

Laura Carlevaris, Graziano Mario Valenti

edited by

DIGITAL & DOCUMENTATION

Reading and Communicating Cultural Heritage

Volume 3



PROSPETTIVE MULTIPLE
STUDI DI INGEGNERIA
ARCHITETTURA E ARTE



Laura Carlevaris, Graziano Mario Valenti

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Reading and Communicating Cultural Heritage

Volume 3

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Via Salasco, 5 - 20136 Milano

Tel: +39 02 5836.7571- Fax: +39 02 5836.5753

egea.edizioni@unibocconi.it

www.egeaeditore.it

EDITORS

Laura Carlevaris and Graziano Mario Valenti

GRAPHIC PROJECT

Elisabetta Caterina Giovannini, Noemi Mafrici,

Cristian Farinella, Lorena Greco

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The volume consists of a collection of contributions from the seminar *Digital & Documentation. Reading and Communicating Cultural Heritage*, realised on online platform on December 4th, 2020. The event, organized by Department of History, Representation and Restoration of Architecture, Sapienza University of Rome, promotes the themes of digital modeling and virtual environments applied to the documentation of the tangible, intangible and natural Cultural Heritage. The event has provided the contribution of external experts who are engaged in the management and conservation of the most important Italian cultural assets.

The scientific responsible for the organization of the event is Prof. Graziano Mario Valenti, Sapienza University of Rome.

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The event *Digital & Documentation - 2020* has seen the participation of professors, researchers, scholars and private Institutions



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DIGITAL CHALLENGES FOR CULTURAL HERITAGE ENHANCEMENT, MODEL INTELLIGENCES BETWEEN COMPLEXITY AND IDENTITY

ELENA IPPOLITI, SANDRO PARRINELLO

The approach to cultural heritage according to a holistic model is now established policy in Europe. Heritage is considered in its entirety, no longer distinguishing between tangible and intangible, between the actions of creation, preservation and enjoyment. It is a complex system that must be supported, enhanced and promoted on the basis of an integrated approach that must take into account cultural, economic, social, historical, educational, environmental and scientific components.

Culture and cultural heritage are common goods and values, nonrenewable resources that must be preserved according to their authenticity and shared for the possibilities of promoting a European identity and mutual respect.

Therefore, 'digitization for documentation' constitutes itself as a great opportunity, but there is no doubt that it also presents several challenges. For first of all, it needs new participatory models to promote the 'shared resource' aspect and the involvement of communities, on the one hand, and high levels of expertise of operators and quality control systems, on the other.

But more generally, 'digitization for documentation' is constituted as a challenge because of the intrinsic characters of cultural heritage itself, that is, its complexity/heterogeneity, on the one hand, and uniqueness/identity, on the other. Intrinsic characters that reverberate in the definition of 'models,' be they those of documentation or even those of communication.

Evidences posed, along with others, for attention by the Seminar *Digital & Documentation* and which also emerge in the essays presented in this part of the Proceedings.

As for example in De Marco and Dell'Amico's essay, where the case study of the Upper Kama territory and the purpose of the European Cultural Heritage Routes research impose a multi-scalar structuring of knowledge, documentation and communication models.

The relationships between territory and community are resolved by the authors by developing a 'grammar of forms' and defining related models of three-dimensional representation of cultural objects at different scales – landscape, urban center, architecture. Models that are the building blocks for describing architectural features, stylistic variety, construction solutions, degradation pathologies, degree of preservation, etc. This process of morphological, technological and typological semantization, from the territorial level to the architectural scale, is thus the basis of the information modeling protocol which, structured on data queries and descriptors, allows for the description of the identity of the Upper Kama region and the combined management of historical memory, information and interventions.

The reflection proposed by Veronica Riavis and Paola Cochelli instead concerns in particular the communication models, the purpose of which must always be to make the different forms of cultural heritage accessible and understandable to the specifics of the audiences for whom these are designed.

In the essay, the audience is the blind and partially sighted people for whom the authors experiment with various models of haptic communication in relation to the different characters of heritage: architecture, painting and sculpture. Unlike what is usually done in the heritage communication segment, where the privileged sense is that of sight, in this case understanding is entrusted to the interaction of the hands with the surrounding environment. To this end, different operational strategies are proposed for the acquisition of geometric-compositional information and the formal translation of contents into three-dimensional models and two-dimensional relief drawings, in accordance with the specificities of heritage and the purposes of communication.

But 'digitization for documentation' is also a challenge because of certain problematic issues introduced by digital. These include the issue of the relationship between 'data quantity and information quality' critically brought to attention by several other essays.

As, for example, in Valeria Cera's essay, which highlights the problematic issue of the balance between the quantity of surfaces and vertices required to describe an architectural object and the management of the corresponding 3D models with web-based fruition and query platforms, consistent with the scientific aspects of the organization of information resources.

For this purpose, the author develops a protocol for structuring the digital replication of architectural heritage from reality-based survey techniques carried out by

automatic decimation algorithms, retopologizing processes and texture baking. The methodological proposal, of which the different operations are described through an illustrative case study, is conducted with reference to the need to restore in the digital replica the identity character of the real object both in terms of geometric coherence and in terms of fidelity and aesthetic quality of visual perception).

The same problematic node is proposed by Michele Calvano, Filippo Calcerano, Letizia Martinelli, and Elena Gigliarelli in the specifics of the relationship between survey data and its use in BIM field, where it's emphasized the fact that the amount of information should be limited to what is strictly necessary, not only for more effective management, but more generally because anything beyond this minimum is waste.

Within this framework, the authors propose a process that postulates the recognition of geometries directly from the scattered cloud of a SfM photogrammetric survey to arrive at modeling and integration of diagnostic data. A kind of topographic survey, where each oriented photo becomes a total station from which to collimate significant points useful for reconstructing two-dimensional primitives.

A workflow aimed at semantic clarity and constructive representation that re-proposes an approach to heritage documentation, so to speak, traditional starting from an analytical approach of geometric conformation to extract from the redundancy of a point cloud the essential

information for the description of the architectural object. A question also raised by Ramona Quattrini who, through four different case studies developed since 2014, shows the evolution and hybridization of digital technologies in the HBIM segment – from ScanToBIM to Artificial Intelligence applications – proposing a reflection not on the tools but on the implications in the context of Digital Humanities and Computational Modeling.

More specifically, the essay proposes a reflection on the meaning and goals of modeling, showing different ways of incorporating meaningful forms of intelligence for the documentation of the built heritage.

Forms of semantic intelligence that are specific to the discipline of Drawing and that can and should also be incorporated into three-dimensional digital models by developing a grammar of forms, building thesauri, ontologies, taxonomies, etc. An intelligence of models which, also thanks to advances in AI, can be shared by communities interested in the enhancement of built Cultural Heritage in a virtuous process that minimizes waste even in the digital segment of information.

An intelligence specific therefore to the discipline of Drawing, as Matteo Bigongiari's essay on Leonardo da Vinci's design contribution to the modernization of the defenses of the city of Piombino also demonstrates.

An investigation that crosses the different forms of drawing, both analogue and digital: that of Leonardo's

authorial signs thanks to the analysis of one of his substantial set of handwritten sheets, that of the configuration of the still existing fortresses around the historic city thanks to survey returns, that of the image of the fortified architecture of Piombino in the 16th century thanks to its digital reconstructive hypothesis, those of the signs of the Renaissance drawings of military architectures thanks to the reading of some of the main treatises of the time.

Essays that collectively demonstrate how the Drawing and the latest technological innovations is not only a tool but an established and powerful scientific method through which to analyze and compare multidisciplinary and chronologically distant data – such as those of design and construction. A method for generating 'intelligence,' that is, a heritage of knowledge and best practices to preserve, share and enhance our past and from which to build our future.