GIADA CERRI

Shaking Heritage

Museum Collections between Seismic Vulnerability and Museum Design

FIRENZE UNIVERSITY PRESS

ricerche | architettura, pianificazione, paesaggio, design

Editor-in-Chief
Saverio Mecca | University of Florence, Italy

Scientific Board
Gianpiero Alfarano | University of Florence, Italy; **Mario Bevilacqua** | University of Florence, Italy; **Daniela Bosia** | Politecnico di Torino, Italy; **Susanna Caccia Gherardini** | University of Florence, Italy; **Maria De Santis** | University of Florence, Italy; **Letizia Dipasquale** | University of Florence, Italy; **Giulio Giovannoni** | University of Florence, Italy; **Lamia Hadda** | University of Florence, Italy; **Anna Lambertini** | University of Florence, Italy; **Tomaso Monestiroli** | Politecnico di Milano, Italy; **Francesca Mugnai** | University of Florence, Italy; **Paola Puma** | University of Florence, Italy; **Ombretta Romice** | University of Strathclyde, United Kingdom; **Luisa Rovero** | University of Florence, Italy; **Marco Tanganelli** | University of Florence, Italy

International Scientific Board
Francesco Saverio Fera | University of Bologna, Italy; **Pablo Rodríguez Navarro** | Universitat Politècnica de València, Spain; **Nicola Braghieri** | EPFL - Swiss Federal Institute of Technology in Lausanne, Switzerland; **Lucina Caravaggi** | University of Rome La Sapienza, Italy; **Federico Cinquepalmi** | ISPRA, The Italian Institute for Environmental Protection and Research, Italy; **Margaret Crawford,** University of California Berkeley, United States; **Maria Grazia D'Amelio** | University of Rome Tor Vergata, Italy; **Carlo Francini** | Comune di Firenze, Italy; **Sebastian Garcia Garrido** | University of Malaga, Spain; **Xiaoning Hua** | NanJing University, China; **Medina Lasansky** | Cornell University, United States; **Jesus Leache** | University of Zaragoza, Spain; **Heater Hyde Minor** | University of Notre Dame, France; **Danilo Palazzo** | University of Cincinnati, United States; **Silvia Ross** | University College Cork, Ireland; **Monica Rossi** | Leipzig University of Applied Sciences, Germany; **Jolanta Sroczynska** | Cracow University of Technology, Poland

UNIVERSITÀ DEGLI STUDI FIRENZE
DIDA DIPARTIMENTO DI ARCHITETTURA

Shaking Heritage : museum Collections between Seismic Vulnerability and Museum Design / Giada Cerri. — Firenze : Firenze University Press, 2021.
(Ricerche. Architettura, Pianificazione, Paesaggio, Design ; 13)

https://www.fupress.com/isbn/978-88-5518-491-5

ISBN (Print) 978-88-5518-490-8
ISBN (PDF) 978-88-5518-491-5
ISBN (XML) 978-88-5518-492-2
DOI 10.36253/978-88-5518-491-5

cover
A reworked version of the photo *Serie Depositi*, 2016 by Marco Lanza.

FUP Best Practice in Scholarly Publishing (DOI https://doi.org/10.36253/fup_best_practice)
All publications are submitted to an external refereeing process under the responsibility of the FUP Editorial Board and the Scientific Boards of the series. The works published are evaluated and approved by the Editorial Board of the publishing house, and must be compliant with the Peer review policy, the Open Access, Copyright and Licensing policy and the Publication Ethics and Complaint policy.

Firenze University Press Editorial Board
M. Garzaniti (Editor-in-Chief), M.E. Alberti, F. Vittorio Arrigoni, E. Castellani, F. Ciampi, D. D'Andrea, A. Dolfi, R. Ferrise, A. Lambertini, R. Lanfredini, D. Lippi, G. Mari, A. Mariani, P.M. Mariano, S. Marinai, R. Minuti, P. Nanni, A. Orlandi, I. Palchetti, A. Perulli, G. Pratesi, S. Scaramuzzi, I. Stolzi.

The online digital edition is published in Open Access on www.fupress.com.

Content license: except where otherwise noted, the present work is released under Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International (CC BY-NC-SA 4.0: https://creativecommons.org/licenses/by-nc-sa/4.0/legalcode). This license allows you to share any part of the work by any means and format, modify it for any purpose, including commercial, as long as appropriate credit is given to the author, any changes made to the work are indicated and a URL link is provided to the license.
Metadata license: all the metadata are released under the Public Domain Dedication license (CC0 1.0 Universal: https://creativecommons.org/publicdomain/zero/1.0/legalcode).

© 2021 Author(s)
Published by Firenze University Press

Firenze University Press
Università degli Studi di Firenze
via Cittadella, 7, 50144 Firenze, Italy
www.fupress.com

This book is printed on acid-free paper
Printed in Italy

progetto grafico
didacommunicationlab
Dipartimento di Architettura
Università degli Studi di Firenze

Susanna Cerri
Federica Giulivo

Imprimé sur papier de cellulose pure Fedrigoni Arcoset

ELEMENTAL CHLORINE FREE GUARANTEED
ACID FREE
LONG-LIFE ISO 9706
HEAVY METAL FREE ABSENCE CE 94/62

TABLE OF CONTENTS

Magnificent Country in a Fragile Setting 9
Francesco Collotti

Introduction 13

Methodological Framework 17

The RESIMUS Approach 19

FOCUS A
The RESIMUS Project 35
Stefania Viti

FOCUS B
The Seismic Safety of Art Work 38
Marco Tanganelli

FOCUS C
Post-War Museography in Italy 47
Alessandro Brodini

FOCUS D
Digital Survey and Museums: Useful Tools and Less Useful Tools for Humanity 5.0 50
Giorgio Verdiani

Case Studies 55

Case 1
The Application of the RESIMUS Approach to a Permanent Exhibition: the National Museum of Bargello, Florence, Italy 57

FOCUS E
The Majolica Room at the National Museum of Bargello 70
Marino Marini

FUP Best Practice in Scholarly Publishing (DOI 10.36253/fup_best_practice)

Giada Cerri, *Shaking Heritage. museum Collections between Seismic Vulnerability and Museum Design*, © 2021 Author(s), content CC BY-NC-SA 4.0 International, metadata CC0 1.0 Universal, published by Firenze University Press (www.fupress.com), ISBN 978-88-5518-491-5 (PDF), DOI 10.36253/978-88-5518-491-5

Case 2
The Application of the RESIMUS Approach to a Temporary Exhibition: di Tutti i Colori, Montelupo Fiorentino, Florence, March 6-July 28, 2019 95

The Exhibition through Pictures 104

Conclusion **119**

Appendix **125**

The RESIMUS Forms 126

Typologies of Mounts 147

Bibliography 155

Acknowledgments 168

Illustration Credits 168

FOCUS D

DIGITAL SURVEY AND MUSEUMS: USEFUL TOOLS AND LESS USEFUL TOOLS FOR HUMANITY 5.0

Giorgio Verdiani
DIDA | Department of Architecture, University of Florence

Digital tools for survey and documentation today offer options of significant interest and great potential for any museum setup. For management, protection, and dissemination, creating a digital copy of the collections is a crucial step that interests permanent and temporary exhibitions, museum collections, and entire museum locations. Thanks to their progressive popularization over the last twenty years, the tools to carry out this transformation are now available to heritage managers, scholars, and more and more often to every visitor in front of what is exposed. From 3D laser scanner units to contemporary photogrammetry, to components implemented in personal devices, the ease of producing digital copies is now getting faster and faster and is progressively improving in terms of quality. The many recent experiences confirm the widespread digital innovation in the reality of museums and collections (Collotti et al., 2021). In the context of the digital innovations at the base of humanity 5.0, that is defined as "a society of intelligence," in which physical space and cyberspace are strongly integrated" (Salgues, 2018). The renewal of a museum design needs to consider the digital innovations at all levels, from the tools allowing the passage from reality to digital to the digitalization of museum architectural spaces or museum collections.

Main technologies

3D laser scanner: It is the fastest and reliable solution. It is the best approach available today to create a digital twin, from the urban and architectural scale to the single items. The units available on the market allow getting large areas covered with a high level of detail. The speed in processing and the quality of the results create all the conditions for having a fully trustable base for any evaluation or producing base drawings. Originated on restoration needs, new design interventions and enhancement works may find the correct references, reducing any possible issues connected to misinterpretation of complex architectural shapes. The recent enhancements in this technology are making it possible to exploit the most recent laser scanner 3D units for the creation of virtual environments usable even out of the "technical" environments like it is for the solutions suggested by Matterport (Shults et al., 2019) and increasing the automatization of the survey procedures.

Photogrammetry: The increase in performance and quickness of "creating a model out of pictures" in the last years pushed

FUP Best Practice in Scholarly Publishing (DOI 10.36253/fup_best_practice)
Giada Cerri, *Shaking Heritage. museum Collections between Seismic Vulnerability and Museum Design*, © 2021 Author(s), content CC BY-NC-SA 4.0 International, metadata CC0 1.0 Universal, published by Firenze University Press (www.fupress.com), ISBN 978-88-5518-491-5 (PDF), DOI 10.36253/978-88-5518-491-5

Fig. D The variety of tools for digital survey allows today to extend the digital documentation to real tasks for creating multimedia contents, digital twins, and tools for diagnostic and monitoring aims. In the pictures: a VR camera with automatic image stitching, two 3D laser scanner units at work on architectures, photogrammetric operations, and thermographic pictures of architectures.

in the realm of the incredible users of photogrammetry. It passed from an old, complex, challenging, and all "high-quality equipment" based processing to a new, fast, and spectacular way of processing the data. Thanks to the increase of computer computation power, the efficiency of the communication speeds, and the miniaturization of lenses, sensors, and cameras, the present scenario allows operating the creation of a 3D model with texturing using from a smartphone camera to a high-quality professional DSRL with noticeable results since the beginning. Besides, the recent "push" produced by introducing the "Lidar" solution in the Apple High range smartphones is moving this practice to be more and more accessible by anyone. Such an evolution, under development since the early years of this century, is changing the approach to creating 3D models and creating extensive digital collections that document the real collections in short times and low costs. The level of quality may vary, but the popularization of the process is a factor in need of extreme attention (Pucci, 2013).

Virtual Reality cameras: Another tool with a past balance depending on long processing times, but even those times seem gone. A large number of cameras are now available for creating good to high-quality panoramic scenes with minimal effort from the operators. The image can be mounted according to "virtual tours" logic and can be easily shared using many online possibilities. The option for implementing these panoramic tours with multimedia content makes this solution extremely interesting, with a high level of customization. The possibility of bringing to the public those spaces with difficult accessibility is a fascinating option. With a display in situ or online, using a personal device, the visitor may

access "forbidden" rooms and sectors of a site or a museum. A fragile fresco, an underground chapel, or a transformed artifact may be seen in all aspects, making the visit more inclusive, and expanding the possibilities of teaching and learning.

Diagnostic and inspecting tools: The enhancements in the field of diagnostic and monitoring have significantly increased in the last years, reducing the weight and size of the tools. Better portability made them easier to use and more affordable. In most cases, the simplification of the procedures and the possibility of having an instant report about the results allow a better understanding of the actual situation and immediately plan the following operations. Thermography (Sfarra et al., 2016), UV photography, endoscopy, X-Ray, and Georadar devices and software have increased their efficiency, bringing the whole set of diagnostic procedures to the digital environment.

The creation of digital twins from tangible elements is a revolutionary innovation of the digital revolution. The challenge seems not only one of the levels of details, of the accuracy in the reconstruction of the performance of the process, but it also seems a mandatory opportunity for the integration of additional information, bringing the options for visualizing "invisible" and intrinsic characteristics of the real object as an easily accessible part of the digital twin. Such enrichment may bring the digital twin to represent an enhanced version of the actual object, suitable for monitoring, diagnostic, and presenting to the public a series of different datasets according to their curiosity or interest. While this integration is still at the first steps, the consistency of the digital heritage brings extended options to the public and is a challenge for any museum or exhibition to exploit, according to their needs and available resources. The digitalization of the collections, or a part of them, and the creation of virtual tour connecting the models from the collection to a digital representation of the space of the museum can be a first step that offers at least three main possibilities: a remote visit as an alternative to the real one, a remote visit before the real one, a preliminary preparation to a better experience of the museum, and the one after the real one, to go back and get even more information and re-experience the interest of the visit. In this, the quality of the contents is fundamental, no one can replace high-quality content with poor digital models, and a virtual tour made of low resolution or blurry images would be just a shame. However, looking around at all the famous digitalization experiences and museums, it seems clear that quality is always present and gradually increasing.

The digitalization of a museum and its collections needs two essential elements to succeed:

1. proper infrastructure to host all the digital contents and people capable of managing it. Whether part or external to the museum structure, the digital product should be online, available, and visible in the shortest time, or it will be a missed opportunity for people interested in the subject.
2. digital data need proper management in time, updates, maintenance. The risk is rapid obsolescence of expensive contents that are not entirely understood as valuable, even though they belong to the "digital heritage" category.

The last decades have seen the progressive rise of the digital revolution, with all the

transformations in procedures, methods, and forms of communication and understanding that it involves. The last years, strongly characterized by the Pandemic event, have accelerated the digital transposition of many cultural spaces and places. The multiplications of contents and the increment in the available solutions for creating online content, exhibitions, meetings, and debates are visible. The results are varied, but this is an ever-changing environment, and many rules about "how to build" the digital heritage are things yet to come. Any figure operating in cultural heritage, from the scholar to the traditional visitors, is now potentially moving in an expanded context of new complexity, where the technological preponderance imposes rules that are not always easy to grasp by all the participants, but for which, sometimes, the real possibilities of use may be something yet to be discovered. The risk of missing the target is more than tangible. The massive production of digital content is nothing without proper infrastructure and data maintenance, and the data gathering for monitoring and diagnostic is nothing without processing, analysis, and understanding. Although obvious, this broad and rich context highlights a fundamental need that at times still seems at risk of neglect, namely that of coherence and content, of the realization of reasoned and proper projects that allow effective results. It is a scenario in which digital twins inevitably play an important and strategic role, a concrete and profitable benefit in using multimedia projects for Cultural Heritage. It is also a scenario that needs correct and well-prepared players, otherwise it will remain at risk of being a significant waste of resources and a collection of missed occasions.

References

Collotti, F.V., Verdiani, G., Brodini, A. (eds.) 2021, *Proceedings of the first ArCo Conference*, Didapress, pp.123-262.

Pucci, M. 2013, 'Prima che appaia il "divieto di fotorilievo": considerazioni', in *Disegnarecon*, n. 12, VIII, pp.2-12.

Salgues, B. 2018, *Society 5.0 Industry of the Future, Technologies, Methods and Tools*, ISTE, Wiley & Sons.

Sfarra, S., Marcucci, E., Ambrosini, D., Paoletti, D. 2016, 'Infrared exploration of the architectural heritage: from passive infrared thermography to hybrid infrared thermography (HIRT) approach', in *Materiales de Construcción*, Vol. 66, Issue 323, July–September, pp. 2-16.

Shults, R., *et al.* 2019, 'Capability of Matterport 3d Camera for Industrial Archaeology Sites Inventory', in *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, Volume XLII-2/W11, 2019 GEORES 2019 – 2nd International Conference of Geomatics and Restoration, 8–10 May 2019, Milan, Italy, ISPRS, pp.1059-1064.

Finito di stampare da
Officine Grafiche Francesco Giannini & Figli s.p.a. | Napoli
per conto di FUP
Università degli Studi di Firenze

Any moment the earth can shake, but we do not know when or where. If it happens, our Heritage might be in danger. *Shaking Heritage* addresses the topic of the seismic vulnerability of museum collections. It develops a way to assess the seismic risks for movable Heritage, proposing a synthetic method to rate the vulnerable settings. It discusses the necessity of integrating museography and anti-seismic solutions for museums and exhibitions, and studies exhibit solutions that would improve the seismic safety of collections and setups. It stresses the necessity of constructing shared guidelines and policies for the safety of the movable Heritage. *Shaking Heritage* is a step forward in acknowledging the importance of the anti-seismic culture among museum institutions and researchers.

Giada Cerri, architect, earned a PhD in Management and Development of Cultural Heritage from IMT School for Advanced Studies Lucca. Her research fields are museography and management of Cultural Heritage. Besides the research and teaching activity, she works as a museum consultant and exhibition designer.

ISBN (Print) 978-88-5518-490-8
ISBN (PDF) 978-88-5518-491-5
ISBN (XML) 978-88-5518-492-2
DOI 10.36253/978-88-5518-491-5