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Building Information Modeling (BIM) for operational management of facilities

ABSTRACT

The design and construction of a building involves the use of Building Information Modeling (BIM) to create building models for various purposes, such as structure, plumbing, mechanical, etc. coordination. Once construction is completed, these models are no longer utilized during the operational use of the building. The techniques of this disclosure enable the construction and use of BIM that support building operations and maintenance by intelligently and proactively identifying issues that need to be addressed, thus saving costs and increasing service efficiency.

KEYWORDS

- Building model
- Facilities management
- Asset management
- Building plan
- Building operations

BACKGROUND

The application of building information modeling (BIM) in facility management (FM) has the potential to improve the lifecycle performance of buildings. BIM has been applied to buildings in the design and construction phase of building development; however, these two phases only account for approximately 15% of the total building life cycle cost. Currently, the BIM developed during design and construction is not developed to support facilities management and maintenance activities. Moreover, the parties responsible for design and construction are typically different from those responsible for managing the facility. As a result, once

construction is completed, the BIM is typically not utilized during the operational phase of the building.

Further, the BIM developed during design and construction is done using different modeling software with various levels of detail integrated per trade, e.g., mechanical trades could use CADduct for fabrication vs architectural using Revit for design. As a result, current techniques do not support the integration of various BIM created during the design and construction of a building into a single model that can support common operational needs.

DESCRIPTION

The techniques of this disclosure enable the construction and use of BIM to generate a building model to support building operations and maintenance. This is achieved by the involvement of the building owner during the design and construction phases during which the model is created. Specifically, the building owner provides requirements for the development of the model and associated data. Since the building owner is responsible for the facilities operations after construction, the requirements provided by the building owner are based on anticipated operational and maintenance needs.

Once construction is finished, control of the building is handed over to the building owner along with the BIM for the building that was generated based on input from the building owner. The model supports use of techniques, such as machine learning and virtual reality, to help facilities management be proactive about identifying and addressing building maintenance and warranty issues.

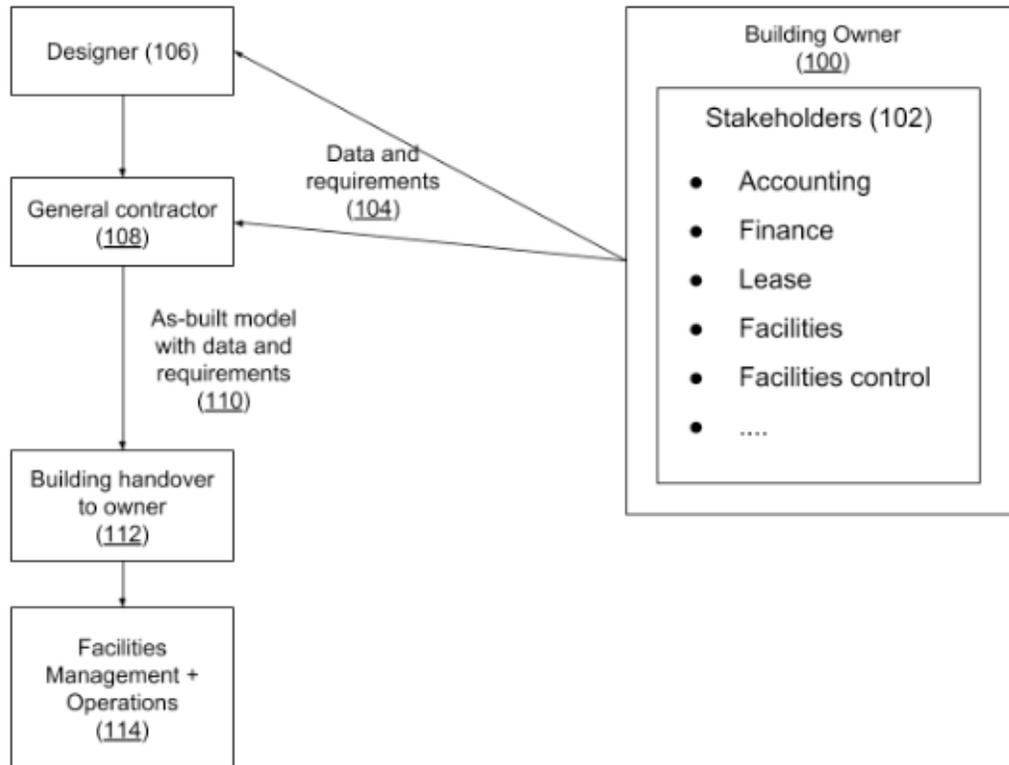


Fig. 1: Provision of as-built building information model to support building facilities management

Fig. 1 illustrates the process to generate a BIM model to support building facilities management, according to the techniques of this disclosure. A building owner (100) is an entity that has several stakeholders (102), e.g., accounting and finance departments, lease, facilities management, facilities control, etc. The building owner determines operational and data requirements (104) for a building with input from the various stakeholders based on anticipated needs for the operation and maintenance of the building. The operational and data requirements are provided to a designer (106) and a general contractor (108) that are tasked with designing and constructing a building for the building owner.

The designer and general contractor take into account the requirements of the building owner along with specific design and construction needs such as structure, plumbing, mechanics,

etc., along with the operational and data requirements. Prior to building handover to the owner (112), the general contractor provides an as-built model (110) to the building owner. The building owner, e.g., facilities management and operations teams (114) utilize the model to support facility management for the building in an operational phase during which the building is utilize.

The techniques of this disclosure enable building owners to specify data and labels for various building entities, such as walls, ceilings, rooms, etc., and objects, such as hand dryers, sinks, sensors, light fixtures, etc. Such data can be analyzed using techniques such as machine learning to support proactive and automated ways to carry out facilities and asset management, thus reducing costs and increasing efficiency.

Further, the building owner can specify software and/or standards for generating the model in order to ensure that the model supports the software and processes used for facilities management. For instance, the model may be made compatible with augmented and virtual reality (VR) systems, thus allowing it to be rendered in an interactive 3D space to facilitate an effective user experience for asset management, team collaboration, and facility management.

The techniques of this disclosure can be applied for a single building or a collection of buildings. Alternatively, a part or all of the processes can be incorporated to extend existing building industry standards, such as AIA (American Institute of Architecture). In addition, the techniques may facilitate the creation and development of new standards for BIMs to support facilities and asset management.

CONCLUSION

The design and construction of a building involves the use of Building Information Modeling (BIM) to create building models for various purposes. However, design and

construction account for only about 15% of the costs over the lifecycle of a building, with the remaining roughly 85% spent on operations. Yet, once construction is completed, these models are typically not utilized during the operational phase of the building. The techniques of this disclosure enable the construction and use of BIM that support building operations and maintenance by intelligently and proactively identifying issues that need to be addressed, thus saving costs and increasing service efficiency. The techniques involve the building owner to provide interested data fields to be collected (e.g., light fixture specification with serial number etc.) applicable for business operations during the design and construction phases in which the model is created.