

Developing a Web-based BIM Asset and Facility Management System of Building Digital Twins

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ABSTRACT

A digital twin involves technology including data analytics, artificial intelligence and IoT that acquire and analyse heterogeneous data from multiple sources, which creates a living digital simulation model that supports the decision-making process. The adoption of building information models (BIM) is one of the core digital twin technologies that can be applied in architecture, engineering, construction, operation, and facility management (AECO/FM) sectors. However, current developments related to building DTs are at an early stage in the building life cycle, especially regarding integrating and analyzing asset and facility management technologies. This study presents a novel holistic system to construct a building-level DT integrating BIM data in the building life cycle from a multi-stakeholder perspective. First, current challenges faced by stakeholders are documented and analyzed by a requirement model. Then, a multilayered framework is proposed to underpin the complex requirements when tackling the challenges. This framework assists five major areas of asset and facility management: space, energy, operation, safety and maintenance. A web-based system based on the proposed framework is developed and visualized through a game engine in a case study for a commercial building in China. This developed building-level DT system is comprehensive, robust, and can efficiently and effectively satisfy the requirements of different stakeholders, such as the estate management team and maintenance staff, who may not have BIM experience. Finally, insights and challenges for researchers and practitioners are concluded and discussed.