

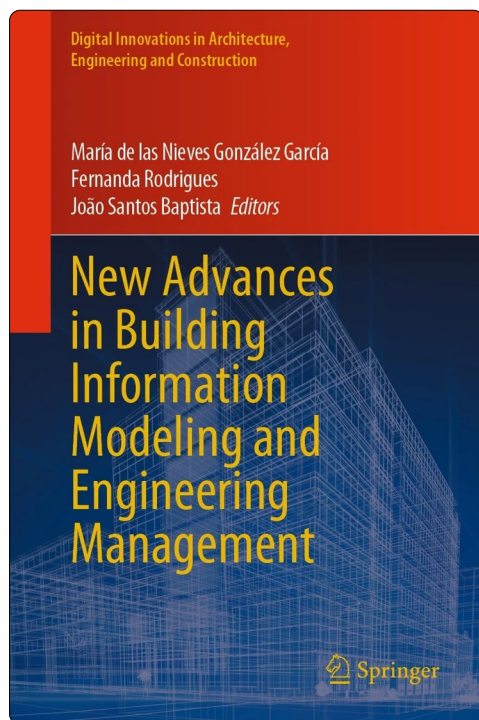
BOOK, CONFERENCE AND EXHIBITION REVIEW

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# New advances in building information modeling and engineering management: digital innovations in architecture, engineering and construction, by María De Las Nieves González García, Fernanda Rodrigues, and João Santos Baptista. Springer Cham, 2023. 231 pp. ISBN 9783031302473

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## 1 Introduction

The ever-evolving landscape of architectural preservation requires a proactive approach that harnesses the power of modern technology and demonstrates how it can reimagine the approach to heritage preservation. 'New Advances in Building Information Modelling and Engineering Management' emerges as a timely and critical contribution challenging traditional paradigms and paving new paths for managing built heritage. Aligning with the Built Heritage Journal's focus on the field of heritage management, the book offers a compelling vision of how Building Information Modelling (BIM) can revolutionise our understanding, protection, and engagement with built heritage.

The book, structured in thirteen chapters, explores the transformative potential of BIM to improve the technical aspects of conservation and restoration. Each chapter covers a specific aspect of using BIM to manage and preserve built structures: from meticulously crafted digital models that breathe life into long-forgotten architectural details to immersive augmented reality experiences that transport us through the layers of time. In this respect, the book promises an exciting glimpse into the future of built heritage management.

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Chapters 1 to 6 delve into the application of BIM in building maintenance management, providing practical methodologies to implement the interoperability between BIM and Excel. Taking Chap. 3 as an example, which is about the development of a methodology for the maintenance management of a 19th century building in Porto, Portugal, renovated in 2017, it is noted that one of the drawbacks of BIM is its limitation in the storage of semantic aspects and attributes, thus lacking adequate query functionality (Yang et al. 2020). However, while highlighting the benefits of BIM, more analysis on overcoming associated challenges and costs would be beneficial.

The unique challenges of modelling and managing complex geometries and materials found in older structures can be buildings, such as historical documents and records. However, these technologies, particularly Hyperledger Fabric and Composer, while can provides transparency, reliability, and efficiency, push the boundaries of BIM technology and improve its overall capabilities. Chapters 5, 9, 10, and 11 of this book highlight the importance of developing automated and innovative methods for efficient and effective building surveying. The authors explore the use of technology for building surveys. For instance, drone-only photogrammetric and thermographic surveys of historic buildings can efficiently integrate data into 3D BIM models for building energy analysis (Chap. 5). Chapter 9 emphasises the importance of smart technologies in construction, focusing on blockchain and BIM for smart energy management and sustainable construction. Blockchain technology ensures the security, accuracy, and authenticity of information exchange in construction projects, which can improve the maintenance, restoration, and verification of historical data associated with historic buildings, such as historical documents and records. However, these technologies, particularly Hyperledger Fabric and Composer, while can provides transparency, reliability, and efficiency to the construction process, are presented in hypothetical case examples in Chaps. 9 and 10 and have not been tested in real construction project environments. Further research and field trials are necessary to validate the effectiveness of blockchain technology in such environments.

Chapter 11 discusses the use of spreadsheet software such as Excel or OpenOffice to efficiently solve common planning problems. In addition, it explores optimisation methods in graphs that can be applied in the planning and management of historical buildings to maximise project duration and reduce costs. Chapter 11 has limitations in that the generalisation of the results obtained only applies to certain cases and cannot be generalised to other cases.

Chapters 4 and 8 are closely related to cultural heritage. In Chap. 4, various approaches to modelling complex and decorative architectural elements are discussed, with a case study focusing on Palazzo Vitelli, San Giacomo, a 16th-century building in Città di Castello. The chapter emphasises the importance of organising and sharing information from a public administration perspective to aid in the management and preservation of historic buildings. Additionally, it highlights the significance of collecting geometric, historical, and artistic information to enrich the HBIM (Historic Building Information Modeling) models with details about construction phases and works of art within historic buildings. Although Chap. 4 mentions the utilisation of photographs, historical documents, and laser scanning to enhance HBIM models, the lack of concrete examples or more in-depth case studies may pose challenges for readers in understanding the practical application of these approaches in real-life situations.

Chapter 8 highlights the use of a GIS-based management system in the Piaggine Building Park, a small historical centre in the National Park of Cilento and Vallo di Diano and Alburni near Salerno, Italy, to improve the energy performance of existing buildings. This system analyses both environmental and built heritage data, compiling a comprehensive database that showcases the life cycle of buildings and identifies issues such as illegal construction. With access to this information, both the public and private sectors can effectively monitor energy consumption, plan repairs or restorations, and safeguard the cultural heritage component of these structures. However, the discussion in Chap. 8 lacks depth regarding the environmental and social sustainability aspects of plans to restore historic buildings. Achieving a positive impact on the community and surrounding environment requires careful consideration of social, cultural, and environmental factors throughout the restoration process (Vafaie et al. 2023).

The focus of the discussion in Chaps. 2, 3, and 13 is on the use of technology. Chapter 2 explores the exchange of BIM data in the construction and development projects, incorporating NUIs (Natural User Interfaces) and AR (Augmented Reality) technologies to broaden access to BIM information among various stakeholders in the Architecture, Engineering, and Construction (AEC) industry. This chapter emphasise the value of AR as a tool for visualising historical data and enhancing visitor experiences at heritage sites by providing interactive information about a building's history, construction, and current condition. Chapter 3 discusses how mobile apps and other digital technologies have transformed the construction industry. By replacing antiquated management

plans with modern, technological approaches, these technologies enable faster and more efficient information exchange and control over the construction process. Next, Chap. 13 delves into the multidisciplinary and complex interactions between maintenance information systems, BIM in construction projects, and the impact of technology on people's lives, policy, and the real estate market. Digital technology in building management can affect heritage conservation, especially in historical and sustainable construction projects. For instance, BIM technology facilitates the mapping and preservation of historical buildings while ensure that new constructions adhere to heritage values.

Chapters 7 and 12 critically examine issues related to occupational health and safety, particularly within the construction industry. Chapter 7 conducts a comparative analysis of the 'Level of Preventive Action' (Lpac) method through a case study in the construction industry. This method evaluates risks and preventive measures in construction projects, with the aim of improving workplace safety and minimise occupational accidents. It is worth noting that the study encompasses only three countries (Brazil, Spain, and Portugal), which may limit the generalisation of findings to other construction contexts. Furthermore, Chap. 12 highlights that construction workers face high psychosocial risks, including stress, time pressure, and workplace harassment. In addition, the book also highlights the high rates of substance consumption, such as alcohol, tobacco, and drugs, among construction workers and their impact on health and safety in the workplace (Chap. 12).

Overall, the book provides rich content and numerous case studies, offering valuable insights into the potential of BIM to innovate cultural heritage management practices. Rather than prescribing specific methods, the book aims to stimulate critical thinking and understanding, inviting reader to embrace technology responsibly and rethink their approach to interacting with built heritage. Consequently, it offers valuable insights for built heritage professionals, BIM practitioners, academic researchers, whether architects, engineers, conservators, historians, archaeologists, directly involved in the management and preservation of historic structures.

#### Abbreviations

|      |  |
|------|--|
| AEC  | Architecture, Engineering and Construction |
| AR   | Augmented Reality                          |
| BIM  | Building Information Modelling             |
| HBIM | Historic Building Information Modelling    |
| LDM  | Lean Design Management                     |
| NUI  | Natural User Interfaces                    |

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