From BIM to DT. A workflow for data integration

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Research Project

Abstract. The integration of data between BIM models and IoT devices enables the creation of Digital Twins (DTs) of existing assets and the management of big data produced at various stages of the building lifecycle, making it possible to experiment AI and data analytics for predictive analysis of building system behavior and performance.

The operation phase engages about 80 percent of the total investment and management costs of a building's life cycle, and the management and monitoring activities of spaces, building components, and facilities play a decisive role in ensuring the well-being of users and health and safety in living and working places. The BIM methodology has lead to the integration of information distributed across different databases and the definition of a centralized repository that can contain all information related to the building and its context[1]. In addition, the flow of data from IoT technologies deployed within buildings for real-time monitoring can be suitably integrated with the structured information implemented within BIM models for the development of decision-making processes and predictive analysis with the introduction of AI and ML techniques referring to the specific building environment[2].

As part of a collaboration with the Building Area of the University of Florence, a research program has been underway for the implementation of BIM models with the objective of create a CDE for information management[3] (fig. 1). In the first phase of this workflow, the available data are selected and catalogued, starting from the information obtained from archive sources and survey, defining the level of information need in relation to the different objectives and BIM Uses envisaged by the organization [4] (fig. 2). The next phase involves the integration of data between BIM models (fig. 3) and IoT devices in open and interoperable formats. The aim was therefore to create a DT, which would combine not only the data coming continuously from the sensors, to be made available to operators through appropriate devices, but also all the digital information related to the characteristics of the assets placed in the BIM model (fig. 4).

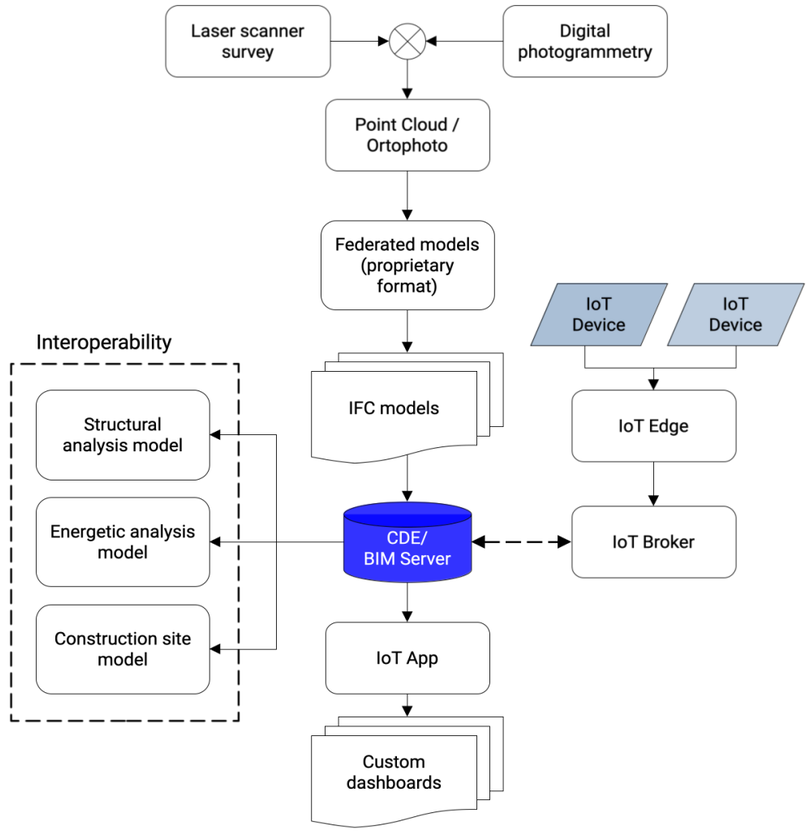

Fig. 1 Workflow for the development of a DT

Fig. 2 Office of sanitation ortophoto

References: [1] Mêda et al., 'Incremental Digital Twin Conceptualisations Targeting Data-Driven Circular Construction', Buildings, 2021 | [2] Pan & Zhang, 'Roles of artificial intelligence in construction engineering and management: A critical review and future trends', Automation in Construction, 2021 | [3] Daniotti et al., 'Digital Transformation in the Construction Sector: From BIM to Digital Twin', in Digital Transformation, 2022 | [4] Paparella & Zanchetta, 'BIM e digitalizzazione del patrimonio immobiliare', 2020. | [5] Snap4City, www.snap4city.org, last accessed 11/05/2023.

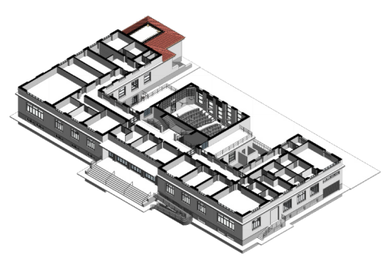

Fig. 3a Office of sanitation BIM model

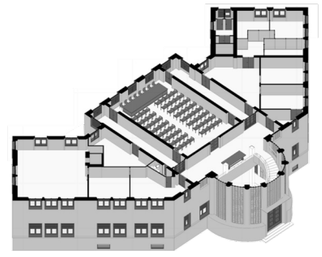

Fig. 3b Medical presidency BIM model

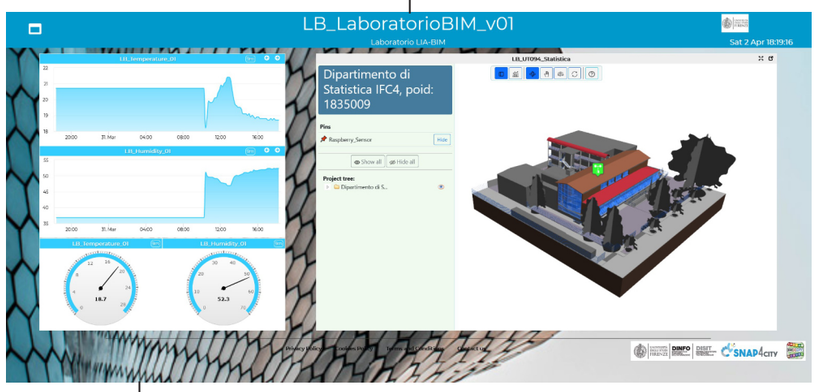

Fig. 4 Dashboard on Snap4City platform [5]

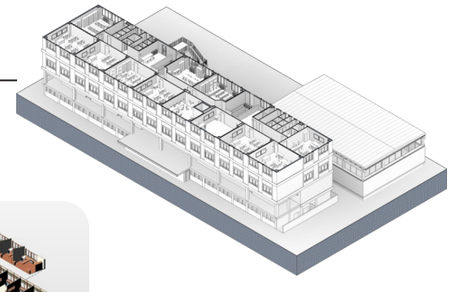

Fig. 3c G. Rodari school BIM model

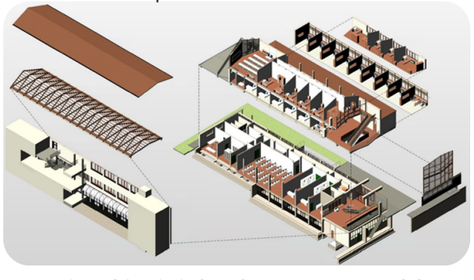

Fig. 3d Statistic headquarter BIM model

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