



REVIEW OF THE DOCTORAL DISSERTATION

“Virtual Reality Technology in Architectural Heritage and its Impact on Conservation”

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1. Basis for the Preparation of the Review

The following documents and materials constituted the basis for the preparation of this review:

- the formal decision of the Council of the Scientific Discipline of Architecture and Urban Planning of Gdańsk University of Technology, issued in accordance with the Act of 20 July 2018 – Law on Higher Education and Science (as amended in 2022), concerning the appointment of the Doctoral Committee and the admission of the dissertation to subsequent stages of the doctoral proceedings;
- the applicable legal acts governing doctoral procedures in Poland, including in particular:
 - the Act of 20 July 2018 – Law on Higher Education and Science;
 - the Act of 14 March 2003 on Academic Degrees and Titles and on Degrees and Titles in the Arts, as amended;
 - the Regulation of the Minister of Science and Higher Education of 19 January 2018 on the detailed procedure and conditions for conducting activities in the doctoral proceedings, habilitation proceedings, and proceedings for the conferment of the title of professor;
- the complete copy of the doctoral dissertation by Mr. Szymon Kowalski, prepared in the external mode, entitled “Virtual Reality Technology in Architectural Heritage and its Impact on Conservation”;

- the supervisory documentation submitted as part of the doctoral proceedings, indicating that the dissertation was carried out under the supervision of Prof. Dr. Hab. Inż. Arch. Jakub Szczepański (Supervisor) and Dr. Hab. Inż. Arch. Piotr Samól (Auxiliary Supervisor), and confirming that the dissertation meets the requirements specified in Article 187(1)(4) and Article 187(2) of the Act of 20 July 2018.

The scope of this review requires a precise understanding of the legal, institutional, and academic framework within which the doctoral dissertation has been submitted. In accordance with the regulations governing doctoral proceedings, the appointment of the reviewer confers responsibility not only for an assessment of the scientific merit of the work, but also for the verification of its compliance with disciplinary standards, methodological expectations, and formal criteria.

The legal acts regulating doctoral proceedings in Poland, including statutes and ministerial regulations, set forth the criteria regarding originality, methodological correctness, contribution to scientific knowledge, and the ability of the candidate to conduct independent research. These criteria have therefore served as a reference point in the preparation of the present review.

Furthermore, the internal documentation of the Faculty of Architecture at Gdańsk University of Technology provides additional procedural guidelines, including definitions of disciplinary alignment and expectations concerning digital methodologies. These documents explicitly recognize the increasing relevance of digital tools in contemporary research on architectural heritage, thereby framing the dissertation as both timely and appropriate. The supplementary materials provided by the candidate – comprising technical datasets, VR files, workflow specifications, and extensive visual documentation – constitute an essential part of the review process, given the nature of the research topic.

The present review has been prepared on the basis of the following materials:

- the formal appointment issued by the competent academic authority;
- the doctoral dissertation authored by Szymon Kowalski, *“Virtual Reality Technology in Architectural Heritage and its Impact on Conservation”*;
- legal provisions regulating doctoral proceedings in the Republic of Poland;
- the internal regulations, guidelines, and procedural frameworks established by the Faculty of Architecture, Gdańsk University of Technology;
- all supplementary materials included with the dissertation, including illustrations, technical documentation, and references.

These documents collectively ensure that the review is conducted in accordance with academic standards, with full consideration of the methodological, formal, and substantive aspects of the dissertation.



2. Formal Characteristics and Content of the Dissertation

The doctoral dissertation by Szymon Kowalski, entitled “*Virtual Reality Technology in Architectural Heritage and its Impact on Conservation*”, addresses a theme of high relevance within contemporary architectural heritage studies. The work is well structured and articulated across a theoretical framework, a methodological apparatus, and three case studies at different scales (interior, architectural, and urban).

The dissertation demonstrates a clear progression from theoretical reflection to technical application. The writing is well organized, the English language is correct and controlled, and the disciplinary terminology is handled competently. The structure of the chapters is generally balanced, although some theoretical sections are particularly extensive and would benefit from greater conciseness. The inclusion of schemes, diagrams, and visual material contributes to clarity and readability, although some transitions between sections could be smoother.

The visual and digital material – photos, diagrams, photogrammetric models, laser scanning data, BIM reconstructions, and VR environments – is of very high technical quality. These materials reveal a strong command of digital surveying techniques, immersive modelling, and spatial rendering. In some cases, captions and explanatory notes could be expanded to provide clearer interpretive context and to better illustrate the relationship between the historical sources, the digital workflow, and the immersive output.

3. Topic, Aim and Thesis of the Work, Research Methods and Classification According to Scientific Discipline

The dissertation addresses a timely and complex research question: the role of Virtual Reality (VR) as an immaterial tool for conservation, representation, and transmission of architectural heritage. The author positions his work within a domain characterized by rapid technological development and an expanding theoretical debate, often progressing at different speeds.

The aims of the thesis are clearly defined:

– to understand how VR can contribute to the documentation, assessment, and communication of heritage;

- to investigate whether and under what conditions VR can constitute a form of “immaterial reconstruction” complementary to, or alternative to, physical interventions;
- to construct a methodological framework that reconciles documentary rigor, philological awareness, and the advanced use of immersive technologies.

The methodological approach is robust and replicable. The candidate explains in detail the tools employed – digital surveying, photogrammetry, laser scanning, BIM modelling, VR environments – specifying parameters, limitations, error margins, and the rationale behind methodological choices.

The case studies selected are an essential component of the methodological validation, as their different scales allow verification of the adaptability and robustness of the proposed framework. The empirical dimension is strong and demonstrates significant technical competence.

From a disciplinary perspective, the dissertation fits squarely within architecture and conservation studies, while also engaging with digital humanities and technological methodologies. The thesis integrates historical analysis, conservation theory, and immersive modelling, producing an interdisciplinary contribution representative of contemporary research directions.

4. Assessment of the Scientific Value of the Work

The scientific value of the dissertation lies in its ability to articulate a structured dialogue among three domains that are often approached separately: history of architecture, conservation theory and practice, and immersive technologies. This convergence is not merely interdisciplinary; it produces a genuine advancement in critical reflection.

The central notion of “immaterial reconstruction” – a conceptual nucleus of the dissertation – is an important and original contribution. The author convincingly argues that digital reconstructions should not be perceived as aesthetic surrogates or spectacular simulations, but as cognitive instruments capable of delivering spatial, narrative, and visual information otherwise inaccessible. The theoretical framework is broad, drawing upon phenomenology of perception, semiotics of the image, the philosophy of the copy, and theories of digital representation. This breadth, while intellectually rich, generates a certain unevenness: some theoretical sections are extensively developed, while others – potentially crucial – are treated more briefly.

The empirical work is rigorous and well executed. The VR models exhibit technical precision, spatial accuracy, and a refined sense of proportion and materiality. The candidate demonstrates maturity in addressing interpretative, epistemological, and cultural risks associated with VR, emphasizing source verification, transparency, and methodological caution. Less developed,



however, is the reflection on long-term digital preservation, data sustainability, and platform obsolescence – topics central to current debates in digital heritage.

Overall, the dissertation stands out for methodological solidity, technical rigor, and the capacity to articulate an original argument, placing it convincingly within international scholarly discussions on VR and conservation.

5. Specific Comments

Strengths:

- Solid theoretical and methodological foundation.
- Excellent mastery of digital surveying and VR technologies.
- Original and well-developed concept of “immaterial reconstruction.”
- Rigorous integration of historical, theoretical, and technical analyses.
- Well-selected and appropriately motivated case studies.
- High-quality visual materials and models.
- Clear, coherent argumentative structure.

Critical remarks and suggestions:

- Some theoretical sections would benefit from synthesis to avoid excessive length or redundancy.
- The discussion of conservation theory could be strengthened, particularly regarding the European (and especially Italian) tradition.
- Captions and explanatory apparatus accompanying visual materials should be expanded.
- Greater attention to long-term digital preservation strategies would be desirable.
- Strengthening the dialogue with European and international heritage literature would further enhance the theoretical framework.

6. Conclusion

Szymon Kowalski’s dissertation represents a significant scholarly contribution of high scientific and methodological quality. It positions itself authoritatively within the debate on architectural heritage conservation and the opportunities offered by VR. The work is characterized by

methodological maturity, technical competence, historical-critical sensitivity, and internal coherence.

The critical remarks provided are intended as constructive suggestions, particularly valuable should the candidate decide to develop the thesis into a publication – a highly desirable prospect given the solidity of the research and the relevance of the topic.

Final judgment:

The dissertation is of high scientific and methodological quality and fully suitable for public defence. I therefore recommend that the Discipline Council accept the doctoral dissertation of Szymon Kowalski and admit it to public defence. In view of its scientific merit and the originality of its contribution, I further recommend that the dissertation be awarded a distinction (cum laude).

Pavia, December 5, 2025

Prof. Arch. Massimiliano Savorra, PdD

A handwritten signature in black ink, appearing to read 'M. Savorra', with a stylized flourish underneath.