



Technology

# Squeezing More Value from a 3D-Enabled Integrated Workflow

As schedules tighten and resources become scarcer integrated project delivery minimizes waste and maximizes efficiency

**A**ustralian contractors have used the alliance model to build infrastructure megaprojects on fast-track schedules for more than 15 years. Since the design-build delivery method was formalized in 1993, more than 40% of projects in the United States have adopted the approach to accelerate construction and control costs. In the past five years alone, "lean construction" teams have reduced costs and schedules by about 20%.

Though different in their contractual arrangements, each of these project delivery methods has one thing in common: collaboration among owners, designers, and builders made possible by an integrated design environment. Taking it to the next level, the concept of a more fully integrated, 3D-enabled process based on the integrated project delivery (IPD) model is now gaining industry traction.

At its core, IPD represents a fundamental change in workflows from project concept to close-out. It brings together all participants from the outset - engineers, architects, fabricators, tradesmen, and operators - with the sole intent to optimize performance and results. In an integrated approach to project delivery, everyone involved in the process is focused on finding and eliminating errors before they cause problems.

"No other delivery model puts these parties together at the same time from the start of the project," said Architect J Stuart Eckblad, AIA, director of design and construction for the University of California, San Francisco, Medical Center. "One could argue that design-build does, but the difference is that in design-build the builder has control over the designers, engineers, and subcontractors. In IPD, the virtual organization of owner/builders/designers has mutual control."

As chair of the Integrated Project Delivery Task Force, an interdisciplinary group sponsored by McGraw-Hill Construction and the American Institute of Architects California Council, Eckblad works to educate the industry about what IPD is, how it works, and why it may become the norm.

"Soon what will distinguish firms is a record of success in optimizing project results for owners," Eckblad said. "IPD brings innovation into a project. Owners see that if they use the IPD model, they will see more innovation for the same dollars."

## A working definition

The IPD Task Force notes that integrated projects are uniquely distinguished by highly effective collaboration. Its report, "Integrated Project Delivery - A Working Definition," offers this interpretation of the process:

"Integrated project delivery is a project delivery approach that integrates people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction."

The Task Force recommends building information modeling (BIM) as essential to efficiently achieve this level of collaboration. Using BIM tools to model design alternatives and simulate construction sequencing, the team can bring the project to a higher level of completion before breaking ground, enabling construction to go more quickly and efficiently than in traditional project delivery.

A BIM-enabled project delivery approach uses the 3D model as a centralized data repository, from which all information about the project is retrieved and distributed - not just during design but through construction and into the lifecycle of the asset. Delivered at close-out, building information modeling (BIM) provides information needed for long-term operation and maintenance.

## Impetus for change

The reality is that entrenched traditions for contracting public projects make innovative approaches a hard sell. At the Design-Build Institute of America, President and CEO Walker Lee Evey attributed the trend toward change in the industry to a perfect storm of factors, including the improved deployment of BIM and demand for value engineering and sustainable construction. Collaboration among design and construction team members is now recognized as a proven method to achieve higher quality results for owners.

Design-build is better known and more widely used, mainly because it is authorized by the federal government and most states. IPD is emerging as an alternative because

it is a more inclusive process that promises dramatic results and lucrative rewards. It encourages the early contribution of knowledge and experience of all participants, but places responsibility on the "most able person" to make decisions on a "best-for-project" basis, according to the IPD Task Force.

Skepticism about how to share the control, risks, and rewards poses no small barrier to the widespread adoption of this model. Yet the growing backlog of AEC work, constrained by resource capacity, is driving business and process innovation. Using a deeply collaborative strategy such as IPD is one way to get more work done with fewer resources.

On the southeast coast of Australia, the West Gate Freeway Alliance is charged with improving traffic flow and safety on a 5.5-kilometer section of freeway that has a chokehold on Melbourne's city center. The alliance united the Victorian Government, design-build firms, construction service contractors, and consulting engineers in a partnership to deliver \$350 million in upgrades by 2010. Using ProjectWise and MicroStation, the team addressed the key issues of safety and traffic congestion throughout the design process. "This was critical in order to meet and optimize the construction program," said alliance team member Richard Tabe, principal road designer at Parsons Brinkerhoff.

Incorporating the best available technology to eliminate errors also reduces the risk of unknown cost increases due to claims, change orders, coordination, and conflict resolution. For example, if documents are incomplete, "they're biddable but not buildable and pricing is incomplete, so you get hit with huge change orders," Eckblad said. With subcontractors on board the

IPD team, BIM is used to fully engineer and coordinate design elements, and detect and resolve conflicts or inconsistencies. "Using BIM, you eliminate the risk of change orders. And because you can do fabrication from the BIM, you increase productivity, which improves the chances that the project will come in within the original budget or less."

With the construction industry valued at \$1.2 trillion in the United States alone, IPD represents an opportunity for enormous savings. It eliminates the inefficiency and waste that plague traditional design-bid-build procurement and construction. An integrated process also delivers projects faster, with expedited fabrication, more accurate as-built, less field rework, fewer material mistakes, and better trade coordination - resulting in lower costs.

Presented with hard evidence that IPD produces results, more owner/operators are likely to follow its lead. "When investors and the constituents to be served need and expect the project to be performing as well and as soon as reliably possible, and when it is of the essence to minimize risk and maximize performance, the preferred delivery model is integrated project delivery," said Bentley CEO Greg Bentley.

## BIM Builds Better-Informed Decisions

Building information modeling (BIM) is a new way of approaching the design and documentation of building projects. It encompasses the entire lifecycle of the building (design-build-operations), includes all information about the building throughout its lifecycle, and uses integrated tools to define and simulate the building, delivery, and operations.

BIM provides several major advantages over CAD. It models and manages not just graphics, but also information - information that allows the automatic generation of drawings and reports, design analysis, schedule simulation, facilities management, and more - ultimately enabling the building team to make better-informed decisions. BIM also supports a distributed team so that people, tools, and tasks can effectively share this information throughout the building lifecycle, thus eliminating data redundancy, data re-entry, data loss, miscommunication, and translation errors.



**9 Principles of Integrated Project Delivery**

- Mutual respect and trust
- Mutual benefit and reward
- Collaborative innovation and decision making
- Early involvement of key participants
- Early goal definition
- Intensified planning
- Open communication
- Appropriate technology
- Organization and leadership

**Source:** *Basic Principles of Integrated Project Delivery* ([www.ipd-ca.net](http://www.ipd-ca.net))