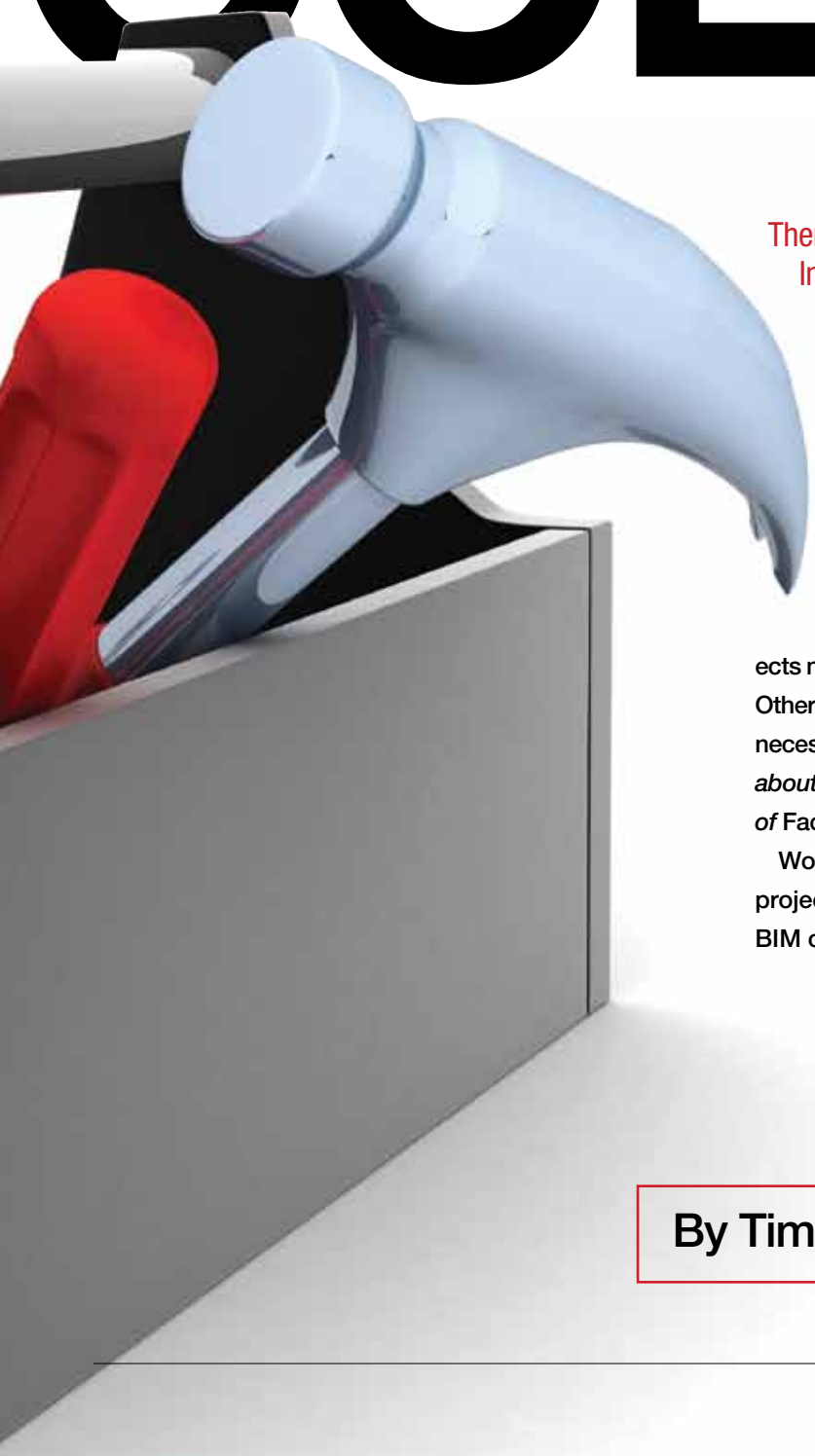
BIM in the FACIL T

ITY MANAGER'S TOOLKIT



There has been a tremendous increase in use of Building Information Modeling (BIM) in the design and construction industry. There have been numerous case studies that have documented the improvements. The majority of these improvements have focused on better coordination of design resulting in fewer Requests for Information and/or change orders. There have also been a number of projects that have reduced timelines due to the more precise design documents.

The owners and facility managers have been slower to adopt BIM. A portion of this delay is directly related to projects moving from design to construction to substantial completion. Other delays may be related to the increased investment that is necessary to move to a BIM platform. [*Editor's Note: Read more about BIM and facilities management in the May/June 2009 issue of* Facilities Manager *and in APPA's Body of Knowledge (BOK).*]

Working with the design and construction team on a new project is the ideal time to being exploring the advantages that BIM can provide to the facility manager.

By Timothy M. Peglow, P.E., MBA, MSE

FROM DESIGN TO CONSTRUCT TO MANAGE TO RENOVATE TO DEMOLISH

Routinely, as projects move through their life-cycle process from design to construction to occupancy, information is lost. This loss of data can come from a number of sources, including change in project team personnel, inadequate transfer of information on key assumptions, or change in expectations or strategies on multi-phase projects.

The ability to capture information in a systematic way throughout the project provides the opportunity to improve understanding of the capabilities and performance of the facilities throughout the process especially upon completion.

Practically, a well-designed model can be modified as the facility needs change or expand. These changes can be in the physical nature of the facility or information about the facility. A BIM model may start with basic room or space information and expand to include robust information on various assets or spaces over time. The initial model may include location of fire alarm or telephone outlets the later phase may include make, model, and identifiers used in the fire alarm system.

The model must be managed in near real time to assure integrity of information. The success of a BIM model is the accuracy and ease of access of the information. If the model is not maintained, it will cease to be an asset to the facility management team. This has been the author's experience with past practices of basic CAD floor plans and traditional paper methods of information capture.

BETTER TOOL FOR FACILITY DATA MANAGEMENT

As one begins to explore BIM, the support for data input and analysis is much more robust than with previous CAD tools. Revit includes bidirectional flow of information using various tools such as external spreadsheets or schedules of information. It is also easier to modify properties for various elements in the BIM model.

Adding additional elements is not much more difficult than adding a column in a spreadsheet. Auto formatting as well as using drop-down menus or yes/no options improves data integrity.

This flexibility and power does create challenges during the implementation process. It requires careful design of data elements and expectations by the facility manager. The other options to personalize the BIM model to the particular nuances of a facility manager are to post process the information received from the designer or contractor using either in-house expertise or outsource the post processing.

The base Revit software provides a good starting point for designing data collection plan. It is my experience that developing a common connecting identifier for assets is important to integrate information between systems. If the facility tracks assets or spaces with a unique identifier the data collection and entry scheme should include a plan to support the identifier, i.e., if a facility manager assigns a number to an asset in CMMS the same number should be used in the BIM model.

Equipment manufacturers are developing BIM families that provide significant amounts of information about their equipment. Wherever possible, using these families will increase the accuracy of the model and the information available in the model.

MANAGING PERFORMANCE OF SYSTEMS WITH BETTER SYSTEM INFORMATION

One of the exciting tools in BIM is the ability to review system-level information with modifications. I

have spent many hours with my team trying to determine simple items such as how many sinks and toilets are connected to a sanitary sewer line, or how many coiling coils are connected to which chilled water pipes. If the BIM model is maintained it is easy to understand what capacity is or is not available in the current infrastructure. Accurate models can also be used to develop more precise troubleshooting and recovery scenarios.

Current trends indicate that energy modeling and performance analysis will be more accurate and reliable in the near term. There are a number of specialty programs that have been developed to help manage the design and operation or facilities. As these programs improve it can help the facility manager better understand the potential efficiencies for a facility.

More accurate asset and space information can assist in developing work plans and staff models. Knowing how much carpet and tile can assist in developing floor tech work plans and staffing models. Accurate counts of assets can help develop a better facility staffing model. Certainly an office building with 50 water source heat pumps will perform and cost differently than a building with 50 variable air volume boxes. Early access to counts and types of equipment can assist in developing a building operating budget.

GRAPHIC VIEW OF ASSETS VERSUS STRICTLY CMMS PROCESS

Although most high-performing facility management departments have a CMMS system, it can be extremely difficult to find assets using text-only system. It also becomes more complicated finding assets after the facility has been remodeled several times. I have had above-ceiling assets in a section of the building linked to the rooms below. It became difficult to reassign location after the spaces were significantly remodeled once or twice. Using a BIM model the assets can be more tracked more easily in relationship to spaces.

Also, search features in BIM software can locate items much easier automatically. Doing a search on key data elements to find assets such as make or model number can be easily accommodated in BIM. The BIM model can then locate those assets for further review.

CREATING MODEL

Challenges creating model

Unfortunately, there is not a lot of guidance on creating a BIM model for facility management. There is a lot of information tailored to the design and construction industry. The key to success is to analyze current information needs and to develop a plan to support that in a phased approach. If there are active building projects, tracking use of BIM in those can provide significant insight into future benefits and opportunities.

There are also significant amount of training available on BIM. These can include webcasts, virtual training and classroom training. Exposure to BIM products will help understand how they can be tailored to meet individual organizational needs.

If your organization currently uses some of the advanced features of CAD products the transition can be much easier.

If your organization has an extensive CAD models consideration to conversion or continued use of CAD is a must. Migration may not be cost effective for buildings with robust CAD files.

Certainly, strong consideration to any existing project being designed in BIM may help promote the transition to BIM.

In the medium term the facility manager may have to support the CAD environment for existing inventory of buildings, while using BIM for new buildings.

Currently, there are some limitations to size of the BIM model and its overall performance. Most recent information suggests that BIM models exceeding 1 gigabyte are difficult to use. Performance of the model and computer make working in this environment difficult.

BIM PROCESSING POWER AND MEMORY ARE IMPORTANT

Model performance can be severely impacted by hardware. This limit is changing rapidly due to faster computers with more memory, better graphics cards and 64-bit operating systems. Specifications need to be considered as part of the implementation plan. Lack of investment in hardware and networking can derail a BIM implementation.

DEFINING DESIRED INFORMATION

This is the most critical decision once you have decided to move to BIM. The flexibility and power of BIM will require this to be carefully planned. It is also important if you developing standards to be included in your design and construction contracts.

A good starting point would be to review your existing information about you facility and determine how much of that data could and should be incorporated in you BIM model. Based upon experience I suggest that space information be fully implemented. Space information is important because when developing schedules, groupings or zones space in Revit is the foundation needed to move this quickly. The plan should include how much detail that is incorporated. Consideration should be given to departments; room types and finishes can be easily included. Thought should also be give to setting data entry methodology as well. These formatting options must be considered to allow better data reporting and queries. Drop-downs, yes/no, and other options should be reviewed.

To keep the model efficient the facility manager needs to define items to be included. Give careful consideration to modeling every pipe, conduit, and valve regardless of size. One thing to remember is that the data must be managed throughout the building life for the model to be valuable. Routine updating and support are important.

OPPORTUNITY TO REPLACE SPECIALTY APPLICATIONS

As a BIM implementation plan is developed, an inventory of software and databases should take place. This review is important because through a BIM application there may be opportunities to eliminate, consolidate, or interface this information. Completing this type of review may also improve data integrity within operations because there are fewer data sources and fewer opportunities for disparate data.

TRAINING AND DESIGN WILL BE MORE COMPLEX THAN CURRENT PACKAGES DUE TO THE OPEN NATURE OF DESIGN

Training is an integral part of a successful BIM implementation. Depending upon current skill set of operators it may require one to three weeks of training during the first year. Training should be geared to the duties of the users. It is also important for the users to being using the application upon completing training.

FOUNDATION PRODUCT FOR FACILITY MANAGEMENT INFORMATION

BIM

BIM can be the source of critical model information. This includes both graphical information about a facility as well as design and asset information. This is the strength of the BIM. A well articulated plan will include information flow between BIM and the following applications that should also be in the facility manager's toolbox.

CMMS

Computer Maintenance Management System (CMMS) is a key application of all high-performing facility management operations. There are endless interface opportunities between BIM and CMMS. The flow of information between CMMS and

Resources

BIM Handbook: A Guide to Building Information Modeling for Owners, Managers, Designers, Engineers, and Contractors, Chuck Eastman, Paul Teicholz, Rafael Sacks and Kathleen Liston

Building Information Modeling: A Strategic Implementation Guide for Architects, Engineers, Constructors, and Real Estate Asset Managers, Dana K. Smith, Michael Tardif

National BIM Standard, buildingSMARTalliance *http://www.buildingsmartalliance.org/nbims/*

BIMFORUM *http://bimforum.org/*

U. S. General Services Administration 3D-4D-BIM Overview *http://www.gsa.gov/portal/content/102276*

Journal of Building Information Modeling, http://www.wbdg.org/references/jbim.php

BIM can help analyze key performance and cost targets. This data can help define true maintenance operating costs per square foot by assigning cost to spaces and departments through use of room and asset assignments.

By assigning work orders cost where appropriate to spaces. Combining data from BIM with cost data from CMMS an accurate cost per square foot can be calculated.

BAS

With energy costs being such a significant portion of facility operating costs, being able to analyze performance and efficiency becomes more critical. Existing performance data from Building Automation System (BAS) can be compared to design information in BIM. BIM modeling information can be used to refine system characteristics and modify operations.

Full understanding of system equipment installation, zones, and space relationships can assist in equipment scheduling, shutdowns, and system performance analysis. Much research and effort is being invested in modeling existing facilities to improve performance.

FIRE AND SECURITY SYSTEMS

Linking fire and security systems with BIM can provide information about the incident location and severity. Also, effectively documenting these systems can assist in maintenance and management of system infrastructure. Linking device information in fire and security to space information in BIM can help identify location quickly.

Spatial information with device location can help assure adequate coverage and identify code conflicts more easily. Defining these systems spatially has been helpful in demonstrating compliance to Authorities Having Jurisdiction such as local fire marshals or, for hospitals, the Joint Commission. When combined with CMMS as well it is easy to determine if all components of the fire system have been managed to code.

PROJECT MANAGEMENT

BIM use can help the design process as well as the construction phase. Accurately defining components to be modified, demolished, or constructed can help define budgets and scheduling. Quantity take-off can be a helpful to manage budget in Job Order Contracting environment.

System capabilities are easily understood if current BIM information is available.

DOCUMENT MANAGEMENT

Links between equipment families and websites (internally or externally) provide excellent opportunities to link aspects of the model to documentation such as submittals, operating and maintenance manuals, preventive maintenance procedures, or operating instructions. This feature is preferred to the current method of looking through numerous notebooks.

ROLE OF MAINTENANCE TECHNICIAN

We are giving carefully thought to how BIM can used by the technicians. We believe that the ultimate power of BIM will be getting letting all members of facility team access data that is contained in BIM. We expected to use create read-only access to information. We also recognize the important role that BIM play in helping comply with many aspects of the Joint Commission survey process in our healthcare environments.

Tim Peglow is associate vice president, patient care and prevention facilities, at the University of Texas MD Anderson Cancer Center, Houston, TX; he can be reached at *tpeglow@mdanderson.org*. This is his first article for *Facilities Manager.*