Making Sense of BIM for FM:
Managing for the Building Life Cycle

By Michael Schley, CEO and Founder, FM:Systems

Building Information Modeling (BIM) is transforming architecture, engineering and construction by providing accurate, timely, and relevant information throughout the lifecycle of a building. While the use of BIM technology for facility management is still developing, the potential to dramatically improve the effectiveness of building lifecycle management is clear.

What is BIM?

At its most basic, BIM encompasses two key attributes:

- Object Intelligence- the ability to associate material and assembly data with graphic elements.
- Three Dimensions- complete three-dimensional graphic representation of buildings.

A more comprehensive definition of BIM has been proposed by construction company M.A. Mortenson.[1] According to Mortenson, BIM must exhibit six key characteristics:

- Digital
- Spatial (3D)
- Measurable (quantifiable, dimension-able, and query-able)
- Comprehensive (design-intent, building performance, constructability, and including sequential and financial aspects of means and methods)
- Accessible (to the entire AEC/owner team through an interoperable and intuitive interface)
- Durable (usable through all phases of facility life)

BIM- The Current State

While BIM is widely considered to be a single, unified technology, this is not currently the case. Leading software developers such as Autodesk, Graphisoft, and Bentley Systems have clearly developed very capable technology that serves the building design, engineering, and construction phases of the building's lifecycle. Moving into the more diverse requirements of the occupancy and management phase of the building's life entails a variety of other technologies and software. Fortunately, software developers are moving rapidly to accomplish the integration needed between these various systems. Most likely the result won't be a single software package but rather sets of compatible software programs that support interoperability.

[1] BIM Handbook, Eastman, Teicholz, Sacks, Liston, John Wiley & Sons, 2008

Evaluating the current state of BIM technology against Mortenson's six criteria shows that BIM has not yet reached its full potential. Although BIM is digital, 3D, and measurable, at this time it is not completely comprehensive, accessible to the entire AEC/Owner team, nor durable.

Benefits of BIM for Building Design

The benefits of BIM for architects and engineers are significant. First, for many design firms, the new BIM software tools support a better way of designing buildings. With the complexity of modern buildings and the difficulties of preparing construction documents using two-dimensional CAD drawings, BIM software programs provide major advances in managing information.

Second, the ability of BIM software to easily generate realistic three-dimensional views and even walk-throughs makes visualization a free by-product. This not only provides valuable guidance to the designer, but is tremendously helpful in communicating a design to clients.

Third, BIM software supports various types of building analyses. In particular, integration with energy analysis programs provides essential information early in the design process to guide decisions on building materials and mechanical systems.

Benefits of BIM for Construction

Although the benefits of BIM during the construction phase are less obvious, they are compelling. First, the ability of BIM tools to track phases of construction is valuable in construction coordination. For general contractors in particular, BIM tools for coordinating space and schedules are very effective, particularly for large projects on urban sites where staging areas are always at a premium.

Secondly, software tools for clash detection provide ways to reveal layout errors in advance, thereby enabling more cost effective resolutions and fewer expensive change orders.

Benefits of BIM in Facility Management

While BIM has proven its value in design and construction for five years or more, the necessary technologies for using BIM in FM are only now emerging. A large number of new building projects have been designed and built with BIM software. However, there is a tremendous opportunity to leverage this store of information and greatly improve the practice of facility management.

Although we are still at the early stage of understanding the ways that BIM can be used throughout a building's life, there are at least six areas that are proving valuable.

Preventive Maintenance

Information about building mechanical equipment stored in BIM models is valuable in creating the database needed for ongoing preventive maintenance. Equipment that requires regular inspection and upkeep, particularly HVAC equipment and life-safety systems are of particular significance. Also, information about air and electrical distribution systems that undergo periodic modification is valuable to facility managers.

Space Management

BIM models provide a useful starting point for space and occupancy management. Organizations that occupy large amounts of office space will benefit from this information. By integrating building data with HR data, organizations can reduce vacancy and ultimately achieve major reductions in real estate expenses.

Energy Efficiency Initiatives

Since commercial and industrial buildings are responsible for almost 20 percent of the energy consumption in many countries, there is a mandate to analyze options to improve energy performance. BIM plays a significant role by facilitating the analysis and comparisons of various alternatives.

Base of Ongoing Changes

Managing accurate record drawings has long been a challenge for building owners and facility managers. Although BIM does not obviate the effort required to maintain accurate building data, it does provide two advantages over traditional CAD technology:

- BIM provides an easier means of representing three-dimensional aspects of the building. This is particularly important for representing mechanical systems.
- BIM models can carry extensive data about assemblies, finishes, and equipment items.

Lifecycle Management

Recent emphasis on sustainability has raised the profile of building lifecycle management. Responsible owners are realizing that this makes sense both economically and ecologically. BIM provides value in managing relevant data about current building conditions and facilitates the analysis of alternatives. Some building design professionals are embedding data on life expectancy and replacement costs in BIM models, thereby helping an owner understand the benefits of investing in materials and systems that may cost more initially but have a better payback over the life of the building.

Building Automation Systems

Building Automation Systems (BAS) provide real-time monitoring and control of the sophisticated electrical and mechanical systems used in today's buildings. Experience has shown that effective building operation is critical to achieving the potential energy savings. Although work is still in early stages, integrating BIM with Building Automation Systems will provide significant benefits, particularly for technical buildings such as hospitals and laboratories.

Keeping BIM Alive

It is common to hear discussion about the BIM handover, implying that useful information will be exported to standardized formats for import into other systems. While there is value in this approach, the one-way migration of data all too often results in the BIM model "dying a premature death." A better approach is to use technology that works bi-directionally between the BIM system and other building management systems. This enables the BIM model to retain its usefulness throughout the life of the building.

Challenges

Although BIM makes it much easier to track building information, there is still effort required to develop information that is current, accurate, and relevant. To obtain true value from BIM, facility managers need to be engaged in the process of information management. This is particularly true due to several "realities" of BIM:

- In order to be useful, information must be updated and verified. For many categories of building information, the cost of doing this will simply not be justified by the value.

- Design intent information is not the same as as-built. When architects and engineers prepare BIM models for design, bidding, and construction; materials and components are defined generically. Specific decisions on manufacturer and product selection are left to the general contractor, the subcontractors, and the specialty suppliers and contractors. Subject to complying with the design documents, contractors are expected to use this freedom of selection in order to achieve a more competitive cost. Although typical construction procedures call for record documents to be provided to the owner at the completion of project, this information is typically provided in the form of paper or scanned documents.

Conclusion

BIM technology applied to facility management is in early stages. Although the ultimate application of BIM to facility management is still being refined, there are ample benefits today to justify the effort. Architects, engineers, contractors, building owners, and facility managers who begin using BIM data today and bridging the information divide will reap the greatest benefits.

About the Author

Michael Schley is the CEO and Founder of FM:Systems, a leading developer of facility management software based in Raleigh, North Carolina, USA. He is responsible for overseeing FM:Systems operations and guiding the company's product direction.

Mr. Schley is recognized globally for his expertise in FM technology and has spoken at numerous conferences throughout the world. He was recognized in 2008 as an IFMA Fellow, chairs the FM Advisory Council for Cornell University, and serves on the IFMA Foundation Board of Trustees.

Mr. Schley has a Master of Architecture degree from North Carolina State University and a Bachelor of Arts degree from Case Western Reserve University.

He can be reached by email at mschley@fmsystems.com.