Is Takeoff Dead?

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Much has been written about the demise of Quantity Takeoff due to the continual integration of takeoff functionality in BIM systems. But, is takeoff really dead?

For years, on-screen quantity takeoff has been the trusted mechanism for how various trades build their projects and determine takeoff quantities. But as we look at what takeoff is and what it means across various trades, a relative newcomer – Building Information Modeling (BIM) – is starting to put pressure on quantity takeoffs.

BIM appears to have the ability for an architect or designer to determine takeoff quantities while the building is being designed. The practicality, though, is that each trade is a specialty and has its own nuances which make it hard, or even impossible, for a single designer to include the uniqueness of each trade. For many trades, it is more appropriate to use on-screen takeoff software. This paper explores why this is true.

The trade estimator can use BIM, but many times they might want to use the two-dimensional drawing to better understand the nuances of what the BIM model is trying to represent.

CAD quantity takeoff vs. BIM auto-takeoff: What's the difference?

Traditional quantity takeoffs are derived from 2-dimensional CAD drawings created by designers. In most instances, the designer turns over blueprints to construction contractors as static PDF files. The contractor's estimator then uses specialized on-screen takeoff software to measure areas on the drawings and identify groups of lines as objects, such as a window or a door. The estimator assigns each of these takeoff items to various conditions that then translate into a quantity of windows, doors, or walls.

BIM systems differ from 2D CAD systems in that the user creates a project using 3-dimensional objects (such as walls, windows, and doors) which have predefined properties. As the designer adds objects to the drawing the data attributes of each object are automatically included in a project worksheet. Consequently, the BIM system is creating a takeoff automatically by the act of designing the building with "intelligent objects" instead of static lines.

Current BIM technologies include libraries of three-dimensional objects (with associated data) that can be brought into drawings. However, while the objects contain common attributes, they lack data about site-specific requirements, such as a concrete foundation that requires a certain amount of rebar, a specific type of concrete, the amount of excavation and formwork. This site-specific data is not included by the project designer, but must be addressed by the concrete estimator.

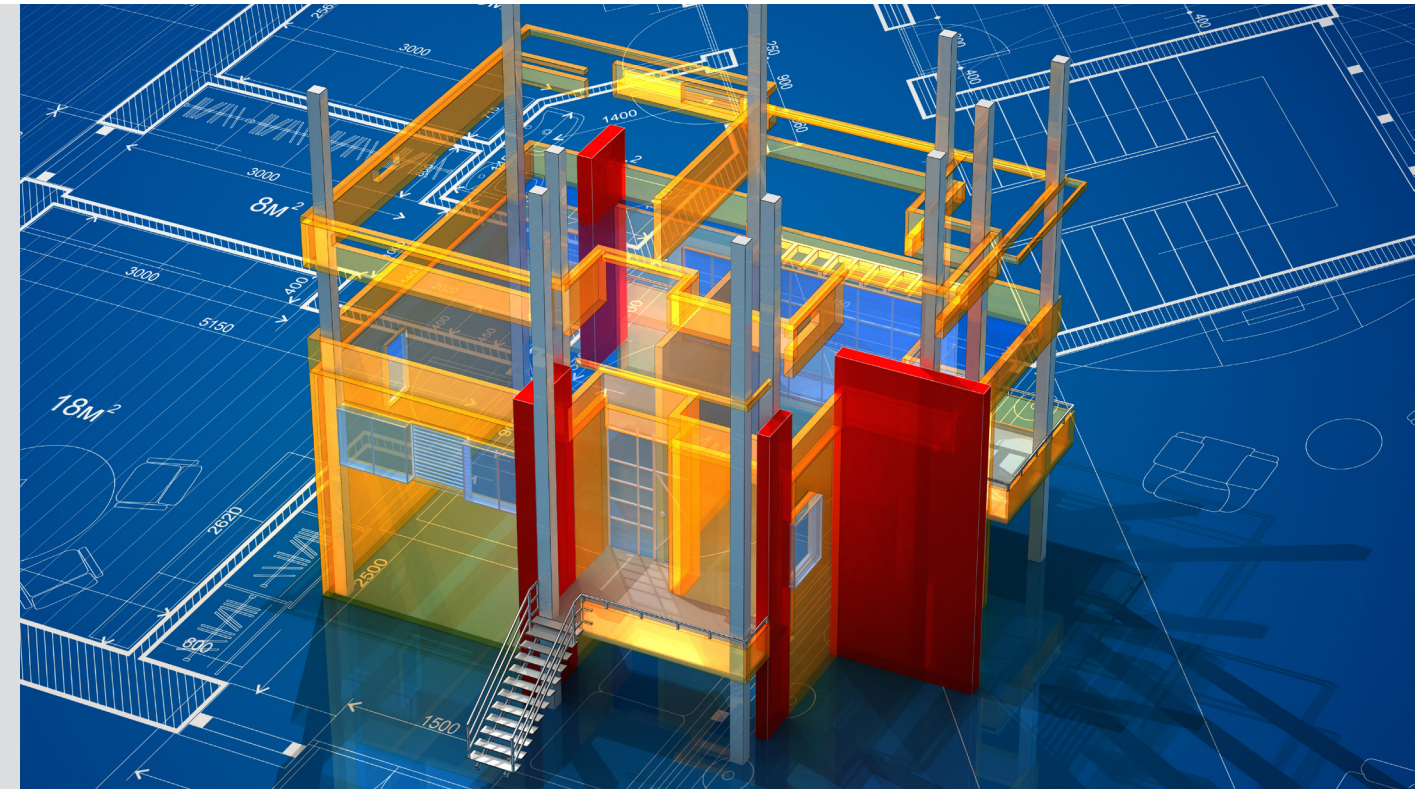
Takeoff: 3D vs. 3D

The designer's job is to provide drawings of "design intent." For example, they might intend that a door is to be painted blue. However, they will not tell the painter how to paint it (roller, spray, or brush) or where to buy the paint. Consequently, trade estimators need to understand not only what the designer has in mind, but they must understand how to get from intent to reality.

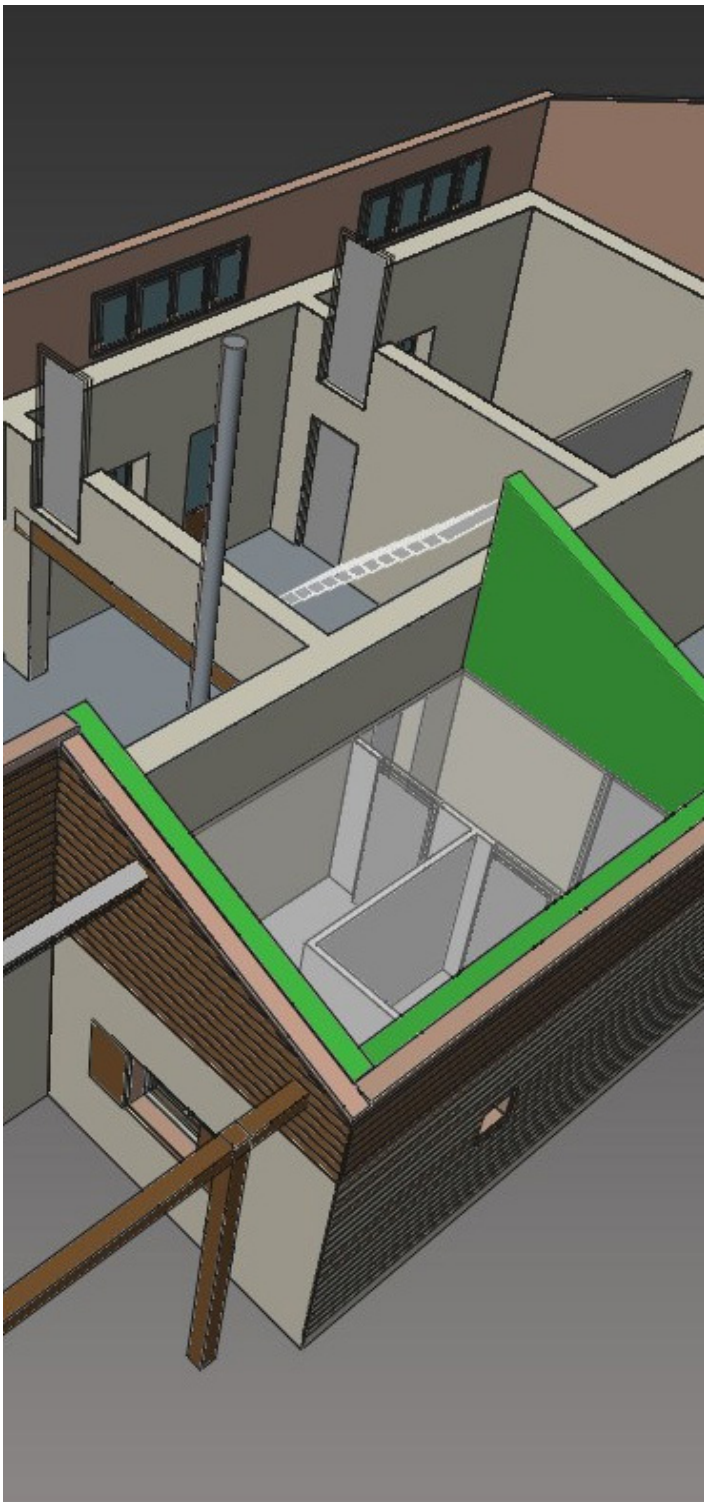
In a two-dimensional world, the designer presents an object in two views. The first is "plan view," which is a top-down view of the object showing lengths and widths. If it's a wall, you might see a double-width line. The second is an "elevation," which is a drawing that shows the height of the wall as if you were looking directly at the wall. The trade estimator, using on-screen takeoff software, identifies the lines as objects and adds object data.

In a BIM world, estimators look at an object in a three-dimensional fashion and can see its height, width, length, and other attributes. Objects have descriptive data "attached" so that when the object is brought into the drawing, the attached data is automatically brought into the project. The estimator then enters the number of hours it will take to install and enters the unit cost.

The trade estimator can use BIM, but many times they might want to use the two-dimensional drawing to better understand the nuances of what the BIM model is trying to represent.



Takeoff is dead... long live BIM



With BIM, designers use software tools that specify tasks or objects to create a 3D view of what the building is to look like. The particular tool that they select tells the BIM software that they are about to draw, for example, a wall object which includes studs, drywall, and insulation. It has a specific color, a particular piece of floorboard, and a window every “X” feet. Unit costs can be included.

As the wall object is brought into the drawing the BIM system will know the distance between studs and the dimensions of each piece of sheet rock. As the designer adds the wall objects the BIM system automatically adds the wall data into the project database.

Now consider parking lots: As the parking lot object is brought into the drawing the BIM system will include data, such as inches of stone base, type and thickness of asphalt, and depth of topping asphalt. As the designer shapes the parking lot they can see the striping for every parking space because striping is part of the library object called “parking lot.”

In BIM, the takeoff is automatically being built at the design level. As the designer creates the 3D BIM drawing they are automatically creating a building database of the material required and costs. There is no further work required to produce the information contained in a quantity takeoff because it is built into the design phase. So...takeoff is dead because it’s done automatically during the BIM design process.

No, wait...
Takeoff is very much alive

Quantity takeoff is not dead. The BIM technology can build a general takeoff, but local nuances require manual intervention. It's not a technology issue, but more of a division of responsibilities between the design community and the construction community. The designers typically do not deal with methods and materials. They might know that a wall needs to be framed, but the designer does not specify how the wall is to be framed.

In addition, for some trades, the estimator has to add additional drawings and data attributes which may be more clear in a two-dimensional world than in a three-dimensional world. Here are some examples:

Fire sprinklers:

Designer plans may show contractors in general where sprinkler heads are to be placed, but they might not show that the sprinkler heads are to be located so that they miss light fixtures, accommodate a drop ceiling or a soffit, and do not interrupt a ceiling pattern or interfere with a sign.

The sprinkler contractor's job is to count the quantity of sprinkler heads and then do a preliminary hydraulics calculation to determine how big the pipe needs to be to go from one sprinkler head to the next. It's their responsibility to develop drawings that show the engineer and the city fire department what size pipe they are running from head to head.

Concrete:

Concrete structures are unique in that they involve complex formwork. The designer might show a nice, round concrete column that stands "X" feet tall and has decorations on the bottom and the top, but the carpenter building the form must think in reverse and come up with a form that is the mirror image of the finished column.

The concrete estimator will know from experience that this type of column or this type of footing or this type of wall requires "X" amount of formwork. Later they will produce drawings to give field personnel the exact dimension of where to put 2x4s, plywood, and struts.

Carpeting:

For a large floor area, there might be multiple patterns of carpet that the designer defines. They might specify a certain overall pattern for most of the floor with a more rugged pattern in high traffic areas. The designer drawings will tell the carpet vendor where to put the carpets, but will not tell the carpet vendor how to install the different carpets or what it will cost. The carpet estimator does that.

The carpet company understands the nuances of buying and laying carpet that the designer does not consider. For example, a particular carpet can only be bought by the carpet vendor in certain size rolls. They will know that even though the designer requires 100 square feet that they must buy, say, a 160-square foot roll because of the way the manufacturer makes the product. Designers might not know that.

These are examples of when a trade estimator must add data elements or additional drawings to the project. The designer may never do a drawing of a concrete column or sprinkler pipes or carpet design. These trade nuances are not part of the BIM drawing so the takeoff that the designer can seemingly produce during the design phase is going to be incomplete.

Conclusion

It's not the technology that's holding up BIM as the replacement of takeoffs. It's job responsibilities. The designer will specify "what" but will not specify "how." The different trade estimators will continue to determine "how."

Better collaboration - from the building owner to the design team and through to the various trade contractors – might lead to the adoption of BIM as the successor takeoff tool. Until that happens – and it may be that it never happens – the traditional quantity takeoff will remain very much alive.