DC BOX

DIGITAL CURATOR
TRAINING TOOL BOX

Enriching Heritage
through Digital Curation

Practice and Training
Handbook

EDITORS Ramona Quattrini ‖ Carlos Smaniotto Costa ‖ Catarina Patrício

PVBLICA SCIENTIFIC COMMITEE

PVBLICA
SHARING·KNOWLEDGE

Marcello Balbo

Dino Borri

Paolo Ceccarelli

Enrico Cicalò

Enrico Corti

Nicola Di Battista

Carolina Di Biase

Michele Di Sivo

Domenico D'Orsogna

Maria Linda Falcidieno

Francesca Fatta

Paolo Giandebiaggi

Elisabetta Gola

Riccardo Gulli

Emiliano Ilardi

Francesco Indovina

Elena Ippoliti

Giuseppe Las Casas

Mario Losasso

Giovanni Maciocco

Vincenzo Melluso

Benedetto Meloni

Domenico Moccia

Giulio Mondini

Renato Morganti

Stefano Moroni

Stefano Musso

Zaida Muxi

Oriol Nel.lo

João Nunes

Gian Giacomo Ortu

Rossella Salerno

Enzo Scandurra

Silvano Tagliagambe

All PVBLICA texts are subject to double peer review

DC BOX

DIGITAL CURATOR TRAINING TOOL BOX

Enriching Heritage
through Digital Curation

Practice and Training
Handbook

EDITORS Ramona Quattrini ‖ Carlos Smaniotto Costa ‖ Catarina Patrício

ENRICHING HERITAGE THROUGH DIGITAL CURATION. PRACTICE AND TRAINING HANDBOOK

EDITORS

Ramona Quattrini, Carlos Smaniotto Costa and Catarina Patricio

CONTRIBUTORS (ALPHABETICAL ORDER BY SURNAME):

Agapiou, Antonia ‖ Angeloni, Renato ‖ Clini, Paolo ‖ Dantas dos Reis, Isabel ‖ de Luca, Daniele A. ‖ Djordjevic, Andjela ‖ Frontini, Alessandra ‖ Gasparini, Massimo ‖ Geraldes, Ricardo Martins ‖ Ivanova, Olesya ‖ Mariotti, Chiara ‖ Nespeca, Romina ‖ Nikolic, Olivera ‖ Patricio, Catarina ‖ Quattrini, Ramona ‖ Smaniotto Costa, Carlos ‖ Stefanelli, Cristina ‖ Vasic, Bata ‖ Vasic, Iva

LAYOUT OF THE BOOK

Isabel Dantas dos Reis
Iva Vasic

ENGLISH PROOF READING

Antonia Agapiou

IMAGES
All the images without captions in the book were obtained by generative AI tools (MidJourney 6), with prompting by Alessandra Frontini. Some stock images are also included (pags. 2, 10, 22, 24). The right for these images was acquired by Sinergia s.r.l.
The cover image is a portrait created by MidJourney 6, an AI system that generates realistic images and art in response to atext description. The AI was asked to produce a digital artwork characterised by pixel and hologram and wass prompted by Alessandra Frontini.

Disclaimer

ACKNOWLEDGMENTS

The partnership of the DCbox project is very grateful to the students and associated partners who decided to be part of this adventure. In particular the partnership acknowledges the following institutions:

Museum of Lourinhã (Portugal)

Municipality of Lourinhã (Portugal)

Museum of Ponisavlje (Republic of Serbia)

Municipality of Fuente Obejuna (Spain)

Civic Gallery of Ascoli Piceno and Ascoli Musei (Italy)

Municipality of Ancona (Italy)

Numana Antiquarium and Marche Regional Directorate for Museums (Italy)

Fondazione Rossini, Pesaro (Italy)

In addition, we would like to thank students and teachers of University of Montenegro and Academy of Fine art in Rome for their commitment in the DCbox MOOC.

Table of Contents

The Cultural Heritage in the Age of Digital Reproducibility

The Authenticity of Digital Replicas

Paolo Clini, Renato Angeloni

In today's digital age, the integration of digital technology and cultural heritage has led to profound transformations in how we perceive and experience it. Moreover, within our increasingly interconnected global society, the historical knowledge and cultural significance embedded in cultural heritage have become essential for maintaining cultural diversity and sense of place. Whether it encompasses historical landmarks, artifacts, traditions, languages, or cultural practices, each facet contributes to preserving the richness of communities, providing a connection to their roots, and fostering a sense of belonging and continuity with the past and the places they inhabit. This innate need to relate to the past may not be as vital as basic human needs such as housing, food, sanitation, or public health, but it is nonetheless crucial for sustaining life, as evidenced by the inclusion of cultural access among essential human rights (United Nations, 1949).

Embracing technological innovations in the management of cultural heritage offers numerous opportunities for engaging communities and fostering a deeper connection with their history (European Commission, 2023). By leveraging digital tools, cultural heritage organizations can create diverse and inclusive experiences tailored to a wide range of audiences. From virtual exhibitions and interactive installations to digital storytelling platforms, digital heritage initiatives hold the promise of sparking meaningful dialogues within communities about their shared past and its relevance in contemporary times. Furthermore, using digital replicas, cultural heritage can transcend geographical and cultural barriers, reaching global audiences and facilitating new forms of engagement compared to the original objects. The interaction with digital objects differs from that with physical ones, raising fundamental inquiries into the concept of authenticity when experiencing cultural heritage through digital replicas (Di Giuseppantonio Di Franco et al, 2018).

Contemporary dialogues on the impact of multimedia technologies on museums, archaeology, and heritage often presume a contrast between the virtual and physical realms, articulated through various dichotomies. The physical world carries significance—weight, aura, evidence, the passage of time, the signs of power through accumulation, authority, knowledge, and privilege. In contrast, replicas are often perceived as diametrically opposed—immediate, superficial, temporary, modern, popular, and democratic. This discourse highlights a dichotomy between original (authentic) artifacts and their inauthentic replicas (Witcomb, 2010). Materialist perspectives have traditionally dominated discussions on the authenticity of replicated heritage objects, with the creation of digital replicas seen as the next step in reproduction technologies after mechanical reproduction (Muller, 2017). Consequently, the authenticity of digital replicas is often compared to that of physical replicas. Debates surrounding physical replication often circle back to Walter Benjamin's seminal essay, "The Work of Art in the Age of Mechanical Reproduction" (1936). Benjamin argues that even the most flawless reproduction lacks the inherent authenticity of an original object. He suggests that an object's authenticity resides in its unique history, encompassing its substantive duration and its testimony to the experiences it has undergone—a quality beyond reproducibility. Contrary to Benjamin's materialistic theories, Latour and Lowe (2011) argue that aura is not lost through replication. They claim that advanced technologies can instill replicas with a degree of the original object's aura and authenticity. According to them, the key lies in the quality of the replica, particularly the precision of the final product, which enables it to be comprehended and revered. They even suggest that replication might enhance the aura surrounding the original, challenging the notion of authenticity as intrinsically linked to the original object. According to them, the crucial factor lies in the quality of the replica, especially the accuracy of the final product, which allows it to be fully understood and respected. In fact, they argue that replication may even enhance the aura surrounding the original, thereby challenging the notion of authenticity being inherently linked solely to the original object.

Following these theories, in recent times, there has been a significant focus on the authenticity of digital replicas, particularly concerning their accuracy, resolution, and aesthetics. However, while ensuring the accuracy of these replicas is crucial, solely prioritizing precise reproduction can lead to technological fetishism. It is imperative to also consider the new insights that a digital replica of a cultural object can provide about the original. These insights have the potential to yield novel understandings and connections with

communities, thereby fostering innovative forms of authenticity for the replicas that were absent in the original. Indeed, digital replicas enable individuals to interact with them in ways that the original artifacts could not facilitate. These novel forms of interaction, supported by digital tools, are arguably authentic. Therefore, the authenticity attributed to replicas should not solely depend on the replica itself but also on its ability to generate authentic experiences (Jeffrey, 2015).

While the questions surrounding the authenticity of digital replicas may be complex, they can be grounded in a simple principle: the original concept of heritage digitization, which underlies the generation of digital replicas. At its core, heritage digitization aims to preserve, document, and make cultural contents accessible. It is noteworthy that The London Charter (2009) outlines principles for the documentation, interpretation, and dissemination of cultural heritage using computer-based visualizations while avoiding the term 'authenticity', possibly due to its potential for misleading interpretations (Hermon & Niccolucci, 2018). Defining an object in terms of authenticity may imply that it is the real and undisputed entity, contrasting with anything fake or copied. Conversely, adherence to The London Charter ensures that replicas are considered 'authentic' copies, meaning they are accurate and trustworthy, grounded in factual information. Such

information is meticulously documented to uphold the intellectual integrity of the scientific research supporting the creation of the digital artifact, along with ensuring data transparency. The principles outlined in The London Charter were specifically designed to ensure that these two aspects are consistently considered whenever computer-based visualization is employed in cultural heritage studies. As a result, the quality of the visualization output can be quantitatively assessed, considering factors such as pixel count, point cloud density, scan quantity, environmental conditions, and more. This allows each researcher to establish their own criteria for determining whether the result is authentic or not. However, this level of precision does not inherently impact the concept of 'authenticity' as long as it is transparently reported and documented. What is considered 'authentic' for communication purposes may not necessarily hold the same authenticity when scientific analysis is involved. Adherence to The London Charter provides the necessary information for any subsequent researcher to evaluate whether the digital replica in question meets the threshold of being 'sufficiently authentic' for its intended re-use.

In conclusion, the advent of digital replicas marks a transformative moment in the dissemination of cultural heritage, surpassing any previous scale in human history. Drawing parallels to Benjamin's

time, the introduction of photography foreshadowed similar advancements, evoking concerns about the potential loss of intangible quality with the ease of image reproduction. However, hindsight reveals that the mass reproduction of art is not as ominous as initially feared by Benjamin. Instead, it presents a multitude of opportunities for cultural institutions to navigate. As digitization professionals, it is imperative to focus on the authenticity of the copy, intended as its measurable cor-respondences with the original object. This entails ensuring that the digital replica fulfills the specific authenticity requirements dictated by the intended purposes of use. The central challenge facing cultural institutions lies instead in effectively navigate the complexities and opportunities presented by digital technologies, promoting authentic cultural experiences of digital replicas. Museums and other cultural sites have the potential to lead the way into the future by transcending historical constraints and embracing innovation, shaping the future of heritage preservation and dissemination in the age of digital reproducibility.

REFERENCES

Abbott, D. (2015). Digital curation and doctoral research: current practice. International Journal of Digital Curation, (10) 1, 1-17

Adorno, T. W. & Horkheime, M. (2002). The Culture Industry: Enlightenment as Mass Deception, Dialectic of Enlightenment: Philosophical Fragments, 94–136. Stanford University Press.

Angeloni, R., Mariotti, C., Petetta, L. & Coppetta, L. (2023). Enabling Scan-to-BIM workflow for heritage conservation and management process. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 48, 79-86

Armstrong, P. (2010). Bloom's Taxonomy. Vanderbilt University Center for Teaching. https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/

Artopoulos, G. & Smaniotto Costa, C. (2019). Data-Driven Processes in Participatory Urbanism: The "Smartness" of Historical Cities. Architecture and Culture Journal, (7) 3, 473-491. https://doi.org/10.1080/20507828.2019.1631061

Arts Council of England (n.d.). Digital Culture Compass. https://digitalculturecompass.org.uk/about

Avgerinou, M., Bertoldi, P. & Castellazzi, L. (2017). Trends in data centre energy consumption under the european code of conduct for data centre energy efficiency. Energies, 10(10), 1470. https://doi.org/10.3390/en10101470

Axelsson, A. & Skantze, G. (2023). Do you follow? A fully automated system for adaptive robot presenters. ACM/IEEE International Conference on Human-Robot Interaction. https://doi.org/10.1145/3568162.3576958

Balzer, D. (2014). Curationism: How Curating Took over the Art World and Everything Else (first). Coach House Books

Banfi, F.; Pontisso, M.; Paolillo, F.R.; Roascio, S.; Spallino, C.; Stanga, C. (2023). Interactive and Immersive Digital Representation for Virtual Museum: VR and AR for Semantic Enrichment of Museo Nazionale Romano, Antiquarium di Lucrezia Romana and Antiquarium di Villa Dei Quintili. ISPRS Int. J. Geo-Inf., 12, 28. https://doi.org/10.3390/ijgi12020028

Beagrie, N. (2004). The digital curation centre. Learned Publishing, (17) 1, 7-9

Benjamin, W. (1999). The Arcades Project (H. Eiland & K. McLaughlin, Trans.). The Belknap Press of Harvard University Press

Benjamin, W. (1969). The Work of Art in the Age of Mechanical Reproduction (1936). Illuminations: Essays and Reflections, (1936), 217–52. https://doi.org/10.1057/9780230511279

Bentkowska-Kafel, A., & Macdonald, L. (2017). "Digital techniques for documenting and preserving cultural heritage". Kalamazoo, MI: Arc Humanities Press.

Bertrand, Stéphanie. (2022). "Curating online collections: towards an authentically digital, mediation protocol for art digitizations." Journal of Curatorial Studies 11.1, 26-51.

Biella, D., Pilz, T., Sacher, D., Weyers, B., Luther, W., Baloian, N. & Schreck, T. (2016). Crowdsourcing and Co-Curation in Virtual Museums: A Practice-Driven Approach. Journal of Universal Computer Science, (22) 10, 1277–1297. https://doi.org/10.3217/jucs-022-10-1277

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H. & Krathwohl, D. R. (1956). Taxonomy of educational objectives: The classification of educational goals. Vol. Handbook I: Cognitive domain. David McKay Company

Bolter, J. D. & Grusin, R. (1999). Remediation: Understanding New Media. The MIT Press

Bordage, F. (2019). The environmental footprint of the digital world. GreenIT

Bowen, J. P. (2010). A Brief History of Early Museums Online. The Rutherford Journal, 3.

Brandt, D.S. & Kim, E. (2014). Data curation profiles as a means to explore managing, sharing, disseminating or preserving digital outcomes. International Journal of Performance Arts and Digital Media (10), 1, 21-34

Cameron, Fiona R. (2021). The Future of Digital Data, Heritage and Curation: In a More-Than-Human World. Routledge

Carpo, M. (2018). Excessive Resolution: Designers meet the second coming of artificial intelligence. Architectural Record, (6) 206, 135-136

CEN European Committee for Standardization (2012). European ICT Professional Profiles. https://en.wikipedia.org/wiki/CEN_Workshop_Agreement

Charter Project (2023a). Mid-term results – Matrix and methodology assessment.

https://charter-alliance.eu/wp-content/uploads/2023/04/D2.3-Mid-term-results-Matrix_and_methodology-assessment_FINAL.pdf

Charter Project (2023b). Report: Guidelines on innovative/emerging cultural heritage education and training paths Deliverable D3.6. , https://charter-alliance.eu/wp-content/uploads/2023/10/D3.6.-Guidelines-on-innovativeemerging-cultural-heritage-education-and-training-paths_final.pdf

Clini, P. & Quattrini, R. (2020). Umanesimo digitale e bene comune? Linee guida e riflessioni per una salvezza possibile/Digital humanities and Commons: guidelines and reflections for a possible salvation. Il Capitale Culturale, 11, 157–175. https://doi.org/ 10.13138/2039-2362/2529

Clini, P., & Quattrini, R. (2021). Digital Cultural Heritage, arts reproduction and Museums systems. Languages and techniques in a Covid and post-Covid scenario for new forms of heritage against the silence of a fragile culture. SCIRES-IT-SCIentific RESearch and Information Technology, 11(1), 1-10

Clini, P., Quattrini, R., Bonvini, P., Nespeca, R., Angeloni, R., Mammoli, R., Dragoni, A. F., Morbidoni, C., Sernani, P., Mengoni, M., Leopardi, A., Silvestrini, M., Gambelli, D., Cori, E., Gallegati, M., Tamberi, M., Fraticelli, F., Acciarri, M. C., Mandolesi, S. (2019). Digit(al)isation in museums: Civitas Project - AR, VR, multisensorial and multi user experiences at the Urbino's ducal palace. Virtual and Augmented Reality in Education, Art, and Museums. https://doi.org/10.4018/978-1-7998-1796-3.ch011

Clini, P., Quattrini, R., Mariotti, C., Nespeca, R. & De Luca, D. A. (2023). From point cloud data to HBIM for public performance spaces knowledge, management and storytelling: Palazzo Olivieri in Pesaro. Disegnarecon, 16(31), 3-1

Collins, J. (1995). Architectures of Excess. Cultural Life in the Information Age. Routledge

Cori, E., & Fraticelli, F. (2021). Aligning market strategies, digital technologies, and skills: Evidence from Italian museums. Cultural Initiatives for Sustainable Development: Management, Participation and Entrepreneurship in the Cultural and Creative Sector, 23-44.

Corona, L. (2023a). Digitization for the visibility of collections. Collection and Curation, 42(3), 73–80. https://doi.org/10.1108/CC-06-2022-0024

Corona, L. (2023b). Digitization: An Overview of the Advantages and Disadvantages. IntechOpen. https://doi.org/10.5772/intechopen.1002006

Cosgrove, D. (2001). Apollo's Eye: A Cartographic Genealogy of the Earth in the Western Imagination. John Hopkins University Press

Council of Europe. (2016). Understanding the impact of digitisation on culture. https://www.coe.int/en/web/culture-and-heritage/culture-and-digitisation

Council of Europe (2005). Framework Convention on the Value of Cultural Heritage for Society - Faro Convention. https://rm.coe.int/1680083746

Cowick, C. (2018). Digital Curation Projects Made Easy. Rowman & Littlefield

Daga, E., Asprino, L., Damiano, R., Daquino, M., Agudo, B. Di., Gangemi, A., Kuflik, T., Lieto, A., Maguire, M., Marras, A. M., Pandiani, D. M., Mulholland, P., Peroni, S., Pescarin, S. & Wecker, A. (2022). Integrating Citizen Experiences in Cultural Heritage Archives: Requirements, State of the Art, and Challenges. Journal on Computing and Cultural Heritage, (1) 15. https://doi.org/10.1145/3477599

Dallas, C. (2016). Digital curation beyond the "wild frontier": A pragmatic approach. Archival Science, 16(4), 421-457

DASH Project (2021). Dash Digital Attitudes & Skills for Heritage. https://www.timmuslimited.co.uk/dashsurvey/resources/

Debono, S. (2021). Thinking Phygital: A Museological Framework of Predictive Futures. Museum International, 73(3-4), 156-167

Di Blas, N., Garzotto, F., Paolini, P. & Sabiescu, A. (2009). Digital Storytelling as a Whole-Class Learning Activity: Lessons from a Three-Years Project. In Iurgel, I.A., Zagalo, N., Petta, P. (Eds.) Interactive Storytelling. Lecture Notes in Computer Science. Springer. https://doi.org/10.1007/978-3-642-10643-9_5

Di Giuseppantonio Di Franco, P., Galeazzi, F. & Vassallo, V. (2018). Authenticity and cultural heritage in the age of 3D digital reproductions (Vol. 1). McDonald Institute

Digital Curation Center (n.d.). https://www.dcc.ac.uk/

Dimitrova, E., Lavenir, M.-L., McMahon, P., Mūrniece, B., Musso, S.F., Nagy, G., Rauhut, C., Rourke, G.D., Sciacchitano, E. & Selfslagh, B. (2020). European Quality Principles for EU-funded Interventions with potential impact upon Cultural Heritage. ICOMOS Publication

Eco, U. (1986). Travels in Hyperreality. Harvest Books

eCult Skills (n.d.). http://daissy.eap.gr/new/en/ecultskills/

Ernst, W. (2013). Digital Memory and the Archive. Ed. and Introduction by Jussi Parikka. University of Minnesota Press

European Commission (2024). Commission adopts EU-wide scheme for rating sustainability of data centres. https://energy.ec.europa.eu/news/commission-adopts-eu-wide-scheme-rating-sustainability-data-centres-2024-03-15_en

European Commission (2023). Driving a green, digital & innovative European cultural heritage. Publications Office of the European Union. https://data.europa.eu/doi/10.2777/600577

European Commission (2022a). Proposal for a Council Recommendation on building bridges for effective European higher education cooperation. https://education.ec.europa.eu/document/proposal-for-a-council-recommendation-on-building-bridges-for-effective-european-higher-education-cooperation

European Commission (2022b). 2022 Strategic Foresight Report "Twinning the green and digital transitions in the new geopolitical context. https://publications.jrc.ec.europa.eu/repository/handle/JRC129319

European Commission (2021a). Europe's Digital Decade: digital targets for 2030. https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

European Commission (2021b). Recommendation on a common European data space for cultural heritage. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32021H1970

European Commission (2021c). 2030 Digital Compass: the European way for the digital decade. https://futurium.ec.europa.eu/en/digital-compass

European Commission (2020a). Europe's Digital Decade: digital targets for 2030. Retrieved from https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

European Commission (2020b). Factual Summary Report on the open public consultation on digital for Cultural Heritage. https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/11837-Evaluation-of-the-Recommendation-on-digitisation-and-online-accessibility-of-cultural-material-and-digital-preservation/public-consultation_it

European Commission (2019a). European Framework for Action on Cultural Heritage. commission staff working document. Publications Office of the European Union.

European Commission (2019b). Final Action Plan of the Partnership on Culture/ Cultural Heritage. Orientation paper, October 2019. https://futurium. ec.europa.eu/en/urban-agenda/culturecultural-heritage/action-plan/final-action-plan-partnership-culturecultural-heritage

European Commission (2019c). Esco Skills and competences. Retrieved from https:// esco.ec.europa.eu/en/classification/skill_main

European Commission (2019d). European framework for action on cultural heritage, Publications Office. https://data.europa.eu/doi/10.2766/949707

European Commission (2017). Expert Group on Digital Cultural Heritage and Europeana. https://ec.europa.eu/transparency/expert-groups-register/ screen/expert-groups/consult?do=groupDetail.groupDetail&groupID=3527

European Commission (2011). Commission recommendation of 27 October 2011 on the digitisation and online accessibility of cultural material and digital preservation. In Comunidades Europeas (7), 28–30). https://eur-lex.europa.eu/ legal-content/EN/TXT/?uri=CELEX%3A32011H0711

European Commission (2006). Recommendation on the digitisation and online accessibility of cultural material and digital preservation. https://eur-lex. europa.eu/legal-content/EN/ALL/?uri=CELEX%3A32006H0585

European Heritage Alliance (2020). Cultural Heritage: a powerful catalyst for the future of Europe. https://pro.europeana.eu/post/europe-day-manifestocultural-heritage-a-powerful-catalyst-for-the-future-of-europe

Europeana (2022). Building Digital Capacity. https://pro.europeana.eu/page/ building-digital-capacity

Europeana. (n.d.). Building Digital Capacity. https://pro.europeana.eu/page/ building-digital-capacity

Fallon, J. & ter Burg, S. (2021). Strategy for building and implementing a capacity building framework. https://pro.europeana.eu/page/building-digital-capacity

Finn, E. (2017). What Algorithms Want: Imagination in the Age of Computing. MIT

Finnis, J. & Kennedy, A. (2020). The digital transformation agenda and GLAMs. A

quick scan report for Europeana. Culture24. https://pro.europeana.eu/files/Europeana_Professional/Publications/Digital

Floch, J. & Jiang, S. (2015). One place, many stories digital storytelling for cultural heritage discovery in the landscape. Digital Heritage, Granada, Spain, 503-510. https://doi.org/10.1109/DigitalHeritage.2015.7419566

Fogal, F. (2020). Il curatore e l'Istituzione. Sviluppo e contesto di una nuova visione della mostra d'arte contemporanea [Università Ca' Foscari]. https://123dok.org/document/8ydwe2gq-curatore-istituzione-sviluppo-contesto-nuova-visione-mostra-contemporanea.html

Gobble, M. M. (2018). Digital strategy and digital transformation. Research-Technology Management, 61(5), 66-71

Harvey R. & Oliver G. (April 22, 2016). Digital Curation: A How-To-Do-It Manual. ALA Neal-Schuman

Harvey, R. & Weatherburn, J. (2018). Preserving Digital Materials. Rowman & Littlefield

Hediger, V, Saba, G. C., Le Maitre, B. & Noordegraaf, J., (2013). Preserving and Exhibiting Media Art : Challenges and Perspectives. Amsterdam University Press. https://doi.org/10.26530/OAPEN_530353

Hedrick, Brandon P. et al. (2020). "Digitization and the future of natural history collections." BioScience 70.3, 243-251

Hedstrom, M. (1997). Digital Preservation: A Time Bomb for Digital Libraries. Computers and the Humanities, 31(3), 189–202. https://doi.org/10.1023/A:1000676723815

Henry, G. (2014). Data curation for the humanities. Research data management: Practical strategies for information professionals. In: Ray, J. M. (Ed.). Research data management: Practical strategies for information professionals, Purdue University Press, 347-374.

Hermon, S. & Niccolucci, F. (2018). Digital authenticity and the London Charter. 8th International Symposium on Virtual Reality, Archaeology and Cultural Heritage. In Arnold, D., Chalmers, A. & Niccolucci, F. (Eds.). VAST2007: Proceedings of the VAST 2007 symposium. Eurographics.

Higgins, S. (2011). Digital curation: The emergence of a new discipline. *International Journal of Digital Curation, 6*(2), 78-88. https://doi.org/10.2218/ijdc.v6i2.191

HLG-MOS. (2023). Large Language Models for Official Statistics. https://unece.org/sites/default/files/2023-12/HLGMOS%20LLM%20Paper_Preprint_1.pdf

Hou, Y., Kenderdine, S., Picca, D., Egloff, M., & Adamou, A. (2022). Digitizing intangible cultural heritage embodied: State of the art. Journal on Computing and Cultural Heritage (JOCCH), 15(3), 1-20

ICOM (2022). Museum Definition. https://icom.museum/en/resources/standards-guidelines/museum-definition/

ICOM Italia (2004). Curricola Guidelines for museum professional. https://www.icom-italia.org/wp-content/uploads/2018/07/ICOMItalia.CurrriculaGuidelinesICOM-ICTOP.2000.pdf

ICTOP (2008). Museum Professions – A European Frame of Reference. https://www.yumpu.com/en/document/read/6377214/museum-professions-a-european-frame-of-reference-the-

ICTOP (2022). Young professionals forum: emerging skills for Heritage conservation. http://ictop.org/projects/2022-young-professionals-forum-emerging-skills-for-heritage-conservation/

Jackson, T. W., & Hodgkinson, I. R. (2022). Keeping a lower profile: how firms can reduce their digital carbon footprints. Journal of Business Strategy, (ahead-of-print)

Jantz, R., & Giarlo, M. (2005). Digital preservation: Architecture and technology for trusted digital repositories. "Rutgers University Libraries, 11" (6). https://doi.org/10.7282/T3DV1H8M

Jeffrey, S. (2015). Challenging heritage visualisation: beauty, aura and democratisation. Open Archaeology, 1(1).

Jones, S., Jeffrey, S., Maxwell, M., Hale, A. & Jones, C. (2018). 3D heritage visualisation and the negotiation of authenticity: the ACCORD project. International journal of heritage studies, 24(4), 333-353.

Kane, G. C., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2015). Strategy, not technology, drives digital transformation. MIT Sloan Management Review

Latour, B. & Lowe, A. (2011). The migration of the aura: Exploring the original through its facsimiles. In Bartscherer, T. & Coover, R. (Eds.) Switching codes: Thinking through digital technology in the humanities and the arts. Chicago UP, 275–298

Li, X., Kim, J. S., & Lee, T. J. (2021). Collaboration for community-based cultural sustainability in island tourism development: A case in Korea. Sustainability, 13(13). https://doi.org/10.3390/su13137306

Loach, K., Rowley, J., & Griffiths, J. (2017). Cultural sustainability as a strategy for the survival of museums and libraries. International Journal of Cultural Policy, 23(2), 186–198. https://doi.org/10.1080/10286632.2016.1184657

Litherland, J. (1991). Storytelling from the bible. Make Scripture Live for All Ages Through the Art of Storytelling. Meriwether

Madrid, M. M. (2013). A study of digital curator competences: A survey of experts. The International Information & Library Review, 45(3–4), 149–156. https://doi.org/10.1016/J.IILR.2013.09.001

Malraux, A. (2023). Il museo dei musei. Le voci del silenzio (I edition 1947). Aesthetica

Marty, P. F., Rayward, W. B. & Twidale, M. B. (2003). Museum informatics. Annual Review of Information Science and Technology, 37(1), 259-294. https://doi.org/10.1002/aris.1440370107

Mibayashi, R., Ueta, M., Kawahara, T., Matsumoto, N., Yoshimura, T., Aihara, K., Kando, N., Shoji, Y., Nakajima, Y., Yamamoto, T., Yamamoto, Y. & Ohshima, H. (2022). MinpakuBERT: A Language Model for Understanding Cultural Properties in Museum. Proceedings 12th International Congress on Advanced Applied Informatics. https://doi.org/10.1109/IIAIAAI55812.2022.00013

Ministero della Cultura / Ministry of Culture (2022). Piano Nazionale di Digitalizzazione del Patrimonio Culturale 2022–2023. https://digitallibrary.cultura.gov.it/wp-content/uploads/2023/10/PND_V1_1_2023-1.pdf

Mu.SA Project (2019). Museum professionals in the digital era; Agents of change and innovation. http://www.project-musa.eu/wp-content/uploads/2017/03/MuSA-Museum-professionals-in-the-digital-era-short-version.pdf

Mu.SA Project (n.d.). Mu.SA: Museum Sector Alliance. http://www.project-musa.eu/it/

Muench, S., Stoermer, E., Jensen, K., Asikainen, T., Salvi, M. & Scapolo, F. (2022). Towards a green & digital future. Luxembourg: Publications Office of the European Union. https://doi.org/10.2760/977331

Müller, K. (2017). Reframing the aura: Digital photography in ancestral worship. Museum Anthropology, 40(1), 65-78

Museu Picasso. (n.d.). https://museupicassobcn.cat/en

NEMO - Network of European Museum Organisations (2021). Follow-up survey on the impact of the COVID-19 pandemic on museums in Europe. https://www.ne-mo.org/fileadmin/Dateien/public/NEMO_documents/NEMO_COVID19_FollowUpReport_11.1.2021.pdf

NEMO (2020a). Final report Digitization and IPR in European Museums. https://www.ne-mo.org/fileadmin/Dateien/public/Publications/NEMO_Final_Report_Digitisation_and_IPR_in_European_Museums_WG_07.2020.pdf

NEMO (2020b). Survey on the impact of the COVID-19 situation on museums in Europe. https://www.ne-mo.org/fileadmin/Dateien/public/NEMO_documents/Final_Findings_and_Recommendations_CVOID19_12.05.2020.pdf

Nespeca, R., Mariotti, C., Petetta, L. & Mandriota, A. (2024). Point cloud segmentation in Heritage Preservation. Advanced digital process for historical houses. The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, 48, 325-332.

Nespeca, R., Quattrini, R., Ferretti, U., Giotopoulos, K. & Giannoukou, I. (2023). Digital transition strategies and training programs for digital curation of museum. International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, ISPRS Archives, 48. https://doi.org/10.5194/isprs-Archives-XLVIII-M-2-2023-1127-2023

Noehrer, L., Gilmore, A., Jay, C. & Yehudi, Y. (2021). The impact of COVID-19 on digital data practices in museums and art galleries in the UK and the US. Humanities and Social Sciences Communications, 8(1). https://doi.org/10.1057/s41599-021-00921-8

O'Neill, P. (2016). The Culture of Curating and the Curating of Culture(s) (Reprint). The MIT Press.

Onians, J. (1994). I Wonder: A Short History of Amazement. In J. Onians (Ed.). Sight and Insight: Essays on Art and Culture in Honour of E. T. Gombrich. Phaidon

Osservatori - Observatory for Digital Innovation in Cultural Heritage and Activities (2021). Digital innovation of Italian museums in 2021 (L'innovazione digitale nei musei Italiani nel 2021). https://www.osservatori.net/it/prodotti/formato/report/innovazione-digitale-musei-italiani-2021-report

Owens, T. (2018). The Theory and Craft of Digital Preservation. Johns Hopkins University Press

Park, H., Heo, J. & Kim, J. (2021). Before You Visit-: New Opportunities for the Digital Transformation of Museums. In: Rauterberg, M. (ed.). Culture and Computing. Interactive Cultural Heritage and Arts. HCII 2021. Lecture Notes in Computer Science, 12794. Springer. https://doi.org/10.1007/978-3-030-77411-0_29

Parthenos Project (n.d.a). https://cordis.europa.eu/project/id/654119/it

Parthenos Project (n.d.b). About Parthenos VRE - D4Science Infrastructure Gateway. https://parthenos.d4science.org/web/parthenos_vre

Patrício, C. & Smaniotto Costa, C. (2023). Smart City as Participatory Environment. An Archaeological Exercise on How to Build a Political Community. Interações, Sociedade e as Novas Modernidades, (44), 118-134. https://doi.org/10.31211/interacoes.n44.2023.a5

Patrício, C. (2021). A Geoestética (de Baalbek a Palmira) e a Terra como Objeto Político. In Bogalheiro, M. (Ed.). Crítica das Mediações Totais - Perspectivas expandidas dos media. Documenta

Pomigalov, A. & Andreev, A. (2022). Digital museums for digital history. Smashing Magazine. https://www.smashingmagazine.com/2022/06/digital-museums-digital-history/

Poole, A. H. (2016). The Conceptual Landscape of Digital Curation. Journal of Documentation, (72) 5, 961-986. https://doi.org/10.1108/JD-10-2015-0123

Pop, I. L., Borza, A., Buiga, A., Ighian, D., & Toader, R. (2019). Achieving cultural sustainability in museums: A step toward sustainable development. Sustainability, 11(4). https://doi.org/10.3390/su11040970

Porto Santo Conference (2021). Porto Santo Charter. Culture and the Promotion of Democracy: towards a European Cultural Citizenship. https://portosantocharter.eu/the-charter/

Proctor, N. (2010). Digital: Museum as Platform, Curator as Champion, in the Age of Social Media. Curator: The Museum Journal, (53) 1, 35–43. https://doi.org/10.1111/j.2151-6952.2009.00006.x

Pryor, G. & Donnelly, M. (2009). Skilling Up to Do Data: Whose Role, Whose Responsibility, Whose Career? International Journal of Digital Curation, 4. https://doi.org/10.2218/ijdc.v4i2.105

Rivero Moreno, L.D. (2020). Sustainable city storytelling: cultural heritage as a resource for a greener and fairer urban development. Journal of Cultural

Heritage Management and Sustainable Development, (10), 4, 399-412. https://doi.org/10.1108/JCHMSD-05-2019-0043

Robinson, M., Sparrow, P., Clegg, C. & Birdi, K. (2007). Forecasting future competency requirements: A three-phase methodology. Personnel Review, 36, 65–90. https://doi.org/10.1108/00483480710716722

Rollason-Cass, S., & Reed, S. (2015). Living movements, living archives: Selecting and archiving web content during times of social unrest. "New Review of Information Networking, 20" (1-2), 241-247. https://doi.org/10.1080/13614576.2015.1114839

Ross, S. & Moles, N. (2013). Report on DigCurV Curriculum Framework. https://zenodo.org/records/438687

Saunders, S. (2022). How to increase the opportunities for our visitors to engage more deeply with our online archive. "AMA Culture Hive". Retrieved from www.culturehive.co.uk/digital-heritage-hub/resource/engagement/how-do-we-increase-the-opportunities-for-our-visitors-to-engage-more-deeply-with-our-online-archive

Sayão, L. F. (2018). Digitization of cultural collections: reuse, curation and preservation. Seminário Serviços de Informação em Museus, 245-258

Schmidt, S. J. (2008). Telling Stories about Storytelling. In Gächter, Y. et al. (Eds). Storytelling - Reflections in the Age of Digitalization. Innsbruck University Press.

SIRA - Società Italiana per il Restauro dell'Architettura (2023). Documento di indirizzo per la qualità dei progetti di restauro dell'architettura. https://sira-restauroarchitettonico.it/wp-content/uploads/2024/02/Atti_SIRA_2023-Sezione0-LOW.pdf

Smaniotto Costa, C., Erjavec Šuklje, I., Kenna, T., De Lange, M., Ioannidis, K., Maksymiuk, G. & De Waal, M. (2019). CyberParks - The Interface Between People, Places and Technology. Springer. https://doi.org/10.1080/20507828.2019.1631061

Smaniotto Costa, C., García-Esparza, J. A., Artopoulos, G, Wehmeier, C. & Rafat-Saleh, M. (2024). Heritage-based storytelling and narratives. The added value of engagement in placemaking and heritage communication. In Delgado, A., Ruchinskaya, T. et al. (Eds). The Future of Placemaking and Digitisation Emerging Challenges and Research Agenda. Brill.

Soini, K. & Birkeland, I. (2014). Exploring the scientific discourse on cultural sustainability. Geoforum, 51, 213–223. https://doi.org/10.1016/j.geoforum.2013.12.001

Taormina, F. & Baraldi, S. B. (2022). Museums and digital technology: a literature review on organisational issues. European Planning Studies, (30)9, 1676-1694. https://doi.org/10.1080/09654313.2021.2023110

Tay, Y., Dehghani, M., Bahri, D. & Metzler, D. (2022). Efficient Transformers: A Survey. ACM Computing Surveys, 55(6). https://doi.org/10.1145/3530811

Taylor, K. (2014). Cities as cultural landscapes. Reconnecting the City: The Historic Urban Landscape Approach and the Future of Urban Heritage, 179-202

Than Oo, K., Jonah, K. & Zaw Thim, M. M. (2023). A Systematic Review of the Pros and Cons of Digital Pollution and its Impact on the Environment. Journal of Sustainability and Environmental Management 2, 61-73. https://doi.org/10.3126/josem.v2i1.53118

The CIDOC Conceptual Reference Model (CRM) (2006). http://cidoc.ics.forth.gr/

The London Charter (2008). The London Charter. https://londoncharter.org/fileadmin/templates/main/docs/london_charter_2_1_en.pdf

Trichopoulos, G., Konstantakis, M., Alexandridis, G., & Caridakis, G. (2023). Large Language Models as Recommendation Systems in Museums. Electronics (Switzerland), 12(18). https://doi.org/10.3390/electronics12183829

Ungerer, L. M. (2016). Digital curation as a core competency in current learning and literacy: A higher education perspective. The International Review of Research in Open and Distributed Learning, 17(5). https://doi.org/10.19173/irrodl.v17i5.2566

United Nations (1949). Universal declaration of human rights (Vol. 3381). Department of State, United States of America

Valerio, C. (2023). La tecnologia è religione. Giulio Einaudi

Van Gogh Museum (n.d.). https://www.vangoghmuseum.nl/en/

Vasic, I., Quattrini, R., Pierdicca, R., Mancini, A., & Vasic, B. (2024). 3VR: Vice Versa Virtual Reality Algorithm to Track and Map User Experience. J. Comput. Cult. Herit. doi:10.1145/3656346

Vaswani, A., Shazeer, N., Parmar, N., Uszkoreit, J., Jones, L., Gomez, A. N., Kaiser, Ł. ukasz, & Polosukhin, I. (2017). Attention is All you Need. I. Guyon, U., Von Luxburg, S. Bengio, H. Wallach, R. Fergus, S. Vishwanathan, & R. Garnett (Eds.). Advances in Neural Information Processing Systems, (30). Curran Associates https://proceedings.neurips.cc/paper_files/paper/2017/file/3f5ee243547dee91fbd053c1c4a845aa-Paper.pdf

Vuorikari, R., Kluzer, S. & Punie, Y. (2022). DigComp 2.2 The Digital Competence Framework for Citizens. With new examples of knowledge, skills and attitudes. https://doi.org/doi:10.2760/490274

Waterton, E. & Watson, S. (Eds.). (2015). The Palgrave handbook of contemporary heritage research. Palgrave

Witcomb, A. (2007). The Materiality of Virtual Technologies: A New Approach to Thinking about the Impact of Multimedia in Museums, in Cameron, F. & Kenderdine, S. (Eds). Theorizing Digital Cultural Heritage: A Critical Discourse. MIT Press. https://doi.org/10.7551/mitpress/9780262033534.003.0003

(All the quoted websites and online references were accessed between May 8, 2022 and April 30, 2024)
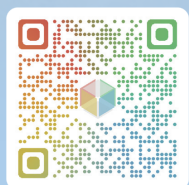
Support the
Digital Transformation
of Museums

Through DCbox

Sport
Jean Monnet
Youth
School education
Vocational education and training
Adult education

Higher education

UNIVERSIDAD Đ CÓRDOBA

unimed

UNIVERSITÀ POLITECNICA DELLE MARCHE

THE CYPRUS INSTITUTE
RESEARCH·TECHNOLOGY·INNOVATION

UNIVERSIDADE LUSÓFONA

sinergia
PROGETTI DI MIGLIORAMENTO

Erasmus+
Enriching lives, opening minds.