BIM & ESTIMATING

Compare 3D modeling designs to estimated budgets and more

by Ed Coffin

Building Information Modeling (BIM) was originally designed to create architectural three dimensional (3D) renderings of a project before construction begins. BIM also quickly became an excellent tool for contractors to coordinate equipment interferences or clash detection for better collaboration between trades. In either case, BIM's objective is to create a 3D computerized model of a project to work out construction designs and conflicts prior to incurring construction costs and to ensure that budgets, schedules and quality are maintained once construction is underway.

BIM has evolved into a detailed pre-planning and collaboration tool for both internal and general project team members.

Sophisticated software has been developed over the years to create 3D construction models for efficient workflow and collaboration from concept through construction. 3D modeling software is also providing more efficient workflows that include pre-fabrication, tracking and layout for MEPT (mechanical, electrical, plumbing and technology) contractors. Traditional tools on the jobsite, such as a simple measuring tape or conduit bender, are being replaced with robotic lasers, scanners and software driven tools with information being sent to them from the 3D models that increase productivity and accuracy on the jobsite.

An important aspect of BIM is the detailed real life model that creates a deliverable plan for each project. Workflows become more efficient when adhering to a plan and where deliverables are measurable. A Work Breakdown Structure (WBS) has traditionally provided a process of itemizing a hierarchy of project tasks that become the construction model for each project. Therefore, it is prudent to create the WBS at the pre-construction stage to help ensure thoroughness of the design and budgets and to serve as an early foundation for effective scheduling and cost estimating.

Estimating software has become the catalyst for contractors in creating a WBS as the basis of each estimate. Project tasks can be systems such as horizontal cabling, intra and inter building backbones, MDFs, IDFs, fixtures, feeders, fire alarm, etc., with a hierarchy of sub-tasks to account for the physical layer of construction including buildings, floors, floor heights, itemized construction phases and areas. Detailed bills of material, labor hours and costs from the estimate can be accounted for to ensure completeness of each task of the WBS.

Integration with estimating software means that 3D construction modeling designs can now generate real bills of material and labor hours for more effective cost comparisons to the budgets and designs. The final labor hours and cost on a project are dependent on many variables during construction, and mitigating the risk on labor has proven to be one of the biggest factors in maintaining budgets and profits. The inherent term 3D is an ideal marriage between 3D modeling and the development of a WBS. 3D models provide many of the key elements that can affect the labor on any project. For instance, the ease or difficulty of an installation will be affected by floor heights, what floor the installation is on which can be further compounded when multiple buildings of varying construction are part of a project. The installation costs can also be affected by the requirement of premium time for any of the areas of the project. Therefore, it is critical that budgets take into account these physical and logistical variables to ensure that budgeted versus actual labor costs are as close as possible to maintain profitability.

> **As BIM continues to evolve, 3D construction modeling designs can now generate real bills of material and labor hours for more effective cost comparisons to the budgets and designs.**

Estimators are still using traditional 2D drawings to develop the budgets during the pre-construction stage, but BIM and 3D Modeling is becoming more common for project management during the construction stage. However, estimating and BIM provide a very useful role for a contractor because of the WBS. If budgets are detailed specific to the project's design and construction using a WBS, the budgets become a baseline for measuring the actual costs against the budgets. So when 3D modelers create the construction layouts, they can be compared to the budgets prior to construction.
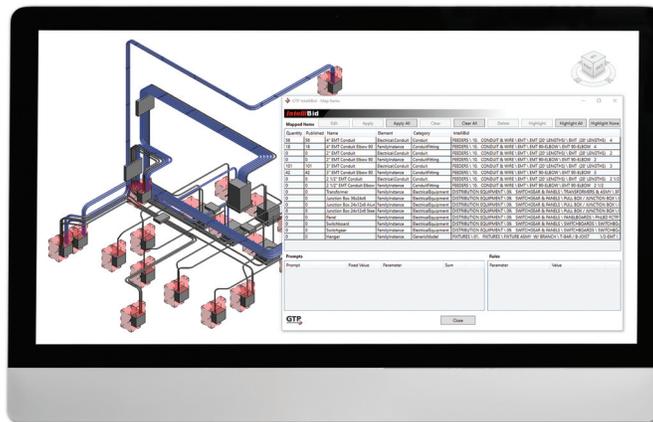
This is a critical and advantageous step for contractors. If the construction layouts differ from the budgets, the contractor can redesign their construction layouts to best reflect the budgeted costs or contract price. In fact, this fits the exact purpose of BIM, allowing the contractor to address any issues before construction where cost and profits are ultimately the most important factors.

3D modeling software does not provide the cost estimating on its own. The partnership and best of breed between 3D modeling software and estimating software are emerging to provide this key advantage for contractors. As stated, the WBS is the key to the benefits between estimating/design and BIM.

Design build contractors can utilize BIM layouts to provide valuable presentation of their designs just as architects have always done. To date, a two-person team consisting of the 3D modeler and the estimator have been required to perform this compilation and presentation of design model and cost estimating. With the dynamic link between 3D modeling and estimating software this can now be one person, dramatically reducing the time and cost versus traditional methods.

As scope changes and change orders take place during construction they can be modeled or laid out using BIM. These changes can quickly be converted to material dollars and labor hours using the contractors established material prices and labor hours used in their estimating software.

One of the many powers of 3D modeling software is its ability to look through the design for pre-determined patterns of installations that can be used for pre-fabrication. These installations once identified can be sent to their estimating software to generate bills of material and labor that can be used to compare savings of field installed material versus factory installed pre-fabricated material.

IN SUMMARY

A WBS has many advantages for a contractor if developed at the design or estimating stage of a project. The detailed information can be carried through the entire process from pre-construction to completed construction.

From knowing what material and labor resources are need on the job and when, tracking budgeted costs to actual costs including efficient job site layout, the workflows become more efficient providing the perfect link between estimating and BIM.

Whether at the design, estimate or project management stage, this efficient workflow helps maintain budgets, schedule and quality and ultimately maximizing their profits.

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