How Healthcare Leaders Are Using Building Information Modeling to Transform Operations & Maintenance

A Guide to Applying BIM Data to Healthcare Operations & Maintenance

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Introduction

Building information modeling (BIM) has transformed the way that buildings are designed and delivered, particularly when it comes to the construction of highly complex buildings such as healthcare facilities. Designers and contractors have found that using BIM can greatly reduce common errors that may not otherwise be discovered until components arrive onsite, resulting in improved scheduling and lower costs.

The operation of complex medical facilities comes with its own significant challenges. Yet few healthcare organizations today are harnessing the potential operational improvements that can come from having BIM data at their fingertips. Much of the data needed for operations and maintenance (O&M) processes already exists in the BIM models turned over following construction, or could easily be included in these models with some advance planning. That healthcare lags other industries in its adoption of BIM for operations is particularly surprising since these complex buildings, with their critical missions, potentially stand to gain the most from using this data.

This paper will explore the potential benefits BIM presents for improving healthcare O&M. Understanding the varied ways in which this data can be used (in fact, at present few health systems seem to be using the data in exactly the same way) can help guide healthcare facilities departments in determining how to put BIM data to use in their ongoing operations.

Future papers in this series will explore the first steps to take to effectively use BIM data in healthcare O&M, and challenges to address in integrating BIM into existing processes. The series will also address the benefits of creating a shared standard and/or knowledge base for broader implementation of BIM data in healthcare O&M processes.

The Data Disconnect Between Healthcare Construction and O&M

The 2015 Dodge Data & Analytics Smart Market Report, Measuring the Impact of BIM on Complex Buildings, notes that although many owners of complex buildings understand the significant benefits BIM can present an operations team, “few owners in the U.S. are currently capitalizing on this opportunity.”
The report goes on to indicate that more than half of contractors (52 percent) surveyed, primarily general contractors, frequently or always provide models to building owners at the close of construction. Despite this, few of these owners are putting the data available into operational use in the ongoing management of facilities. In fact, of the 86 percent of those owners who occasionally or more frequently receive models, only 17 percent of those owners report using data from the models for facility management. Nowhere is this truer than in the healthcare industry.

Health Facilities Management found in its 2016 Hospital Construction survey that while 48 percent of project managers are using BIM for hospital construction, only 34 percent of survey respondents reported using it for O&M. This is in line with data from the 2014 survey (33 percent using BIM for O&M).

Healthcare owners understand that BIM holds tremendous potential for boosting operational efficiency. One significant challenge, however, has been in understanding what data to use and how to connect that data to existing systems and processes.

BIM models can hold vast amounts of data. Much of the data handed over by the construction team following commissioning might be completely irrelevant to facility maintenance professionals. In addition, some of the data that could boost operations might not be necessary for design and construction so, although it could easily be entered during those phases, that data may not be included in the model. To understand what data is needed, it may help to explore some of the potential benefits that BIM can present for O&M processes, described on the following pages.

### Understanding BIM’s O&M Benefits to Determine Data Collection

During design and construction, BIM is used as a means for communicating various project activities and boosting collaboration across project teams. These models house accurate real-time information that helps project teams make informed decisions and quickly respond to project needs.

Because these intelligent models are shared between numerous parties—from architects to specifiers and general contractors to an array of specialized fabricators and subcontractors—they gather...
increasingly detailed levels of data throughout the construction process. Much of that data is the same information that maintenance teams might later spend countless hours collecting in order to populate a computerized maintenance management system (CMMS).

Consider the example below of the data that might be captured in BIM about a simple component, the glycol pump in your chilled water system.

<table>
<thead>
<tr>
<th>Phase</th>
<th>Data Captured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design</td>
<td>→ Expected gallons per minute the pump will deliver</td>
</tr>
<tr>
<td>Shop drawings</td>
<td>→ Model name</td>
</tr>
<tr>
<td>Procurement</td>
<td>→ Serial number</td>
</tr>
<tr>
<td>Installation</td>
<td>→ Installation date</td>
</tr>
<tr>
<td>Commissioning</td>
<td>→ Validation testing data</td>
</tr>
</tbody>
</table>

With access to data like this on Day One, a facility maintenance team can save significant time that would otherwise be devoted to entering assets one by one into a CMMS system. Some healthcare facility managers find that this manual data collection process can take up to a year to complete. This data can be used to ensure peak operational performance, to track preventive maintenance, make claims before the warranty ends, and countless other tasks.

Of course, this is only a small piece of the data collected during design and construction processes. Determining what data to gather is an important step in effective use of BIM for O&M, which we’ll expand upon in a later paper in the series.

**Examples of BIM Data Benefits for O&M**

Healthcare owners and facilities managers understand that the data gathered in BIM throughout the design and construction processes possesses tremendous potential value for facilities management. Because use of BIM in healthcare operations is still in its infancy, healthcare facility and BIM managers are still discovering the many ways in which this data can improve processes.
Examples of how BIM data is being used in healthcare operations today include the following:

1. **Reaping cost and time savings.**
   - BIM’s biggest benefit is its ability to reduce errors and omissions in the design stage. This leads to reductions in change orders, with their significant associated costs. Meghan Ruffo, AIA, contract BIM manager for Carolinas Health System in Charlotte, N.C., is now taking that a step further and using BIM as a standards check on projects, ensuring that the right finishes are used, for example, or running basic code to ensure doors or dampers located in fire-rated walls have been appropriately marked.
   - BIM is also helping Carolinas Health System easily check the interfaces between certain equipment and necessary infrastructure. Rather than checking the typical 200-page pdf of equipment data against the design to ensure services such as electrical power or water lines are in place, the team now imports into BIM the Excel sheet used to order the equipment. The program places the equipment in the model along with any service requirements.

2. **Improved space management.**
   - Accurate space management data is crucial for healthcare systems that rely on Medicare and Medicaid reimbursements. Including that data in a BIM model during the design stage requires no additional work from the designer—it simply requires input from the individual in charge of the space analysis to ensure that data is included.
   - Carolinas Health System had a number of facilities where space management data was not available. Previously someone might have gone in and drawn the space in CAD. Instead, Carolinas Health System has found it is almost twice as fast to generate this space data in a Revit-based BIM model.

3. **Improved asset management.**
   - Mayo Clinic is getting to work on asset management with its O&M department. John Muhler, an architect handling campus planning and design, offers an example of the work the system is undertaking: Since the Joint Commission requires all fire dampers be tested and documented, the facility is aiming to keep fire
damper asset information in a Revit model and share that model with O&M to use in the field. They will not only have all the asset information—and the ability to document it for The Joint Commission—but they will also have a graphical 3D model of exactly where to find the fire damper above the ceiling.

- Joe Porostosky, director, facilities information and technology services, The Ohio State University in Columbus, Ohio, says that requiring future projects to ensure all data is turned over in the needed format will mean that the department has certain needed asset attributes available from Day One, along with easy access to O&M manuals.

4. **The ability to exploit warranty information.**
- The Ohio State University is also exploring how BIM can be used to better reap the benefits of warranties. When building components break, the facilities department often fixes it because warranty information isn’t always easily available, accurately entered in the CMMS or entered before the warranty period has expired. Because BIM captures the installation date of all systems under warranty, that data is available on Day One—and the health system can potentially reap significant savings in warranty claims.

5. **Greater ease in meeting standards.**
- Carolinas Health Systems has created a tool that runs inside of Revit that ensures contractors are only able to select finishes and schedules that are part of the approved standard. There is no longer a P1 or P2—or time wasted identifying what P1 means to various concurrent projects.

**Creating the Roadmap Guiding Use of BIM in Operations**

There is no true roadmap today for implementing BIM in healthcare operations, and that may deter some health systems from investing in the technology, processes and training needed to get started. Finding a place to start often presents its own challenge, since the benefits are so
varied. But in spending too much time finding the “right” place to start, health systems are losing out on gaining any benefits.

Chuck Mies, senior manager, AEC business development, for Autodesk Inc. in San Rafael, Calif., explains it this way:

“If you can just extract the space management information out of the BIM that the architect turns over to you and it helps you manage space—but you haven’t figured out assets—that’s good enough. I too often see organizations fall into ‘analysis paralysis.’

I’ve got one healthcare organization that has been having the same conversation about BIM for two years. They’ve had two new buildings come online in those two years and they’ve missed the opportunity to get any benefit because they’re still trying to figure out the big picture.”

While use of BIM in facilities operations has risen in recent years, in most cases facilities departments are each creating their own processes for using BIM data. Each organization is starting from the beginning, rather than benefiting from knowledge sharing among organizations that have already put best practices in place. Yet ongoing research conducted by FM:Systems in partnership with the Georgia Institute of Technology indicates that most facilities require similar attributes to begin operations.

As more healthcare systems take a leadership role in harnessing BIM data for improving facility operations, potential benefits will become more visible. By sharing knowledge on benefits, best practices and even failures, all healthcare organization stand to gain efficiency improvements that can move building performance forward industry-wide.

Of course, organizations also stand to gain a competitive edge in adopting today the tools that will become part of the standard operating procedure tomorrow.
About the Health Care Institute

The Health Care Institute (HCI), an IFMA Alliance Partner, serves a constituency that interacts directly with the business office and/or C-suite, and supervises multiple aspects of healthcare facilities management including healthcare facility design, construction and operations. HCI is one of the most prominent healthcare facilities-related organizations internationally, with members throughout the world.

HCI’s nationwide educational seminar series has traveled to 25 different cities (some multiple times), resulting in a forum where facilities managers can problem solve with healthcare architects, designers, engineers, contractors and administrators.

For more information about HCI, visit [http://hcinstitute.info](http://hcinstitute.info). Questions can be directed to media@hcinstitute.info.

About BIM for Healthcare Owners

BIM for Healthcare Owners is a collaborative community created for healthcare owners, and managed by healthcare owners, offering support for the BIM evolution. By creating a venue outside of the influences of the AEC industry from which owners who are practicing or interested in BIM can share best practices, have discussions on process and technologies, and examine successes and failures, the organization hopes to help others advance their BIM programs.

For more information about BHO, visit [http://www.bimforhealthcareowners.com/](http://www.bimforhealthcareowners.com/).

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