

Implementing 5-D Virtual Construction Technology

One of the biggest issues facing the construction industry is the inability to identify constructability problems during the design and preconstruction phases of a project. To combat this challenge, an increasing number of construction organizations now turn to virtual construction technology.

A virtual construction solution includes three elements: design (3-D), schedule (4-D) and cost (5-D). These elements are interlinked, ensuring that a change to any of the three automatically updates the other two. As a result, all users can access the most current project information, which thwarts potential mishaps. Additionally, the use of 5-D modeling allows users to extract accurate estimates and analyze alternative construction sequences.

The benefits that virtual construction technology provides to owners, architects and contractors include: integration of design and estimating; accurate cost calculations; creation, analysis and optimization of schedules; and risk reduction.

INTEGRATION OF DESIGN AND ESTIMATING

Ultimately, cost drives design. In current practice, architects only receive cost feedback after a construction company reviews the design, determines quantities and assigns prices. A cost-driven design change often results in large amounts of rework.

Applying virtual construction technology solves this problem by turning design and cost estimating into parallel processes.

Cost can be determined using a data publishing mechanism based on the information in the 5-D model at any moment, immediately informing the design team of the cost consequences of design decisions.

CREATION OF COST CALCULATIONS

With virtual construction technology, objects in a 3-D model connect to an estimating “recipe” that stores the information required to carry out cost estimation and scheduling of the specified object. Using this descriptive way to capture real-world objects, 3-D models do not need to be highly detailed, saving modeling time.

When exact prices are not yet set, cost risks are included and identified by assigning cost variances. This provides a user with a quick overview of the largest variances that may imply a cost risk to the project.

During the design process, more specific recipes replace the variance recipes used earlier. Price variance risk decreases as the design work progresses.

CREATION, ANALYSIS AND OPTIMIZATION OF SCHEDULES

Planning production to flow continuously minimizes the likelihood of trades interfering with each other. Doing so minimizes time and onsite conflicts.

With virtual construction technologies, tasks can be defined by grouping materials and applying a production factor. Users have improved control of work progress, as well as access to information reflected in the original schedule. Construction errors can be flagged as warning signs and anticipated.

RISK REDUCTION

The two main contributors to risk are incorrect information caused by ineffective synchronization of all data related to project design, cost and time; and, inaccurate assumptions generated by the

variability of conditions during actual construction.

Virtual construction technology addresses these problems in a number of ways:

- design information is more accurate and comprehensive;
- the synchronization of design, cost and time data is automatically maintained at all stages of design and construction; and
- the project team can constantly monitor, analyze and respond to conditions throughout the project.

It can provide a more effective decision support framework than traditional processes.

Overall, the construction industry tends to fall behind other industries in adopting new technology. With general contractors relying on 2-D drawings, information may be incorrect, incomplete and disconnected. Waste, as well as cost and schedule overruns occur because of disconnected planning and control systems.

Virtual construction technology allows users to move the construction planning and control process from a 2-D drawing environment—with disconnected estimating, scheduling, procurement and production control—to a fully integrated 5-D workflow system, which employs a 3-D model as the foundation for connecting all systems and data.

In implementing this type of technology, architects, owners and contractors can win more business and improve the predictability of their projects.

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