are physically perceptible, be it by hearing or seeing or reading words. Such materialities are embodied in practice as well as other materialities which have a physical form. Collectively, they are part of a situation of socio-material practices. The same holds true for digital practices, as Trischler continues: "*Digital practices can also be understood as socio-material. This means that they rely on different, specific entities and in practice develop their effect as materialities. Here, such practices are understood as digital, for which the situational implementation of digital devices is necessary.*"[33] This means that digital materialities are part and product of socio-material practices in which the implementation of these practices is not only based on technical entities such as hardware, software, files and computer systems, but also on socio-technical infrastructures, spatial equipment and specialised people, as Trischler[34] puts it. According to Trischler, hardware, software, infrastructures or files are not per se different types of materialities. Rather, their digital materialities show themselves in their practical interaction and application on the side of the users, in the case of the museum, the visitors. Indisputably, information technologies have material properties that confront their users with real constraints on and opportunities in interaction.[35] Understanding how people deal with an information technology's materiality is essential for developing a broader and fuller understanding of users and their interaction.[36]

27 Ibidem, p. 312 f.

28 Cf. DORNHEGE, Pablo and Franziska RITTER. Im/materielle Theaterräume erlebbar machen. Sammlungsobjekte virtuell erforschen. In ANDRASCHKE, Udo and Sarah WAGNER (eds.). *Objekte im Netz. Wissenschaftliche Sammlungen im digitalen Wandel*. Bielefeld: transcript, 2020, p. 154.

29 MANOFF, Marlene. The materiality of digital collections: Theoretical and historical perspectives. *Portal: Libraries and the Academy*, 2006, vol. 6, no. 3, p. 320.

30 For these aspects see for example SCHWEIBENZ, Werner. How do online visitors look for museum information? Some indications from research literature. In *IV Encuentro International Museo Cerralbo, Madrid May 17th 2021: Tourists – Visitors – Followers. Museum audiences between 19th and 21st centuries: Prospect for the future*. Madrid: Ministerio de Cultura y Deporte, Museo Cerralbo, 2022, pp. 203–212.

31 TRISCHLER, Ronja. *Digitale Materialität. Eine Ethnografie arbeitsteiliger Visual-Effects-Produktion*. Bielefeld: transcript, 2021, p. 260.

32 Ibidem, p. 261 f.

33 „*Auch digitale Praktiken können als soziomateriell verstanden werden. Das heißt, dass sie auf verschiedene, spezifische Entitäten bauen und diese in der Praxis ihre Wirkung als Materialitäten entfalten. Hier werden solche Praktiken als digital verstanden, für deren situierten Vollzug digitale Geräte notwendig sind.*" Ibidem, p. 262. English translation provided by the author.

34 Ibidem, p. 273.

35 As described by LEONARDI, Paul M. Digital materiality? How artifacts without matter, matter. *First Monday – Peer-reviewed Journal on the Internet* [online]. 2010, vol. 15, no. 6-7 [accessed 2024-10-06]. Available from www: <https://firstmonday.org/ojs/index.php/fm/article/view/3036/2567>; LEONARDI, Paul M. Materiality, sociomateriality, and socio-technical systems: What do these terms mean? How are they different? Do we need them? In LEONARDI, Paul M., Bonnie A. NARDI and Jannis KALLINIKOS (eds.). *Materiality and organizing: Social interaction in a Technological World*. Oxford: Oxford University Press, 2012, pp. 25–48.

36 LEONARDI, Paul M. and Stephen R. BARLEY. Materiality and change: Challenges to building better theory about technology and organizing.

Change of authenticity:

"*Indeed, there are many features important to research and enjoyment that are added through digitization. But there is something irreducible about an encounter with the real thing, and that is what constitutes the experiential and affective authenticity of the artifact.*"[37] In accordance with Abby Smith, Romanek[38] states that there are fundamental differences between the original and the digital object, particularly in relation to the concept of authenticity. There is good reason to think that this reflects the prevailing opinion in current museological research, which is characterised by a strong orientation towards objects due to the aforementioned material turn. However, this should not mislead us to believe that there is a "hierarchy" between the physical and digital object and that a digital object is always to be considered as a surrogate and therefore inferior to the original. This will be discussed in more detail in one of the following sections. With regard to authenticity, Smith[39] suggests that a digital object does not only have an experiential dimension but that the specifics of any given instantiation or materialization are crucial aspects of the object's authenticity. These features are called "the look and feel" of the digital object and are intrinsic to its presence and aura. Other authors even speak of a kind of "digital patina" that inscribes digital objects with traces of their biographies, marking them as distinct.[40] This could create a kind of authenticity in the digital realm that might emanate into the physical world.

Change of aura:

The change of practice described above might also lead to a change of perception both by traditional and virtual visitors as "*the aura of the digital object cannot be the same as that of the physical*".[41] When dealing with digital objects, it is important to develop new ways of perception and estimation and an appropriate attitude.[42] Pablo Dornhege and Franziska Ritter,[43] who work in the context of collections in im/material theatre spaces, use the concept of aura as an object property of sensual presence that arises at the moment of contemplation. Consequently, they do not regard aura as a quality inherent in the work of art, but as something created in the present and for the present in order to relate to the past. They argue that the creation of an "auratic" experience in digital space – as in physical space – is ultimately a question of presentation (or mise-en-scène) and contextualisation. Although they negate the concept of the migration of the aura from the original to reproduction, as promoted by the author,[44] they argue that relaunching the material artefact as a digital object creates a new version of it with an independent aura: the sensual presence of the intangible object.[45] In this sense, it seams reasonable to speak of a change of aura because the virtual experience can also enhance the perception of an "auratic presence" of the original in the material world which indicates that physical and digital object complement each other.[46]

The process of change does not create interchangeability:

The process of digitisation triggers a number of changes but this does not mean that the physical and the digital object became interchangeable! The digital object can by definition not be identical with the original, as Mannof[47] states. Rather, it is a new expression of the object. Therefore, the two cannot be treated as if they were interchangeable. In order to better understand the nature of digital objects, we have to realise the processes and machines involved in their presentation.[48] This is especially true because these processes and machines add layers of abstraction on the way from the artefact or naturafact to the digital object or digitalifact, a neologism proposed by the author for digital objects in the museum context, analogous to artefact and naturafact.[49]

Information and Organization, 2008, vol. 18 no. 3, p. 171 f.

37 SMITH, Abby. Authenticity and Affect. When is a Watch not a Watch? *Library Trends*, 2003, vol. 52, no. 1, p. 174.

38 ROMANEK, Devorah. Digital Curation. Theorising The Digital Object. In *Proceedings of the 2008 Annual Conference of CIDOC "The Digital Curation of Cultural Heritage", Athens, September 15-18, 2008* [online]. p. 16 [accessed 2024-10-06]. Available from www: <https://cidoc.mini.icom.museum/archive/past-conferences/2008-athens/>.

39 SMITH, Abby. Authenticity and Affect. When is a Watch not a Watch? *Library Trends*, 2003, vol. 52, no. 1, p. 179.

40 MARDON, Rebecca and Russell BELK. Materializing digital collecting: An extended view of digital materiality. *Marketing Theory*, 2018, vol. 18, no. 4, p. 560.

41 MEEHAN, Nicole. Digital Museum Objects and Memory: Postdigital Materiality, Aura and Value. *Curator: The Museum Journal*, 2020, vol. 65, no. 2, p. 11.

42 DORNHEGE, Pablo and Franziska RITTER. Im/materielle Theaterräume erlebbar machen. Sammlungsobjekte virtuell erforschen. In ANDRASCHKE, Udo and Sarah WAGNER (eds.). *Objekte im Netz. Wissenschaftliche Sammlungen im digitalen Wandel*. Bielefeld: transcript, 2020, p. 154.

43 Ibidem.

44 SCHWEIBENZ, Werner. Das Museumsobjekt im Zeitalter seiner digitalen Repräsentierbarkeit. In MURLASITS, Elke and Gunther REISINGER (ed.). *Museum multimedial. Audiovisionäre Traditionen in aktuellen Kontexten, 9.-10. Dezember 2011, Universalmuseum Joanneum*. Wien: Lit, 2012, pp. 57–60.

45 DORNHEGE, Pablo and Franziska RITTER. Im/materielle Theaterräume erlebbar machen. Sammlungsobjekte virtuell erforschen. In ANDRASCHKE, Udo and Sarah WAGNER (eds.). *Objekte im Netz. Wissenschaftliche Sammlungen im digitalen Wandel*. Bielefeld: transcript, 2020, p. 159.

46 Ibidem, p. 160.

47 MANOFF, Marlene. The materiality of digital collections: Theoretical and historical perspectives. *Portal: Libraries and the Academy*, 2006, vol. 6, no. 3, p. 314.

48 Ibidem, p. 319.

49 WALZ, Markus. Digitalifact. In MAIRESSE, François (ed.). *Dictionary of Museology*. London:

Museums and digital materialities – adding layers of abstraction

The transformation of a physical thing into a museum object takes place in the familiar process of musealisation,[50] that is "*the operation of physically and conceptually removing an item from its original natural or cultural context and turning it into a 'museum object'*". In this process, the object is taken out of its original context and transferred into a new one, the museum context. There, it is integrated into a museum collection through the process of acquiring, inventorying, researching, labelling, and exhibiting. Although a new context for the object is created – the museum context – the object keeps its original material structure which is often unique. To understand and communicate the meaning(s) of the object in both the old and the new context, interpretation and information are necessary to provide contextualisation as the object itself – although static in form and place – is ambiguous and polysemous in interpretation. This is both a strength and a weakness of the museum object because, on the one hand, it has "*the capacity to carry meanings, and these meanings can be attributed from a number of perspectives*",[51] on the other hand, it needs permanent recontextualisations when presented in exhibitions because in a specific context only certain meanings are of interest. Overall, the process of musealisation is a process of abstraction in which specific layers of interest and information are identified and brought to the foreground while others move to the background or even get lost over time. Regardless of the focus or perspective, the object itself still has a stable material form and a contextual frame, be it the exhibition or in storage or in the museum collection and documentation.

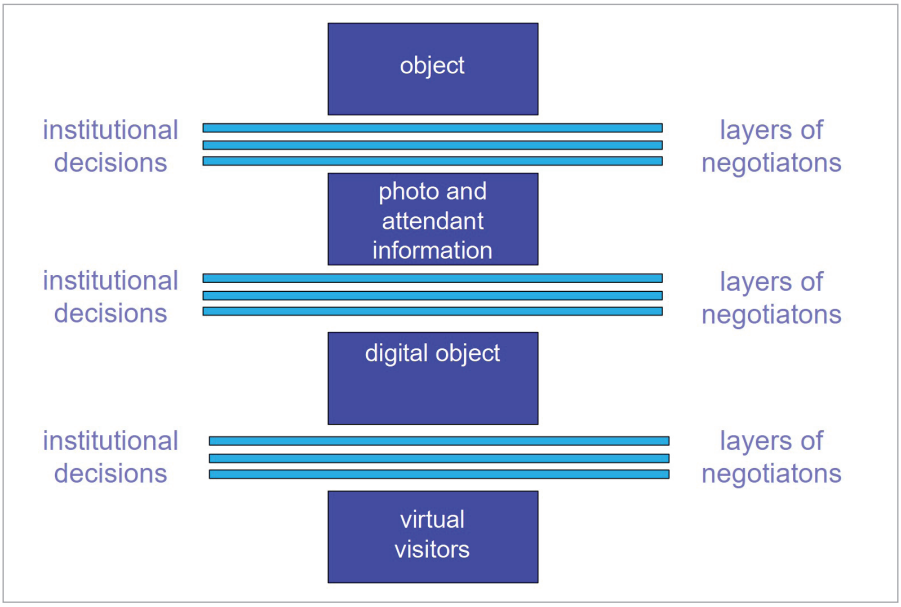

Fig. 1: Institutional decisions and layers of negotiation

Digitisation, however, removes both the material structure and context from the museum object and transfers it into a representation coded in ones and zeros that can be encountered through various media and in different forms (text, image, audiovisual, 3D, etc.). As Romanek[52] points out: "*Digital cultural heritage collections can provide information about, and access to, material culture(s), but as culturally specific products themselves, they also illuminate the contextual relationships inherent in those productions, which, […], are implicitly political.*" For Romanek "political" refers to the act of curation as there is no truth or neutrality in the presentation but rather a position, or a series of positions. These positions are created by decisions and negotiations inside the museum and "*the digital object takes on board all of these original negotiations, and adds layers of new negotiations on top of those*".[53] Finally, these "*layers of negotiation take the form of the formatting and framing of the digital image and the attendant information*".[54] These "layers of negotiation" are generally multi-layered and impact both the institution making these choices and the virtual visitors encountering the digital object[55] as indicated in Fig. 1.

For Romanek[56] "*it is clear that the digital object, […], is a nexus of multi-layered relationships and negotiations*". This means that the digital object cannot be neutral or true as it is based on prior decisions, negotiations and positions. At the same time, "*the*

Routledge, 2023, p. 131.

50 MAIRESSE, François. Musealisation. In MAIRESSE, François (ed.). *Dictionary of museology.* London: Routledge, 2023, p. 312.

51 HOOPER-GREENHILL, Eilean. *Museums and the Interpretation of Visual Culture.* London: Routledge, 2000, p. 111.

52 ROMANEK, Devorah. Digital Curation. Theorising The Digital Object. In *Proceedings of the 2008 Annual Conference of CIDOC "The Digital Curation of Cultural Heritage", Athens, September 15-18, 2008* [online]. p. 11 [accessed 2024-10-06]. Available from www: <https://cidoc.mini.icom.museum/archive/past-conferences/2008-athens/>.

53 Ibidem.

54 Ibidem.

55 Ibidem, p. 17.

56 Ibidem, p. 16.

experience of these manifestations and technology can be dispersed over time and space".[57] In theory, the digital object can also be ubiquitous as it has no material, spatial and temporal limitations. However, in digitisation not only the material structure and limitations of the original object are removed, but also the contextual physical frame. The digital object can be used in any arbitrary context and only the form of presentation and the accompanying information create a frame of reference. This makes accompanying information and context a decisive factor. The Norwegian museologist Janne Werner Olsrud[58] explains this as follows: "*Context is not something that can be discovered, but is made together with objects, texts and issues at stake: …*" The reason why it has to be made or constructed by the museum is that digitisation creates an additional level of abstraction by eliminating the physical context and all the information this context contains or provides both for the presenters and the recipients. In other words, the digitisation of the museum object is abstraction in the square. Therefore, the digital object is heavily dependent on contextualisation. In relation to the medium of presentation, this information has to be prepared and processed by the museum in order to provide specific points of access that allow what the British museologist Sandra Dudley[59] describes for the physical object as "object-subject engagement". These points of access serve as triggers activating experiences on the part of the visitors. Such trigger points can be both previous knowledge and sensory experiences depending on the context of use. This means that the digital object can be experienced very differently from the physical one as the triggers can be very different depending on the device, the context of presentation and the accompanying information. This aspect raises questions on the specific qualities of digital objects in relation to physical ones and their relation to each other.

Some thoughts on the relationship of the physical and digital object

As information scientist Olivia Frost[60] points out, *"[o]bjects in their original format have characteristics that make the viewing of an original artifact a quite different experience from the viewing of a representation*" and that there is no replacement for the experience of viewing an object in its original form and setting. However, as Frost continues "*digital representations, while they provide an inferior viewing experience in some ways, have their own advantages unique to digital information formats*". These advantages include specific qualities of the digital object that are not inherent in or shared by in its material counterpart. The following theses present some commonalities and differences between the two. This selection of theses on the relation between the physical and digital object does not claim to be exhaustive. Its intention is not to provide a complete synopsis of commonalities and differences, but to illustrate some essential aspects that are of importance to digital materialities.

Thesis 1: The digital object cannot replace the physical one

The digital object is a mediated representation of the original, it is made of coded ones and zeros and does not have a material form, as indicated above. Therefore it does not allow all potential facets of perceptual experiences the original offers in its setting. Consequently, it will not be able to replace it due to the differences in experience, as Frost[61] puts it: "*Viewing an original object in its physical milieu, walking through the halls of a gallery, is a distinctly different experience from the stationary viewing of surrogate objects on a computer screen.*" This viewing experience might change with a broader availability of virtual reality applications in the near or distant future. Further research is necessary to identify the practical effects of virtual reality.

Thesis 2: The digital object can influence the way the original is perceived

Due to the ubiquity of digital copies, the digital object might influence the way viewers perceive the original as they might have a conditioning effect on the viewers' memory and therefore influence their experience of the original in the museum when they saw the digital copies first.[62] However, currently there is only anecdotal evidence for this assertion as there is still a lack of research on this topic. A strong argument in favour is Leonardo da Vinci's "Last Supper" in Santa Maria delle Grazie church in Milan that was hardly discernible in the original for centuries due to ruin and overpaintings[63] but widespread and popular in the form

57 Ibidem, p. 8.

58 OLSRUD, Janne Werner. Documenting museum objects: A practice of copying and a 'copious' practice? In BRENNA, Brita, Hans Dam CHRISTENSEN and Olav HAMRAN (eds.). *Museums as Cultures of Copies. The Crafting of Artefacts and Authenticity*. London: Routledge, 2019, p. 226 f.

59 DUDLEY, Sandra. Museum Materialities: Objects, Sense and Feeling. In DUDLEY, Sandra H. (ed.). *Museum Materialities. Objects, Engagements, Interpretations*. London: Routledge, 2010, p. 7.

60 FROST, Olivia C. When the Object is Digital: Properties of Digital Surrogate Objects and Implications for Learning. In PARIS, Scott G. (ed.). *Perspectives on Object-Centered Learning in Museums*. Mahwah: Lawrence Erlbaum, 2002, p. 93.

61 Ibidem, p. 82.

62 SCHWEIBENZ, Werner. The Work of Art in the Age of Digital Reproduction. *Museum International*, 2018, vol. 70 no.1-2, p. 10.

63 Cf. Fig. 2.

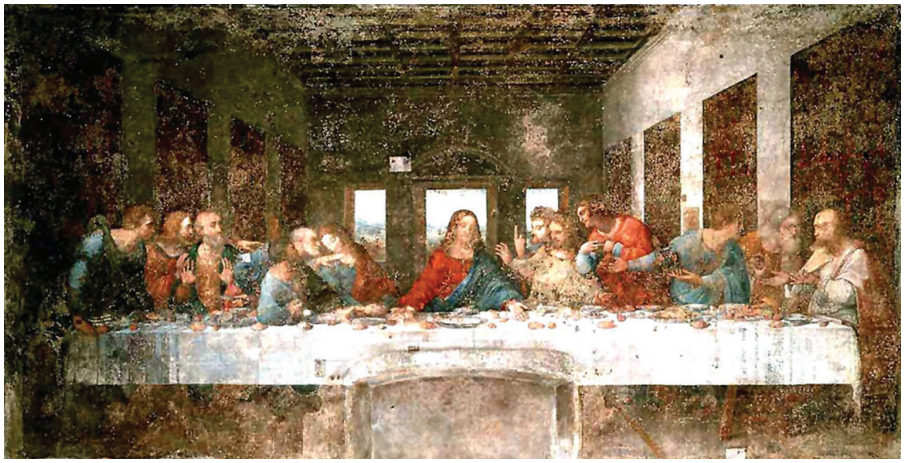

Fig. 2: In the 1970s Leonardo da Vinci's Last Supper (between 1495 and 1498) was in a terrible condition (Source: Leonardo da Vinci, Public domain ©, https://commons.wikimedia.org/wiki/File:Leonardo_da_Vinci_-_Ultima_cena_-_ca_1975.jpg/ © Wikimedia Commons)

Fig. 3: The Yellow Milkmaid Syndrome (Source: Jan Vermeer, CC0 1.0 Universal Public Domain Dedication / © Romaine – Wikimedia Commons)

of graphic reproductions.[64] These reproductions certainly formed the perception and memory of the ruined original on the side of the audience.

For example, Johann Wolfgang von Goethe wrote his famous essay on the "Last Supper" not in front of the original but assisted by graphic reproductions: "*Goethe encountered what was left of the virtually invisible original on his Italian journey in 1787 but his principal access to Leonardo's work, as he was writing his review, was an engraving by Raphael Morghen, […]. Morghen's engraving, in turn, was based on a drawing made for him by Teodoro Matteini of the Castellazzo copy of The Last Supper. Copy thus leans upon copy, in various media and both the arts of poetry and painting, to guide us to the original.*"[65]

As Philipp Fehl points out, the reproduction can guide us to the original – but it can also misguide us, as the following example of the "Yellow Milkmaid" syndrome indicates. This phenomenon refers to an effect observed by the Rijksmuseum Amsterdam, the custodian of Jan Vermeer's famous painting "The Milkmaid". The museum reported that many visitors in the museum's shop did not believe that the postcards on sale truthfully represented the original painting by Vermeer, because they were used to the low quality of massively available yellow-tinted Internet reproductions (Fig. 3). According to the Rijksmuseum's research, there were more than 10,000 copies of Vermeer's "Milkmaid" available online.[66]

Thesis 3: The physical and the digital object are not in opposition or competition

The Australian museologist Andrea Witcomb[67] states that the contemporary discussions on the impact of multimedia technologies on museums tend to assume a radical difference between the virtual and the material world and that this difference is conceived in terms of a series of oppositions: "*The material world carries weight – aura, evidence, the passage of*

64 SCHWEIBENZ, Werner. The Work of Art in the Age of Digital Reproduction. *Museum International*, 2018, vol. 70 no.1-2, p. 12.

65 FEHL, Philipp. In praise of imitation. Leonardo and his followers. *Gazette des Beaux Arts*, 1995, vol. 137, no. 126, p. 10.

66 VERWAYEN, Harry, Martijn ARNOLDUS and Peter B. KAUFMAN. The Problem of the Yellow Milkmaid: A Business Model Perspective on Open Metadata. In *Europeana White Paper* [online]. 2011, no. 2, 28 November 2011, p. 2 [accessed 2024-10-06]. Available from www: <https://pro.europeana.eu/post/the-problem-of-the-yellow-milkmaid>.

67 WITCOMB, Andrea. The Materiality of Virtual Technologies. A New Approach to Thinking about the Impact of Multimedia in Museums. In CAMERON, Fiona and Sarah KENDERDINE (eds.). *Theorizing Digital Cultural Heritage: A Critical Discourse*. Cambridge: MIT Press, 2007, p. 35.

time, the signs of power through accumulation, authority, knowledge, and privilege." In contrast, the digital "*is perceived as 'the other' of all of these – immediate, surface, temporary, modern, popular, and democratic*". However, the character of these oppositions is rarely disputed. From the point of view of Witcomb[68] these oppositions are not helpful; it would be more productive not to presume such radical oppositions between the material and the virtual. This becomes obvious when we regard the different materialities of the physical and the digital: "*Digital objects are qualitatively, materially different from their 'real' counterparts. Where the material object is stable in time and space, the digital object is both mobile and volatile.*"[69] As a consequence, "*the digital object is unstable materially in a way that the 'real' object is not – the user-learner can re-format, re-align, re-colour, crop, erase and alter an artefact composed of bytes in seconds*".[70] This suggests that physical and digital objects are very different in the ways they are perceived and handled by the audience. This difference is a fact but does not imply an opposition or competition between the two of them. On the contrary, digital objects can complement the physical ones because "*there is no mutually exclusive divide between the real and the virtual worlds, the material and the immaterial; rather that these worlds are intertwined in complex ways*".[71] This is also a perspective that Meehan[72] identified on the side of the visitors who do no longer differentiate between the physical and digital but instead anticipate a seamless intertwining of both. This is possible due to a characteristic trait of the digital object which can accommodate.

Thesis 4: The digital object can be more accommodating than the physical one

As Walter Benjamin[73] put it, the (photographic) reproduction can "meet the beholder or listener in his own particular situation" as it "*is more independent of the original*". While the original is bound to time and place as Dennis Niewerth[74] has claimed,[75] the digital object is more flexible and can therefore easily accommodate to the needs or wishes of virtual visitors and their particular situation of perception. This becomes manifest as an advantage for a broader audience.

Thesis 5: The digital object can allow multisensory engagement

In the field of museum studies, digital technologies are by and large considered to privilege visual experiences at the expense of the multisensory.[76] In order to refute this assumption, the anthropologist Graeme Were examined the use of three-dimensional digital representations of ethnographic objects in a British university museum teaching collection in order to find out if digital objects allow a multisensory engagement in "hands-on" learning. This was of particular interest as the apparent emphasis of visual aspects of digital images seem to run counter the sensory turn in anthropology.[77] In Were's study, undergraduate students were asked to describe and analyse digital objects in terms of their form, material and technique in laboratory exercises. Subsequently they were asked to set up virtual exhibitions with the three-dimensional digital renditions of the objects. Were's findings[78] showed that most students found that the digital representations allowed them to engage in new ways with the objects, while others were sceptical as the exercise replicated the analytical process of the material culture laboratory. Overall, student comments showed that they were making connections between the material culture laboratory and the virtual laboratory and "*this, in fact, allowed the students to visually feel the texture of an object surface, its weight and its material properties, and so on. In effect, the digital image became a conduit for transmitting sensory information and experience*".[79] Were's conclusion[80] was on the one hand "*that the digital reproduction contains within itself many levels of social experience of varying levels of concreteness, and, in this respect, it is like the real object in many ways. But the digital image also resembles the real object in the sense that the object represented is known by the students through interaction in the material culture laboratory. The students could thus be familiar with the materials*

68 Ibidem, p. 36.

69 BAYNE, Siân, Jen ROSS and Zoe WILLIAMSON. Objects, subjects, bits and bytes: Learning from the digital collections of the National Museums. *Museum and society*, 2009, vol. 7, no. 2, p. 112.

70 Ibidem.

71 WERE, Graeme. Out of Touch? Digital Technologies, Ethnographic Objects and Sensory Orders. In CHATTERJEE, Helen (ed.). *Touch in Museums. Policy and practice in object handling.* Oxford: Berg, 2008, p. 133.

72 MEEHAN, Nicole. Digital Museum Objects and Memory: Postdigital Materiality, Aura and Value. *Curator: The Museum Journal*, 2020, vol. 65, no. 2, p. 3.

73 BENJAMIN, Walter. The Work of Art in the Age of Mechanical Reproduction [1936]. In ARENDT, Hannah (ed.). *Illuminations. Walter Benjamin – Essays and Reflections*. New York: Schocken Books, 1985, p. 220 f.

74 NIEWERTH, Dennis. *Dinge – Nutzer – Netze. Von der Virtualisierung des Musealen zur Musealisierung des Virtuellen*. Bielefeld: transcript Verlag, 2018, p. 131.

75 See section on physical and digital materialities in museums.

76 WERE, Graeme. Out of Touch? Digital Technologies, Ethnographic Objects and Sensory Orders. In CHATTERJEE, Helen (ed.). *Touch in Museums. Policy and practice in object handling.* Oxford: Berg, 2008, p. 121.

77 Ibidem, p. 122.

78 Ibidem, p. 127.

79 Ibidem, p. 130.

80 Ibidem, p. 131.

and techniques used in making the object". On the other hand, he found that if the students were asked to analyse an object they had experienced in digital form only, it was much more difficult to do so. From his findings Were[81] concludes: "*Digital heritage technologies thus open up new ways of knowing and experiencing a world replicating in images*". Tula Giannini and Jonathan Bowen[82] provide some examples from exhibitions that integrate different formats of media to create attractive exhibitions that amplify audience experiences.

Thesis 6: The digital object can activate emotional responses

The Australian museologist Andrea Witcomb[83] states that museum exhibitions are prime sites for affective responses and that an emotional response can lead to a greater degree of understanding: "*By engaging in a very direct and physical way with the viewer, they are able to activate an emotional response*",[84] and convey a knowledge that is felt rather than rationally understood. Nevertheless, it has an emotional impact: "*the object offers an entry point for imagination to play a role in the process of coming to know. The process is exactly the same with the multimedia installation*".[85] Witcomb uses the same line of reasoning in favour of digital objects in museums as Dudley does for physical ones. Dudley[86] asserts an "*active, two-way engagement between people and things [that should] be as full, as material, and as sensory as possible*". Further, she strongly argues in favour of "*very personal, very individual, very subjective, very physical and very emotional responses to material things: responses which have the potential to be very powerful indeed, but which are inhibited by so much of what museums do and are expected to do*"[87] because things are illustrators of information or stories that allow us to make a connection. To illustrate this, Dudley describes a personal experience she had had with a Chinese bronze ritual object from the Han Dynasty, a heavenly horse, in an exhibition: "*The horse was over a metre high, and stood considerably higher still as a result of its plinth. I was utterly spellbound by its majestic form, its power, and, as I began to look at it closely, its material details: its greenish colour, its textured surface, the small areas of damage. I wanted to touch it, though of course I could not – but that did not stop me imagining how it would feel to stroke it, or how it would sound if I could tap the metal, or how heavy it would be if I could try to pick it up. I was, in other words, sensorially exploring the object, even though I was having to intuit rather than directly experience some of the sensory experiences.*"[88]

Although she claimed to know nothing about this artefact, its three-dimensionality, facility and sheer power had literally moved her to tears, her "*initial response to the horse was a fundamental, emotional, sensory – even visceral-one*".[89] It is important to note that Dudley – as she concedes herself – was not allowed to touch the artefact. Instead she imagined the materiality of the object just from seeing it – based on her prior experience (which might lack to the majority of average visitors). The result was a profound experience of materiality on her side although the object was out of touch. If we follow Dudley's argument and accept her experience as valid, we have to ask ourselves why, conversely, this kind of experience should not be possible with immaterial objects. For example, fans have profound experiences with music or movies that they can "only" hear or see, but not experience physically as they are not material. Nonetheless they trigger strong emotions, a whole fan culture is based on such immaterial experiences. Therefore, the same should hold true for digital objects as they can also create affective and emotional responses.

Thesis 7: The digital object is an object in its own right

With increasing dissemination and accessibility, digital objects are becoming a familiar form of encounter, at least from the visitor's perspective, as Frost points out: "*As more and more material becomes available in digital form across the Internet, the digital surrogate may well become an increasingly common form of our experience of objects. To some extent, and particularly when users are more accustomed to seeing digital representations than originals in museums, users may*

81 Ibidem, p. 132.

82 GIANNINI, Tula and Jonathan P. BOWEN. Rethinking Museum Exhibitions: Merging Physical and Digital Culture – Past to Present. In GIANNINI, Tula and Jonathan P. BOWEN (eds.). *Museums and Digital Culture. New Perspectives and Research*. Cham: Springer, 2019, pp. 163–193; GIANNINI, Tula and Jonathan P. BOWEN. Rethinking Museum Exhibitions: Merging Physical and Digital Culture – Present to Future. In GIANNINI, Tula and Jonathan P. BOWEN (eds.). *Museums and Digital Culture. New Perspectives and Research*. Cham: Springer, 2019, pp. 195–216.

83 WITCOMB, Andrea. The Materiality of Virtual Technologies. A New Approach to Thinking about the Impact of Multimedia in Museums. In CAMERON, Fiona and Sarah KENDERDINE (eds.). *Theorizing Digital Cultural Heritage: A Critical Discourse*. Cambridge: MIT Press, 2007, p. 41.

84 DUDLEY, Sandra. Materiality Matters. Experiencing the Displayed Object. In WATSON, Sheila, Amy Jane BARNES and Katy BUNNING (eds.). *A museum studies approach to heritage*. London: Routledge, 2019, p. 424.

85 WITCOMB, Andrea. The Materiality of Virtual Technologies. A New Approach to Thinking about the Impact of Multimedia in Museums. In CAMERON, Fiona and Sarah KENDERDINE (eds.). *Theorizing Digital Cultural Heritage: A Critical Discourse*. Cambridge: MIT Press, 2007, p. 42.

86 DUDLEY, Sandra. Materiality Matters. Experiencing the Displayed Object. In WATSON, Sheila, Amy Jane BARNES and Katy BUNNING (eds.). *A museum studies approach to heritage*. London: Routledge, 2019, p. 424.

87 Ibidem.

88 Ibidem.

89 Ibidem, p. 425.

view the images as artifacts having their own intrinsic value rather than as imperfect surrogates to be compared against the original."[90] Therefore, the digital object will sooner or later also occupy its own category – the aforementioned digitalifact – within the traditional hierarchy inside the museum with its structures of value, materiality and authenticity that is formed and rooted in the physical.[91] However, this position in the hierarchical system is traditionally considered to be lower because the digital object, by way of its immateriality and intangibility, is inherently excluded from possessing a material quality.[92] Meehan's argument is that "*[v]iews upon materiality of the digital object play a commanding role in designations of value. If the digital continues to be positioned relative to, and thus inevitably in a lower position, to the physical, it will continue to be determined to be of lesser value*".[93] Meehan[94] continues "*that in failing to consider the digital in its own right, we fail to truly comprehend its impact upon cultural economies, specifically audience engagement, knowledge acquisition and memory production.*" Therefore, it is important to recognise the value of the digital in itself and to consider the digital object as an expression in its own right.[95]

Thesis 8: The digital space can serve as a contact zone

A digital contact zone is a network of interactive relations, where culture, communities and people can meet and exchange ideas, within this network the museum forms one of many nodes.[96] The concept of the contact zone was introduced by the anthropologist James Clifford[97] who looked at some of the ways museums are communicating with peoples from other cultures. Clifford described the contact zone as a space in which peoples geographically and historically separated come into contact with each other and establish ongoing relations.[98] Within these relations, the museum is no longer the centre, broadcasting knowledge outwards, but a place of contact and reciprocal communication.[99] Anthropologist Haidy Geismar[100] argues "*that we need to think about the digital not only as material, rather than immaterial, but also in terms of a trajectory of materiality that links our commonplace understandings of the digital to the analogue, information to material*". In this way traditional museum collections and new technologies come together and form a contact zone. Moreover, the museum as contact zone "*allows us to think about the multiplicity of experience; the varied forms of sociality; and the negotiation of authority that continually takes place around museum collections*".[101] In this manner, "*the contact zone is a productive way to understand our relationship to museum collections, and can help us to figure out the entanglement of social and material contexts*".[102] According to Geismar,[103] "*[d]igital resources are currently creating new and complex materialities and permitting new kinds of access to collections*".

This list of theses was not intended to provide a complete synopsis of commonalities and differences, but to illustrate some essential aspects of physical and digital objects that complement each other and therefore can provide different experiences.

Conclusion

As mentioned before, the relationship between museums and digital materialities is complex. Nevertheless it is essential to deal with this issue, especially in the context of the material turn. Dudley's[104] appeal to "*shift the focus back to physical objects*" concentrates on the aspect of materiality which is lost in the process of digitisation. This process imposes a number of changes that determine the relationship of physical and digital objects in a decisive manner. Therefore, as converting an object into a museum object is a step of abstraction, it seems reasonable to state that digitisation of a museum object is abstraction in the square. At the same time, the aspect of digital materiality is added. This new facet is important as the digital encounter becomes

90 FROST, Olivia C. When the Object is Digital: Properties of Digital Surrogate Objects and Implications for Learning. In PARIS, Scott G. (ed.). *Perspectives on Object-Centered Learning in Museums*. Mahwah: Lawrence Erlbaum, 2002, p. 84.

91 MEEHAN, Nicole. Digital Museum Objects and Memory: Postdigital Materiality, Aura and Value. *Curator: The Museum Journal*, 2020, vol. 65, no. 2, p. 3 f.

92 Ibidem, p. 4.

93 Ibidem, p. 7.

94 Ibidem.

95 Cf. also WITCOMB, Andrea. The Materiality of Virtual Technologies. A New Approach to Thinking about the Impact of Multimedia in Museums. In CAMERON, Fiona and Sarah KENDERDINE (eds.). *Theorizing Digital Cultural Heritage: A Critical Discourse*. Cambridge: MIT Press, 2007, p. 36.

96 MEEHAN, Nicole. Digital Museum Objects and Memory: Postdigital Materiality, Aura and Value. *Curator: The Museum Journal*, 2020, vol. 65, no. 2, p. 9.

97 CLIFFORD, James. Museums as Contact Zones. In CLIFFORD, James (ed.). *Routes. Travel and Translation in the Late Twentieth Century*. Cambridge: Harvard University Press, 1997, pp. 188–220.

98 GERE, Charlie. Museums, contact zones and the internet. In BEARMAN, David and Jennifer TRANT (eds.). *Museum Interactive Multimedia. Selected Papers form the Forth International Conference on Hypermedia and Interactivity in Museums (ICHIM '97) Le Louvre, Paris, France, September 1-5, 1997*. Pittsburgh, PA: Archives & Museum Informatics, 1997, p. 62.

99 Ibidem, p. 63 f.

100 GEISMAR, Haidy. *Museum object lessons for the digital age*. London: UCL Press, 2018, p. XVII.

101 Ibidem, p. 15 f.

102 Ibidem, p. 17.

103 Ibidem, p. 27.

104 DUDLEY, Sandra. Museum Materialities: Objects, Sense and Feeling. In DUDLEY, Sandra H. (ed.). *Museum Materialities. Objects, Engagements, Interpretations*. London: Routledge, 2010, p. 4.

more and more prevalent for museum audiences. Therefore, the aspects of the digital and its social materiality should not be neglected. The eight theses presented in this article might lead a way to a better integration of physical and digital materiality. First and foremost, it should be obvious that the digital object cannot replace the physical one. However, it might influence the way it is perceived. As the digital object can be more accommodating than the physical one, it can allow multisensory engagement and activate emotional responses. Overall, the digital object is an object in its own right and its digital materialities can establish contact with objects in the museum space, both the physical and the virtual one.

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