Heritage Building Information Modeling (HBIM): Australian Landscape

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Abstract

Building Information Modelling (BIM) has been widely used in Australia for over a decade, gaining significant traction in the construction and infrastructure sectors. While it's challenging to pinpoint an exact date for its widespread adoption, BIM began gaining prominence in Australia around the mid-2000s, with its utilization steadily increasing since then in the construction industry more generally (Olatunjiand Kumaraswamy, 2015).

The integration of Building Information Modelling (BIM) technology into heritage building conservation, known as Heritage Building Information Modelling (HBIM), represents a significant advancement in the management and maintenance of historic structures (Cheng et al., 2015; Logothetis et al., 2015).

This paper explores the extension of BIM to heritage buildings, emphasizing its potential to streamline Facility Management (FM) operations. By incorporating FM applications, HBIM can record building pathologies, maintenance histories, and current conditions directly within 3D models, which are accessible to maintenance operators. This integration enhances the monitoring and maintenance of heritage buildings, leveraging cloud-based or in-house data storage to ensure secure access to pertinent information.

The implementation of HBIM allows for the integration of traditional building inspection methods with technological innovations, providing additional tools to monitor hard-to-access areas. While physical inspections remain necessary, HBIM offers supplementary means of recording and monitoring until such technologies mature to potentially replace manual inspections. Recording of building pathologies and maintenance issues can be added directly into the 3D models of the buildings and can be accessed by maintenance operators to enable them to review the history of repairs and current condition of the building components. Models and all pertinent integrated information and data can be stored in the ‘Cloud’, or in an in-house data-storage facility depending on the security protocols of the building owners. Eventually, utilising BIM integrated with FM databases will integrate the updates of maintenance and repairs into a lifecycle forecast simulation of any heritage building.

Technological innovations can be streamlined and integrated with the traditional types of building inspections to include sketches, photographs, and measurements drawn from the systems mentioned above. BIM-generated information is not intended to fully replace physical building inspections; these new innovations will provide additional tools to monitor places which are hard to access during a building inspection. HBIM can already accommodate FM operations of heritage buildings (Cheng et al., 2015) and SHM is available to aide conservators in routine inspections (Anastasi et al., 2009, Ceriotti et al., 2009, Wu et al., 2010). These technologies will serve as supplemental tools for recording and monitoring until physical inspections become redundant due to the new systems maturing to a more sophisticated technological level.

One of the case studies undertaken for this research, the Sydney Opera House (SOH), is already using the very latest state-of-the-art technology to solve the issues pertaining to the collection and retention of accurate building documentation and recording historical data about the building. The Sydney Opera House collects all of the data from the existing building maintenance system – which is called 'Maintrack' for their facilities management operations and integrates them into a building information model (BIM). All repairs, building pathology, and other important records are being kept on a centralised FM/BIM database, so that existing and future operators can easily retrieve any important information they require for planning future maintenance, repairs or other building-type works.

The case study of the SOH demonstrates the application of state-of-the-art HBIM technology, integrating existing maintenance data into a centralized FM/BIM database. This approach facilitates the efficient retrieval of essential information for future maintenance planning. Although high-profile heritage buildings like the Opera House can afford this sophisticated technology, broader adoption is anticipated as costs decrease and systems become more accessible. Figure 1 illustrates diagrammatically the Sydney Opera House system.

It will only be a matter of time before the majority of the monitoring and recording of maintenance information and operations related to heritage buildings will be coded in the BIM environment and then those applications will be linked with any facility management system so that continual updates of maintenance operations can be monitored and managed. Mathematical and computer simulations of a building's lifecycle, deterioration and required renewal profile can also be derived using this platform. Ultimately, the widespread adoption of HBIM for heritage buildings will enable continuous updates of maintenance operations and support lifecycle forecasting, enhancing the preservation and management of historic structures.

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Figures

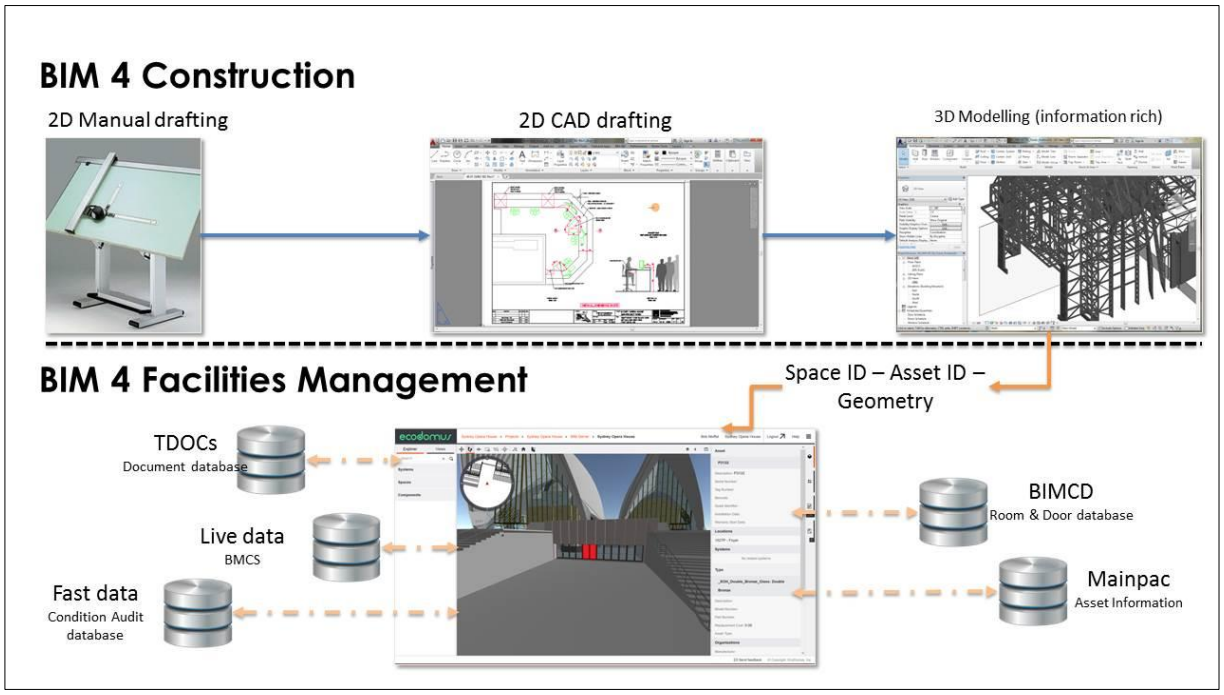

Figure 1 Sydney Opera House FM/BIM streamlining