BIM is no longer just for the A/E portion of the A/E/C industry: A recent Timetric survey of 100 global construction participants, including contractors, found that 49% of respondents are currently using or piloting BIM. And, BIM usage among contractors is expanding. In the Associated General Contractors (AGC) of America’s 2017 Construction Hiring and Business Outlook, 34% of respondents expect that in this year alone, the number of projects with BIM will increase.

Primarily used by contractors, BIM provides constructability input into the design process, which leads to greater efficiency during construction and, therefore, better financials and reduced risks. Many contractors are highlighting the use of BIM, along with their preconstruction processes, in order to stand out to project owners and attract more business.

Knowing the basics of BIM will help you effectively communicate with your customers, executive team, and operations management. And, you’ll have the baseline knowledge for determining how to make BIM your ally.

**What Is BIM?**

A building information model is a digital representation of a building or infrastructure made up of objects – electronic versions of building components, such as walls, doors, and windows – that can contain dimensions and product information. An object can also be a resource or process, such as a laborer, a piece of equipment, a temporary structure, or pouring concrete.

With BIM, objects can act intelligently in relationship to other objects. Consider, for example, the rules that construction superintendents take for granted when deciding on the positioning of a door and a light switch. BIM can incorporate these same rules so that, for example, when a door in the model is moved along a wall, the swing of the door and the location of the light switch move in relationship to each other.

More than just the digital model or software used to create it, BIM is an entire model-based process in which building team members share information and collaborate to more efficiently plan, design, construct, and manage buildings and infrastructure.

For contractors, BIM is a way to work out the kinks in a project’s design and construction before crews even set foot onto the jobsite. It also allows a company to collect and later share as-built information with customers that can be used in future facility management and maintenance.

**Who Uses BIM?**

According to a 2016 BIM survey conducted by Dodge Data and Analytics that focused on large-size contractors ($50 million or more in annual construction value), 55% of GCs and 56% of construction managers reported using BIM. The survey also showed that 41% of trade contractors employ BIM, with the highest usage among structural fabrication, HVAC, and mechanical contractors.

Does this mean small contractors can’t benefit from BIM? Not necessarily. As with any business decision, it’s worthwhile for a contractor of any size to weigh the benefits of implementing BIM against the associated costs to determine if and when it makes sense for the company. Future BIM advancements may also make the technology more practical for smaller contractors.

**The Different Dimensions of BIM**

The main BIM processes are often described as different dimensions – 3D, 4D, 5D, and 6D BIM.

With each dimension, BIM gets closer to its vision of establishing a basis for improved decision-making and problem-solving throughout the building life cycle.
3D

The process most associated with BIM today is 3D design, which offers many benefits over 2D drawings. Project stakeholders can better visualize and inspect a project with more realistic representations of the building or infrastructure. An estimator can see whether a wall is slanted, where there are soffits, and other details that aren’t apparent on 2D plans. This allows the estimator to better understand a project’s complexity and create a more accurate estimate.

Constructability concerns and “clashes” can also be more easily identified and resolved. For instance, BIM processes can help detect pipework running through a steel beam (a hard clash) or a safety issue for workers (a soft clash).

Catching these types of issues during the design phase can substantially reduce total project cost; in fact, a clash found during construction can cost anywhere from thousands to tens of thousands of dollars – unexpected costs to consider from an accounting perspective.

Savvy contractors also use a 3D model as a valuable communication tool. They take their clients and building partners on virtual project walk-throughs to market their services, offer building solutions, and better communicate a project’s scope.

4D

When timelines are applied to models, it’s known as 4D BIM. This allows construction planners to run simulations to assess how proposed design features will impact the schedule and workflow. With 4D BIM, planners can determine appropriate resource scheduling, identify potential bottlenecks, develop phasing plans, communicate and track milestones, and find opportunities to improve the schedule overall.

Take, for instance, materials – one of a project’s biggest cost components. Using 4D BIM tools and methods, schedulers can better forecast when materials are needed on site for installation. Parameters could also be added to later track material ordering and delivery status as well as manage the supply chain.

4D BIM models are especially helpful in exploring space and sequencing requirements. The best placement for material delivery, temporary facilities, and equipment and assembly areas can all be evaluated and determined for each phase of the construction process.

As an added bonus for project owners, 4D models can also be used to plan a phased occupancy during a renovation, retrofit, or addition.  

5D

Estimators enter the picture with 5D BIM, also known as model-based estimating. 5D BIM brings together design and scheduling processes with the cost element of construction.

Using estimating tools that integrate with BIM, estimators can more quickly provide owners and others on the building team with the cost impact of different design and schedule scenarios. Cost-saving strategies can be explored and detailed cost risk assessments conducted in significantly less time. As the design progresses and changes are made to the model, the estimate can be easily – if not automatically – updated to assure everything stays within target costs.

5D BIM provides a more sophisticated cost analysis. For example, costs can be linked with the master schedule for such visualizations as showing the cash flow of a project. Or, sustainable design strategies can be evaluated from a cost perspective, including projecting energy savings for owners in the future.

For CFMs, 5D BIM means more accurate estimates and budgets. Down the road, more realistic cash flow forecasts may also assist in monthly reporting for even greater cost control throughout the project.

Adding the cost component to BIM can have a large impact. In fact, the McKinsey Institute lists 5D BIM as one of the “five big ideas” that can help the construction industry transform itself over the next five years.  

6D

BIM doesn’t stop once construction is complete; 6D BIM kicks in during the operations and maintenance of the building. Using as-built information gathered from the design and construction process – as well as updated details from ongoing maintenance – facility managers can use 6D BIM to support decision-making throughout a facility’s operations cycle.

Consider, for example, all the equipment installed in a building. Data available through a model can include such details as equipment manufacturer, installation date, expected lifespan, and recommended maintenance schedule and operation guidelines. With this type of information, facility managers can predict anticipated maintenance expenses far into the future. It also allows for more proactive maintenance, which is less expensive and not as disruptive to building occupants.

When renovation is needed, 6D BIM also provides valuable information. Owners can have access to drawings and information showing exactly how a facility was constructed. So,
when renovation crews tear into a wall, they already know what’s behind it, saving time and money on renovations.

Many facility owners recognize the cost savings 6D BIM can provide. The U.S. General Services Administration (GSA), for example, is currently encouraging, documenting, and evaluating the use of 6D BIM to support its facility management and building operations. In addition to cost- and time-savings, optimizing the operation and maintenance of building systems to reduce energy usage seems to be a big motivator for the GSA’s use of BIM.7

BIM comes full circle when design and construction professionals use information gathered during facility management to refine proposals and planning for renovations and new buildings.8 This real-world data can include energy efficiency, operational cost, and space performance.

Where Does BIM Reside?

All the data related to a building information model doesn’t necessarily exist in one location. For example, cost information may not be in the model itself. Instead, it may be contained in estimating software that is linked to the model by mapping different components to corresponding cost items in the estimating system. There are two reasons for this:

1) Too much information entered into the model could significantly impact model size and performance.

2) Members of the building team can participate in the BIM process with software they typically use, rather than having to learn a designer’s system.

Software vendors are working more closely together to make this BIM integration possible.

The Business Impact

There’s a lot of talk about how BIM works, but does it really make a measurable difference for construction businesses? The 2016 BIM study conducted by Dodge Data and Analytics9 provides some insight into how contractors and construction managers view BIM’s impact on their work:

- 70% reported at least a 5% decrease in requests for information (RFIs) during construction, indicating improved communication.
- Approximately 50% saw at least a 5% reduction in material waste, schedules, and final construction costs.
- 43% of trade contractors, 26% of GCs, and 25% of construction managers saw at least a 5% decrease in reportable safety incidents.

BIM can also lead to more business opportunities. Many federal agencies are moving toward requiring BIM on their building projects. State and local governments are also requesting BIM (e.g., Wisconsin and Texas have adopted BIM deliverable standards).

What Are the Challenges of BIM?

BIM has made great strides, especially from a design and engineering standpoint. However, it is still very much in its infancy when it comes to passing information “downstream” to other parties that use the model.

Model authors are typically designers who don’t necessarily know what information other building team members may need. For example, estimators using a 3D model to take off quantities often still need to refer to 2D drawings because such details as floor and wall finishes are typically missing from the 3D model.

Kevin Miller, a professor of construction management at Brigham Young University who specializes in estimating from BIM models, explains that “We’re going through a transitional period where some designers are advanced at using BIM and some are still learning it, so the amount of information included in a model can vary greatly.”

Better communication is still needed so downstream users – such as estimators – better understand the usability and limitations of the models they are receiving. But strides are being made. The Level of Development (LOD) Specification, created by BIMForum, helps to specify and communicate the content and reliability of BIM at various stages in the design and construction process. The specification allows model authors to define models for specific information exchange, milestones in a design work plan, and deliverables for specific functions such as quantity takeoff.

New technology is also helping to bridge the gap for estimators and others when information is not available from a model. For example, some takeoff systems will allow estimators to switch between 3D models and 2D electronic plans so that they have all the necessary information for producing estimates more quickly while also taking advantage of the visualization and collaboration benefits of BIM.

Where Is BIM Heading with VR & the Cloud?

The future of BIM promises many advances. Some contractors are already integrating virtual reality (VR) with models to create a more real-life experience.
According to the 2016 JBKnowledge Construction Technology Report, 7% of construction professionals reported using VR. While a small number, this VR usage is a marked increase over the previous year, indicating that the technology is beginning to gain traction in the construction arena.

The combination of BIM and VR offers many possibilities. Project owners could be taken through a virtual walk-through of different building designs or even presented various flooring, fixtures, and spacing options to see which they preferred. Construction workers could perform certain tasks virtually first to determine the safest way to do the work. On the horizon, VR technology will even include touch, scent, and sound – expanding its potential for replicating what a built environment’s occupants and users will actually experience.

Cloud technology will play an even bigger role by allowing real-time sharing of BIM data. Essentially, the cloud will provide a common environment that ties together all of the data associated with a building or infrastructure, regardless of where the information is located.

In this new BIM environment, every time data is added to the building model, other relevant software applications used by team members will be updated simultaneously, which reduces the need for large file transfers and promotes efficiencies (e.g., team members only get the updates and data that pertains to their work). Even accounting applications could tap into the BIM environment to better predict cash flow or understand the actual percent of construction completed.

**Conclusion**

CFMs play a major role in a project’s life cycle. In fact, a significant portion of the information associated with a building – the materials used, who supplied them, their cost, change orders – is processed by accounting staff. This is useful BIM data. Although the direct applications of BIM for construction accounting are still developing, BIM will most certainly be a major factor in the future of the construction industry.

**Endnotes**


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CFMA Building Profits July/August 2017