BRIDGES
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THE VALUE OF SCIENCE AND TECHNOLOGY IN ADDRESSING THE GREAT CHALLENGES OF OUR TIME

edited by
Francesco De Matteis and Diana Angela Palma

with the collaboration of
Natascia Conforti, Michaela Riccio, Emanuele Scarpato, Diletta Taverni

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NEW CHALLENGES FOR THE MANAGEMENT AND ENHANCEMENT OF TANGIBLE AND INTANGIBLE HERITAGE

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Digital transition and climate change represent complex challenges that require a broad and shared vision, even in decisions concerning the safeguarding and valorisation of cultural heritage[1]. We can no longer face the trials of the coming years with isolated, limited, or regionally confined interventions. Instead, it is necessary to work at a transnational level to develop inclusive global strategies capable of transcending territorial boundaries and designing large-scale, reasonable solutions. Emerging technologies can play a key role in this endeavour, offering tools to develop a new culture that simultaneously ensures the conservation, accessibility, and sustainability of both tangible and intangible cultural heritage[2]. This challenge has already been embraced by China and Italy, whose decade-long collaboration represents a concrete example of how international dialogue can operate positively and facilitate, through open communication, the continuous exchange of virtuous experiences and best practices that mutually enrich both parties.

The tangible prospects offered by the growing adoption of Open Science principles are driving researchers and professionals toward the creation of supranational research spaces that foster the emergence and consolidation of interdisciplinary collaborations aimed at the growth and defence of cultural heritage[3]. Governments are also particularly active in promoting policies that support effective digital transformation, developing strategies useful for achieving the goals of truly open and shared knowledge.

Artificial intelligence and, more broadly, technologies within the domain of Digital Humanities are opening new scenarios for research, safeguarding, and the management

1 Russo Spena, Bifulco 2021.
2 Milosz, Kesik 2024.
3 Roued-Cunliffe 2020.

of artistic, architectural, and archaeological heritage[4]. The new challenges we are called to address are gradually revolutionizing artisanal and professional sectors that encompass knowledge rooted in rich and well-established traditional cultures. Areas such as diagnostics, restoration, monitoring, and valorisation are increasingly relying on artificial intelligence techniques and the opportunities offered by computer graphics, providing innovative immersive experiences. Analyses of paintings, frescoes, statues, and even large monuments and entire residential complexes can now be effectively conducted by computers capable of suggesting reconstructive hypotheses while simultaneously supporting virtual restorations[5].

However, the spread of computational techniques must not overshadow the philological approach and sensitivity in the study of antiquity that allows us to look to the past as an inexhaustible reservoir from which to draw new knowledge. The risk, on the contrary, is delegating the entire process of historical-artistic analysis and reconstruction to digital techniques, particularly artificial intelligence, with the danger of falling into the trap of so-called hallucinations.

The inclusion of a specific panel dedicated to the frontiers of artistic and cultural heritage conservation within the framework of the 13th Italy-China Week has fostered dialogue between Italian and Chinese researchers on the themes of technological innovation and the protection of cultural heritage, further consolidating the strategic global partnership that has linked the two nations for over two decades.

The new challenges posed by industrial, productive, and social transformations require attention to the protection and valorisation of not only material but also intangible heritage, as well as the de-functionalization and re-functionalization of large monuments by institutions interested in enhancing the cultural and touristic offerings of even disadvantaged territories. The paradox of this growth lies in the increased environmental risks and dangers generated by uncontrolled mass tourism, which threatens to overwhelm both small and large communities[6]. To monitor the risks of overtourism and, more generally, the increase in pollution caused by industrial growth, digital technologies can offer innovative solutions through the use of sensors capable of analysing tourist flows in real time while simultaneously monitoring potential anthropogenic or environmental hazards. Non-invasive sensor technology can also play a significant role in improving conservation techniques for ancient artifacts made of different materials and in various contexts, revolutionizing traditional restoration and conservation methodologies, which can also benefit from advanced material nanotechnology[7].

4 Ruthven, Chowdhury 2015.
5 Thiel, Bernhardt 2024.
6 Chica-Olmo *et al.* 2024.
7 Laohaviraphap, Waroonkun 2024.

In terms of cultural and artistic heritage management, digital technologies open new scenarios by providing tools for the creation of digital cultural ecosystems. These ecosystems function as open spaces where a plurality of actors can freely access and draw information about material and intangible heritage, thereby promoting more inclusive sharing and valorisation[8].

The various presentations by scholars during the 13th Italy-China Week highlighted some of the most significant national initiatives, showcasing best practices, scientific achievements, and novel research perspectives, including new forms of international cooperation. In particular, the role of citizens in protecting and enhancing practices related to intangible heritage emerged as crucial for the development of integrated policies for industrial planning and environmental sustainability. For example, national cultural parks, an original Chinese concept, encompass the protection of ecosystems and cultural resources and are based on community involvement, which is entrusted with the responsibility of transmitting spiritual, civil, and material heritage.

Thus, the digital transition plays a central role in safeguarding an ecosystem where the artistic, historical, and archaeological components of heritage merge with technological innovation. The key tools of this process, characterized by digitization and more modern management of cultural resources, are intelligent transformation and creative regeneration, which can unlock the economic value of archives and artistic data.

Digital technologies, artificial intelligence, Big Data, and the Internet of Things offer new forms of exploration, immersion, and perception of cultural heritage that transcend the rigid constraints of traditional museum experiences and preservation policies. At the same time, however, we must not abandon the culture and practices of conservation that can mitigate the dangers posed by climate change, even by resorting to innovative monitoring techniques such as those derived from satellite image analysis.

In conclusion, the 13th Italy-China Week provided a valuable opportunity to listen to proposals and general ideas, compare best practices in the protection, preservation and enhancement, and utilization of material and intangible heritage, and promote new institutional mechanisms while improving policies related to education and international collaboration.

[8] Cassia, Castellani, Rossato 2023.

Bibliographical references

Cassia 2023: F. Cassia, P. Castellani, C. Rossato (eds.), Accessible Tourism in the Digital Ecosystem, Springer https://doi.org/10.1007/978-3-031-38782-1.

Chica-Olmo 2024: J. Chica-Olmo, M. Vujicic, R.A. Castanho, U. Stankov, E. Martinelli (eds.), Sustainable Tourism, Culture and Heritage Promotion: Development, Management and Connectivity, Springer Nature Switzerland <https://doi.org/10.1007/978-3-031-49536-6>.

Laohaviraphap, Waroonkun 2024: N. Laohaviraphap, T. Waroonkun, Integrating Artificial Intelligence and the Internet of Things in Cultural Heritage Preservation: A Systematic Review of Risk Management and Environmental Monitoring Strategies, Buildings 14(12), 3979 <https://doi.org/10.3390/buildings14123979>.

Milosz, Kesik 2024: M. Milosz, J. Kesik (eds.), 3D Information Technologies for Tangible and Intangible Cultural Heritage, Lublin.

Roued-Cunliffe 2020: H. Roued-Cunliffe, Open Heritage Data, London.

Russo Spena, Bifulco 2021: T. Russo Spena, F. Bifulco (eds.), Digital Transformation in the Cultural Heritage Sector. Challenges to Marketing in the New Digital Era, Springer.

Ruthven, Chowdhury 2015: I. Ruthven, G.G. Chowdhury (eds.), Cultural Heritage Information: Access and Management, London.

Thiel, Bernhardt 2024: S. Thiel, J.C. Bernhardt (eds.), AI in Museums. Reflections, Perspectives and Applications, Bielefeld <https://doi.org/10.14361/9783839467107>.