

Summary

Nowadays, the increasing complexity of buildings highlights the need for the Architecture, Engineering, Construction and Operations (AECO) sector to manage a large amount of data. In this scenario, the process of building digitalisation offers the opportunity to create virtual databases able to collect data from different disciplines and domains in a useful way for the building lifecycle. For this reason, Building Information Modelling (BIM) represents the innovative methodology capable of optimising the entire building process. Its application has been studied and documented in the design-to-construction phase, but it is important to underline its importance also in the Facility Management (FM) sector. Thanks to the creation of an integrated database, able to dialogue with Integrated Workplace Management System (IWMS) platforms and to manage a large amount of data, the adoption of this innovative method could overcome the existing gap in the building process between the implementation and management phases. Currently, the main challenges in the FM sector derive from the application of a traditional method based on a fragmented database characterized by a great data loss, while the main issues in the adoption of BIM methodology are mainly procedural and not technical, due to a lack of standardization.

Based on these considerations, the research thesis aims to analyse the definition of a BIM methodology standardization for FM based on the identification of a series of operating protocols which enrich the BIM procurement documentation through the development of proper guidelines. The results achieved may contribute to the creation of an operational background, composed of examples able to overcome the actual lack of standardization, making the proposed method more effective and highlighting its potential.

In order to investigate the proposed standardization, the definition of the BIM model uses connected to the FM field becomes essential. For the research case study, represented by the Allianz Stadium, the defined model uses are: the implementation of an As-is Model for FM, the Integration with an IWMS platform and the possible future implementation of FM system over Virtual and Augmented Reality (VAR). These could be reached through the operational declination of the corresponding objectives of Data Organization, Data Integration and Data Visualization.

The proposed methodology starts with the analysis of the As-built documentation and the investigation of existing FM and BIM standards to define the Level of information need for each model use and objective. The implementation of the BIM models oriented to these purposes is based on the definition of requirements that should be included in standards and guidelines. The developed BIM guidelines for FM contains the investigated methodology standardization defined as a set of activities related to the development, management and visualization of models. Their application allows the definition of operating protocols for the new concept of stadium 2.0.

The application of these activities for the Data Organization allowed the development of a possible As-is model of an existing building, based on an information database suitable for carrying out FM activities. On the other hand, the analysis concerning Data Integration identified several technical standards that should be considered for correct integration with the IWMS database, minimizing the loss of information. Due to the large amount of data and their central role, an automated BIM Model Checking (BMC) validation process of alphanumeric information, based on Visual Programming Language (VPL), has been implemented and connected to the concept of Data Validation. Finally, the study of possible uses of VAR applications highlighted their potential for consulting the information content during maintenance activities and as a possible validation tool.

The results of the thesis highlight the advantages of the application of the BIM methodology in the field of FM, proposing the developed of specific guidelines which are a tailor-made solution based on technical protocol, usable for other case studies with the same model uses. In this way, the lack of standardization is overcome and the operating content may vary if the objectives and uses change, but the methodology remains the same, enriching the second level of BIM maturity. The analysis of the digitalization process of the building sector carried out allows defining the new concept of stadium 2.0 that will be implemented in the future, representing the starting point for the digital “archive of the future”.

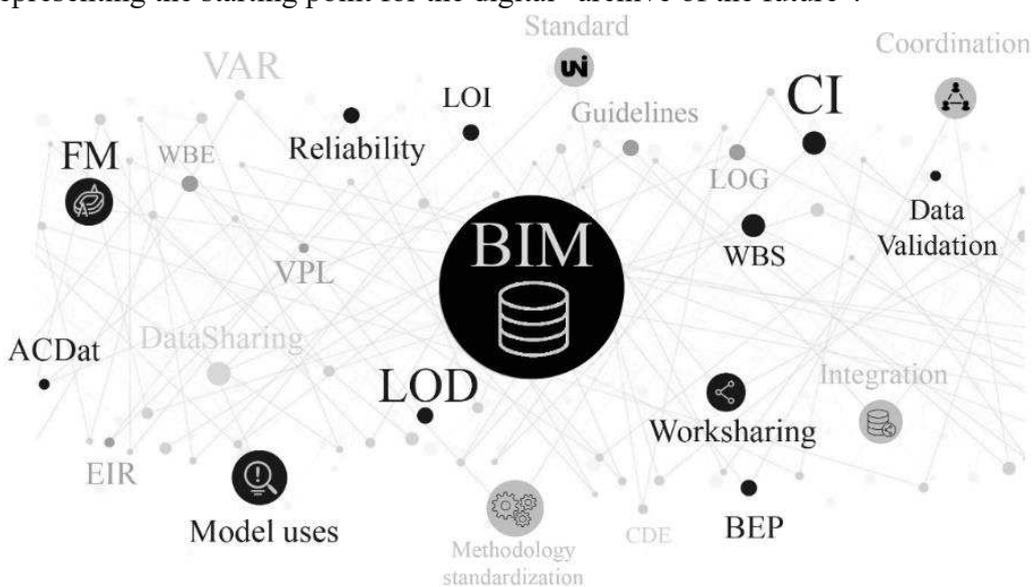


Figure 1 – Keywords of the research activity