

BIM Data and Digital Twin Framework: Preserving the Past and Predicting the Future

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Abstract : This research presents a framework used to develop The Ara Polytechnic College of Architecture Studies building “Kahukura” which is Green Building certified. This framework integrates the development of a smart building digital twin by utilizing Building Information Modelling (BIM) and its BIM maturity levels, including Levels of Development (LOD), eight dimensions of BIM, Heritage-BIM (H-BIM) and Facility Management BIM (FM BIM). The research also outlines a structured approach to building performance analysis and integration with the circular economy, encapsulated within a five-level digital twin framework. Starting with Level 1, the Descriptive Twin provides a live, editable visual replica of the built asset, allowing for specific data inclusion and extraction. Advancing to Level 2, the Informative Twin integrates operational and sensory data, enhancing data verification and system integration. At Level 3, the Predictive Twin utilizes operational data to generate insights and proactive management suggestions. Progressing to Level 4, the Comprehensive Twin simulates future scenarios, enabling robust “what-if” analyses. Finally, Level 5, the Autonomous Twin, represents the pinnacle of digital twin evolution, capable of learning and autonomously acting on behalf of users.

Keywords : building information modelling, circular economy integration, digital twin, predictive analytics

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