



Integrated Project Delivery

Aligning Project Organization,
Operating System and
Commercial Terms

Joel Darrington and William Lichtig

Integrated Project Delivery

Aligning Project Organization, Operating System and Commercial Terms¹

Joel Darrington and William Lichtig

Contents

- 1 Introduction: Why Integrated Project Delivery?
- 2 IPD and Project Organization
- 3 IPD and Operating System
- 4 IPD and Commercial Terms
- 5 Lessons Learned from IPD's First Decade
- 6 IPD Success Story: Sutter Health Castro Valley Replacement Hospital
- 7 Emerging Evidence of IPD Benefits
- 8 About the Authors
- 9 Reference

Why Integrated Project Delivery?

Some of the most common issues affecting construction projects:

1

High rates of inefficiency and relatively low rates of productivity



2

Frequent disputes and adversarial relationships among project partners



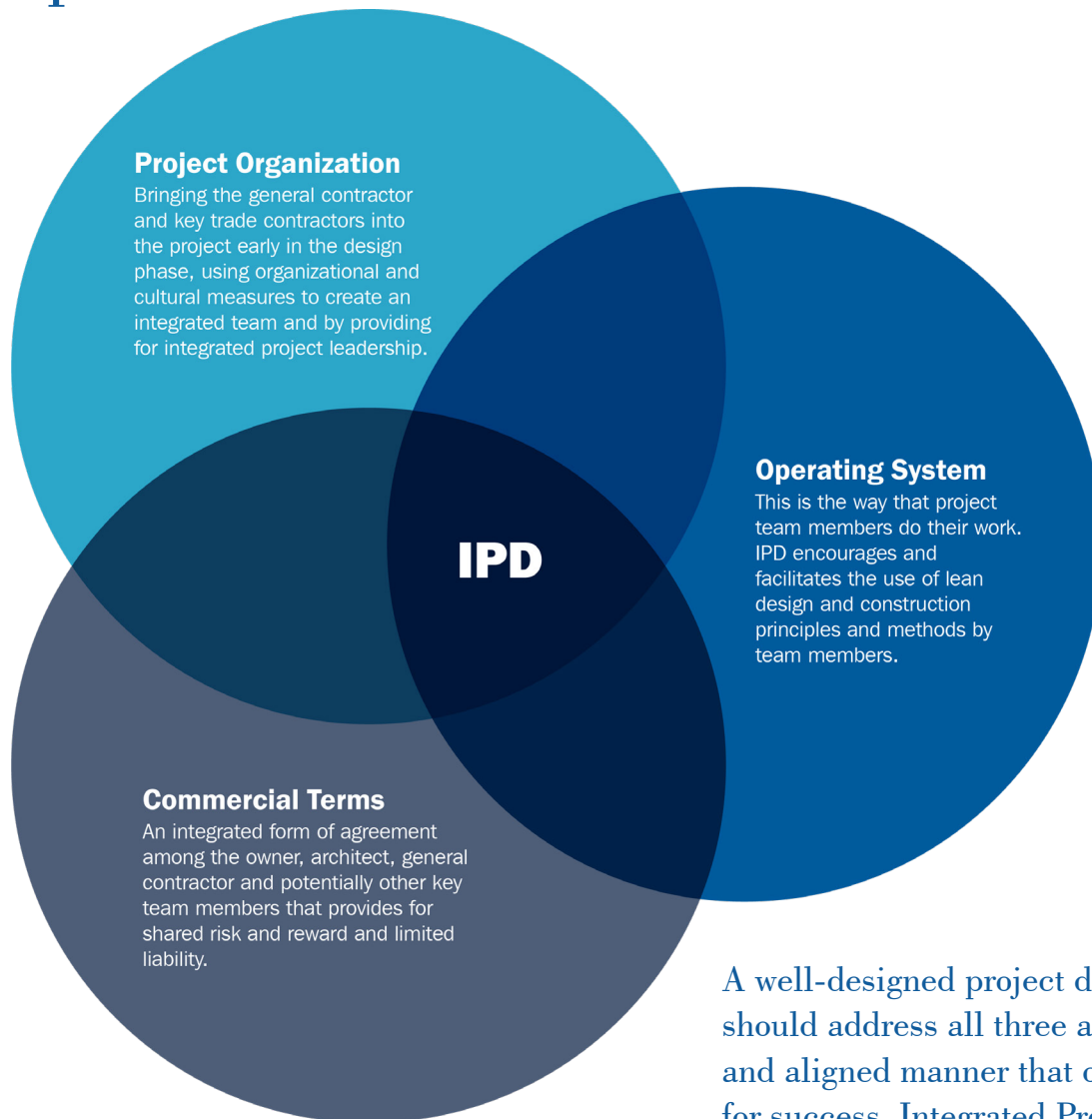
3

Unpredictable delivery relative to project goals of time, cost and quality



Integrated Project Delivery (IPD) was developed to transform the design and construction process, and the contractual arrangements that support it, in ways specifically designed to counteract those problems.

IPD transforms each of the basic areas within which any project delivery system operates:



A well-designed project delivery approach should address all three areas in a coherent and aligned manner that optimizes a project for success. Integrated Project Delivery does just that through contract structures, team culture and practices designed to better integrate the project delivery team and align them with the best interests of the project.

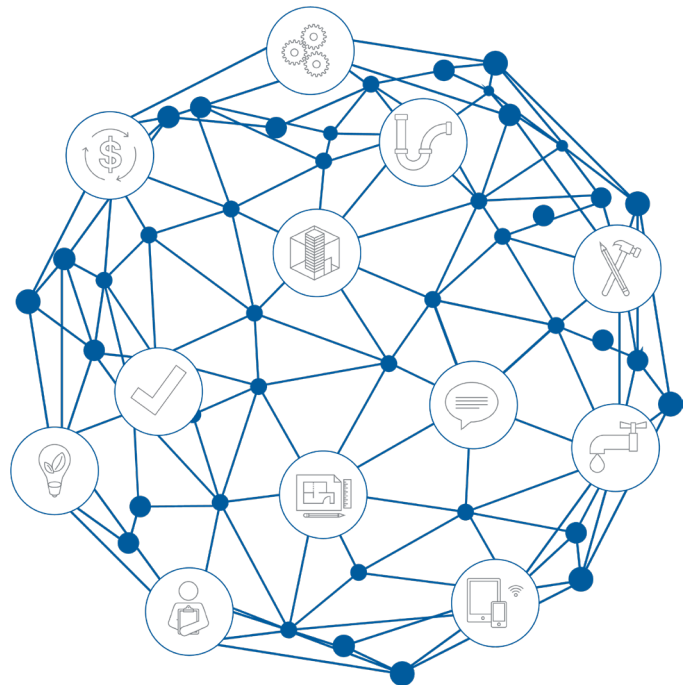
IPD and Project Organization

Typically, construction projects are “siloed” organizations with well-defined hierarchies. The first silo is the project owner’s own organization. Another silo involves the design team, which is contracted by the project owner early in the project. The construction team forms another silo, with the construction manager (if any) typically coming on mid-way into design and the general and trade contractors coming on after the design is fairly complete. Project communications move through the hierarchy along contractual lines, so that a trade contractor sends a question to the general contractor, who in turn sends it over to the architect or owner, and then they may need to send the question downstream to a consultant or person in the owner’s organization that has the answer. This inefficient method of communication is emblematic of the many other inefficiencies caused by the traditional project organization: wasted design effort, large contingencies, high volumes of change orders with their attendant cost increases, adversarial relationships and more.

Instead of a “siloed” approach, Integrated Project Delivery creates a flatter, more collaborative organizational structure for project teams. First, the owner engages the general contractor (or construction manager) and key trade contractors alongside the architect and key design firms to participate in design. As a result, key project team members develop a much higher level of common understanding of project requirements, constraints and characteristics – and do so much sooner in the project timeline. This significantly reduces the likelihood of change orders and rework, as well as the likelihood of disputes. Additionally, it allows the constructors to provide continuous input to the owner and designers regarding cost, constructability and other issues affecting the project’s value and success, which results in better design and fewer change orders and design re-work.

“IPD also provides organizational and cultural constructs that help integrate team members from different companies into a more cohesive project team – a kind of virtual company.”

- Joel Darrington, DPR Construction



IPD PROJECTS DO THIS IN MULTIPLE WAYS, SUCH AS:



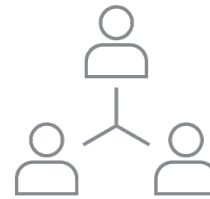
Forming cross-functional and interdisciplinary “cluster groups” of different project team members that collaboratively design project components or solve discrete project issues.



Co-locating project team members in a “Big Room” where team members from different companies work side-by-side in designing and building the project.



Creating team charters, having team social functions, using posters and other visual cues to promote integrated and lean behaviors, studying a lean construction book together, etc.



Developing a systematic onboarding process whereby new team members are oriented to the project’s operating system and culture.

IPD projects also involve some form of integrated project leadership. Typically, a management group (sometimes called a Core Group or a Project Management Team) is appointed to make the day-to-day project decisions, set the tone for the entire project team and exhibit the shared commitment that all project participants are expected to share. This group always includes a representative of the owner, architect and general contractor, and sometimes, representatives of key trades or designers. Decisions are made by consensus. Any impasses are usually addressed by an appointed senior executive group.

IPD and Operating System

Nearly all IPD projects rely on some degree of lean design and construction methods for their “operating systems.” Leaders in the lean construction movement advocate IPD as the project delivery approach best suited to lean implementation. There are abundant resources on lean design and construction methods and their benefits – see www.leanconstruction.org for starters.

lean
/lēn/

IPD provides both the project organization and commercial terms that allow lean construction to flourish on a project.

adjective

1. a culture, and way of doing work, based on a set of principles focused on creating more value for the customer through elimination of waste, streamlined processes and continuous improvement
“lean is a better way to design and build”

IPD and Commercial Terms

PROBLEMS OF TRADITIONAL CONTRACTING STRUCTURES

In traditional project delivery models, a series of two-party contracts create a vertical chain of relationships connecting ultimately to the owner (e.g., supplier to trade contractor, trade contractor to general contractor, general contractor to owner), but do not connect project participants horizontally (e.g., the mechanical trade has no contractual relationship with the architect). This structure incentivizes each project participant to behave in a way to maximize its own interests to the potential detriment of the project or individual team members.

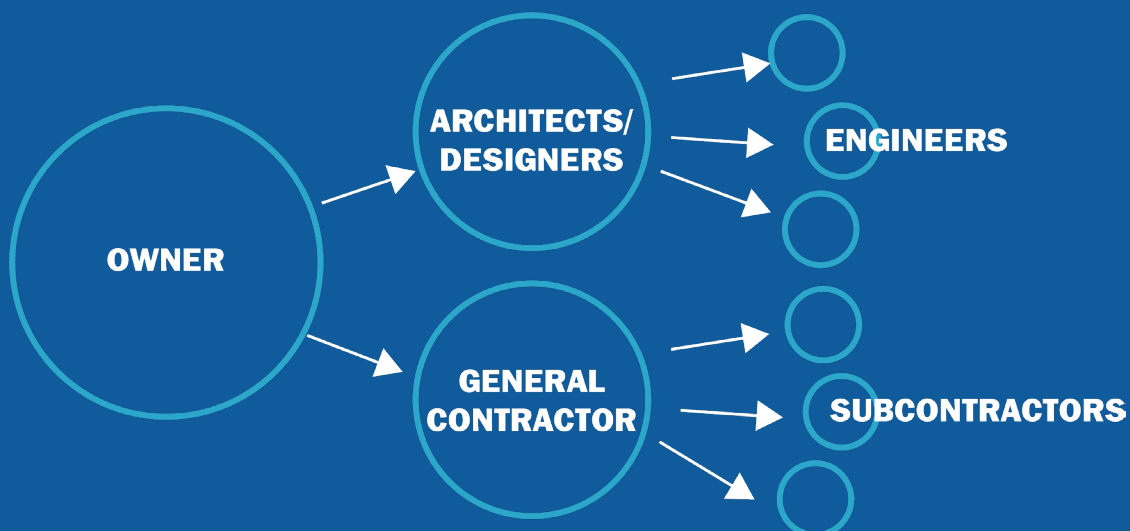
For example, under a traditional contracting structure, an air conditioning trade would benefit economically by routing its ductwork on a floor in the way least costly to the company even if that would result in the plumbing trade having to spend considerably more in routing its piping.

Looking at the perspective of the project as a whole, the cost of the project would be lower if the air conditioning ducting and plumbing piping had been routed more efficiently. However, the contract structure got in the way of what was best for the project, benefiting the air conditioning trade but ultimately hurting the owner and perhaps others.

Another feature of traditional construction contracting involves significant risk-shifting. In construction contracts, we commonly hear the principle that “the party that can best manage the risk should bear the risk.” This principle assumes that there is only one party that can manage or bear a risk – the “**unitary risk approach**.” Despite this principle, construction contracts frequently shift risks instead to the party with the least bargaining power.

It’s easy to see how this is a flawed approach. In a complex environment like a construction job, one company acting alone cannot adequately manage certain risks. Various project team members can influence, or be influenced by, the actions of other team members or by external events, which affect the level of risk to each team member and to the project as a whole. Also, even though project participants may be affected by certain actions or events, team members will vary in the degree to which they can address that risk. This complex web connecting various players and events makes it functionally impossible for any one party to effectively manage many kinds of project risks by itself.

TRADITIONAL CONTRACT STRUCTURE UNITARY RISK



Making a party solely bear a risk that it cannot effectively control by itself is unfair and inefficient. If a team member bears a risk it cannot effectively manage, then it's more likely that risk will hurt both the responsible team member and other team members and the whole project.

Another inefficiency resulting from the traditional risk-shifting approach is that other project participants have commercial terms that incentivize them to withhold help (since it costs more to help) even when the potential helper could improve the outcome of the whole project. In this scenario, the potential helper has an economic motive to view those problems as "someone else's" rather than "ours." The end result is that each project team member's contract encourages it to optimize its own part of the project rather than optimizing the entire project.

Of course, the driver of this behavior is money. So then, if we change the contracts so that the major project participants each have a shared financial stake in mitigating risks that otherwise would be "someone else's problem" under the unitary risk approach, those team members are more likely to offer help in solving the problem. Instead of impeding collaborative and efficient behavior, this approach supports an integrated project

culture where the team members believe "we're all in this together." Each player is more likely to reduce the risk on the project in its own way, including risks primarily associated with another's scope. This is **collective risk management**, and it results in less risk for the whole project.

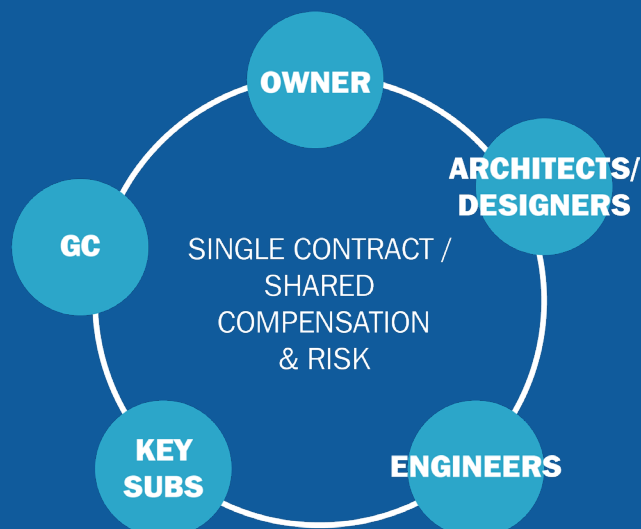
Also, consider that while the risk-shifting unitary risk approach seems to protect the risk-shifting party, there are real financial costs in doing so and shifting the risk contractually does not always effectively protect one from that risk.

What will a contract party do when it is required to bear a risk that it cannot effectively manage? It will attempt to protect itself against that risk in at least one or both of the following:

- (1) adding additional contingency (explicit or hidden) to its contract price or schedule to buffer against the risk; or
- (2) engaging in adversarial behavior, such as demanding change orders or making claims so as to cover the costs it anticipates losing due to that risk.

The increased contingencies can be multiplied throughout the supply chain, as contingency at one tier of contracting gets stacked on top of contingency in the lower tiers.

INTEGRATED PROJECT DELIVERY COLLECTIVE RISK MANAGEMENT



IPD agreements provide a commercial framework that addresses both compensation and risk in a way that better aligns the economic interests of the main parties with the success of the entire project. By creating a contractual relationship among all the major project participants, implementing a pain- and gain-sharing compensation model, and sharing more risks, IPD agreements promote collective risk management as an alternative to the risk-shifting unitary risk approach.

IPD AND COLLECTIVE RISK MANAGEMENT

Unlike the traditional contracting approach of vertically interlocking two-party contracts, in an IPD agreement, the owner and the non-owner parties that share risk and reward (“risk/reward members”) are all in a single contract with each other, with rights and responsibilities connected to all of the others. This allows for more integration of the team, both organizationally and commercially.

IPD COMPENSATION

While IPD agreements will differ in the details, most IPD agreements will provide some kind of compensation structure where risk/reward members share in the upside or downside of the project’s financial performance. Typically, the project team sets a target amount (sometimes called an estimated maximum price or a target cost) for the design and construction costs and then shares any cost under-runs or overruns at final completion of the project. Thus, the risk/reward members and owner all benefit when the project achieves cost savings and all share the risk of cost overruns.

IPD agreements also typically provide for a single, shared contingency for all the risk/reward members within the cost target. The project management group would be responsible for decision-making with regard to spending this contingency. By sharing a single contingency fund, the risk/reward team is further motivated to act more collaboratively and collectively manage risk. A shared contingency also reduces the problem of contingency stacking. If every risk/reward member provides for a contingency in its individual contract price, then the aggregate amount of all contingency for the project will be unknown to the



team, and quite probably exceeds the amount of contingency funds that would be needed to reasonably address the risk of the project. By sharing contingency, the risk/reward members can thus reduce the total amount of contingency on the project. Some IPD teams set an aggressive cost target early in the design process to stimulate innovation in designing cost-effectively. Other IPD teams use target costs as part of the target value design process, but wait until the design is substantially complete to set the estimated maximum price that is the basis for pain-sharing/gain-sharing. Either way, the IPD agreement calls for open-book accounting and reimbursement of project costs (including overhead) for risk/reward members, plus a base profit that is pooled with the profit of other risk/reward members. Usually, this pooled profit is wholly at risk for cost overruns and augmented with a share of cost savings.

IPD agreements address how cost overruns are shared, too. Normally, they provide for the pooled profit of the risk/reward members (once all contingency is expended) to be the first layer of funding for overruns of the cost target. Should the profit be exhausted paying for the cost overrun, then the owner continues paying the risk/reward members their project costs, but they earn no profit.

In contrast, savings below the cost target are typically allocated by a percentage of the savings being added to the risk/reward members' profit pool, with the remainder kept by the owner. Any balance remaining in the profit pool is typically distributed to the risk/reward members according to established percentages. Usually, each risk/reward member's share of the profit pool is proportionate to its estimated profit compensation in relation to the total pool. Some project teams have adjusted those percentages to provide a greater share to the designers than this math calculation would produce, since otherwise their share might be disproportionate to their influence on project outcome.

By sharing cost overruns or savings, the team's economic interests are better aligned so that the owner and risk/reward members have financial incentives to help each other optimize the whole project and collectively manage risk. Also, by limiting the risk/reward members' risk for cost overruns to their pooled profit, the IPD agreement allows the risk/reward members to better focus on achieving project success without unduly focusing on protecting their individual bottom lines.

This commercial structure better allows the team to move money across traditional commercial boundaries so that the risk/reward members are not penalized by investing, for example, \$100,000 in the mechanical contractor's work to save \$150,000 in the plumbing contractor's work. As a result, IPD teams are better positioned to have an entrepreneurial mindset in creating overall project value.

Many IPD agreements also address non-cost performance through the incentive compensation system. These vary widely, but the general idea is to tie some part of the risk/reward members' compensation to successful performance in several key areas that would contribute toward "success" on that project. The incentives need to keep the different performance metrics in balance so that the team members are not encouraged to over-perform in one area and under-perform in others.



The incentive compensation system can be enhanced by including periodic performance evaluations. This encourages IPD teams to regularly reflect and share their assessments of current performance, with an eye toward learning and improvement. Regular performance evaluations are important to recognize and reinforce what the team is doing well and to also call out and address areas where performance needs to improve. Performance evaluations need to be done frequently so that the project can benefit from the lessons learned by the team during the project and reinforce an atmosphere of continuous improvement.

IPD AND LIMITED LIABILITY

IPD agreements usually provide a limitation of liability or a general waiver of claims among the owner and risk/reward members, subject to some exceptions. By limiting the liability of risk/reward members to a reasonable level, the agreement allows these parties to focus more directly on meeting the owner's objectives and much less on the need to protect their companies from loss. Because the risk/reward members still have their profit at risk and still are subject to a certain level of liability, they each have significant "skin in the game" to keep them sharp and avoid undue risks, but without putting their company's survival at risk. When team members must worry about whether a decision would jeopardize their company's viability, they are more apt to act in a way that avoids failure, rather than attempting something "outside the box" that could add significant value. Limiting liability and implementing collective risk management thus frees up creativity and initiative otherwise expended on defensive behavior.

Lesson's Learned from IPD's First Decade

IPD PREREQUISITES

With a decade of experience with IPD projects, we have observed that there are certain prerequisites for an IPD project to be successful (or even attempted):

1

OWNER INVOLVEMENT

The owner must be actively involved in the project decision-making and culture. Owners play a critical role in integrated project leadership and in inspiring and maintaining the team's integrated project culture. IPD is not well-suited to a project where the owner does not want to be involved much.

2

TRUST

There must be a basic level of trust among companies (owner and the risk/reward members) and among individuals working on the project. If a party is not willing to extend sufficient trust or violates the trust of the others, then either the party needs to be replaced or the delivery method changed.

3

PROJECT-FIRST MINDSET

The owner and risk/reward members need to understand and accept a commitment to put the interests of the project ahead of their individual interests. Frequent reminders of this commitment during the project will help keep the team culture on track.

4

OPEN MIND

IPD and lean construction involve a major change in the thinking and behavior of team members from what they have developed from years of experience on traditional construction projects. People who are not willing to at least consider and experiment with something new will quickly become a hindrance to successful IPD implementation. Not everyone needs to be entirely convinced of IPD and lean construction at the beginning of the project, but just about everyone needs to be willing to give it an honest try.

5

OWNER INVESTMENT IN DESIGN PHASE

IPD involves a greater involvement of the designers and constructors during the design phase so that greater value can be realized during the construction phase. Owners accustomed to paying a certain percentage of their budget in design must be comfortable spending more up front to spend less later (and often less overall).

Lesson's Learned from IPD's First Decade

OPERATIONAL CHALLENGES IMPLEMENTING IPD

Using IPD doesn't mean the project will go smoothly with no difficulties. Some of the operational challenges that commonly arise with implementing IPD include:

STAFF ALIGNMENT. Most IPD projects face significant challenges in aligning the staff of project team members with the integrated practices and culture of IPD. Of course, this is an issue with starting a project and also when new individuals come onto the team. Successful IPD projects do not take it for granted that staff will eventually "get it"; instead, they take various measures to coach staff on how the project intends to operate and how team members should behave. Even more challenging, though, is overcoming the natural tendency of people to slide back into their traditional ways of thinking and behaving – especially when under stress. IPD project leaders should conduct periodic checks on how well their team members are living up to the project's integrated practices and culture. Sometimes that requires hard choices, such as reassigning a long-tenured employee to a different project.

INSUFFICIENT EMPOWERMENT. Sometimes an IPD agreement signatory appoints someone to the project management group who is not invested with sufficient decision-making authority. Project leadership and decision-making bogs down because this representative has to keep deferring decisions until she or he checks back with upper management.

SUBSTANTIALLY NON-PERFORMING PARTY. Sometimes an IPD project team discovers over time that a certain risk/reward member is unable to perform up to expectations. Because of the trust and time invested in the relationship, the team usually makes significant effort to help a non-performing member succeed. At some point, teams need to make the difficult choice to terminate a non-performing party for the sake of the project.

SETTING AN APPROPRIATE COST TARGET. Setting cost targets is an art, not a science. They need to be aggressive enough to stimulate innovative thinking and hard work, but not so aggressive to make it unlikely the risk/reward members will earn their profit. IPD projects have sometimes set the cost target too low, resulting in the team earning slim or no profits. Once that becomes apparent, it will hurt overall team morale.

IPD Success Story

Sutter Health's Castro Valley Replacement Hospital

Completed 2012



PROJECT DESCRIPTION

Widely praised and publicly reported as a model of IPD success, the Sutter Health Eden Medical Center project in Castro Valley, California demonstrates the real-world application of IPD and lean design and construction. The owner, Sutter Health, engaged an integrated team led by architect Devenney Group Ltd. and general contractor DPR Construction under a poly-party IPD agreement to design and build a seven-story, 230,000-sq.-ft. hospital located half a mile from an active seismic fault line.²

PROJECT ACHIEVEMENTS

6

Delivery six weeks ahead of schedule,³ already compressed by 30%⁴

\$2M

Project cost two million dollars below owner's aggressive budget⁵

\$1M

Steel delivery six months early with one million dollars of owner savings⁶

97%

Ninety-seven percent of inspections passed the first time

74%

Time on task for major trades, far above typical range of 30-50%

Full Program

Almost no compromises to the owner's space program⁷

Emerging Evidence of IPD Benefits

Scholarly research is now beginning to verify the theoretical and anecdotal benefits of IPD. Recently, a group led by Professor Renée Cheng, then of the University of Minnesota, completed an in-depth, yearlong study of 10 completed IPD projects in the USA and Canada.

Their report, “Motivation and Means: How and Why IPD and Lean Lead to Success,” concludes that IPD in conjunction with lean construction results in projects that more reliably meet cost and schedule commitments and the other goals set out by the owner. They found that IPD “sets the terms and provides the motivation for collaboration,” while lean “provides the means for teams to optimize their performance.”

OTHER NOTABLE FINDINGS INCLUDED:

- Remarkable consistency of teams on IPD projects to have a project-first commitment.
- IPD helped cultivate high-performing team behaviors and culture, such as collaboration, mutual trust, clear communication and blame-free problem solving.
- Success in IPD requires a sustained investment in team-building throughout the project.
- IPD typically results in less conflict, more reliable schedule and budget outcomes, and the intangible benefits of a strong team culture (such as “fun” or “excitement”).⁸

In light of these positive results and the proven problems of traditional project delivery, owners and projects teams should strongly consider using Integrated Project Delivery and lean design and construction for their projects.

About the Authors



JOEL DARRINGTON, CONTRACTING COUNSEL DPR CONSTRUCTION

Joel Darrington is Contracting Counsel for DPR Construction, a U.S.-based general contractor specializing in advanced technology, health care, life sciences, corporate office, higher education and other technically challenging projects. Joel has extensive experience as a construction attorney, and has supported construction transactions in a wide variety of industry sectors in both traditional and collaborative project delivery settings, including Integrated Project Delivery, Lean Construction, design-build, CM-at-Risk, multi-prime and design-bid-build. Additionally, Joel is active in the Lean Construction Institute and has written and presented numerous times about Lean Construction and IPD. Joel was a key contributor in the 2016 comprehensive update of the ConsensusDocs 300 Standard Multi-party Integrated Project Delivery Agreement, a leading industry form for IPD contracts.



WILL LICHTIG THE BOLDT COMPANY

Will Lichtig is an internationally recognized leader in the lean and Integrated Project Delivery movements. He has been at the forefront in the development of Integrated Lean Project Delivery® process. He is the past chairman of the Lean Construction Institute and a member of the National Academy of Construction. In his role with The Boldt Company, Will has worked with teams to develop and implement lean process for target value design, lean production planning and control, Built in Quality, lean problem solving and other key processes that provide innovative approaches to project delivery. He also provides leadership coaching to project teams as they develop the wherewithal to deliver projects using lean methods.

Reference

- 1 A version of this paper was translated into German and included as a chapter in the German language Lean Construction – Das Managementhandbuch, M. Fielder (editor), Springer-Verlag GmbH Deutschland (2018), available at https://doi.org/10.1007/978-3-662-55337-4_19.
- 2 See Aliaari, Mohammed and Najarian, Edwin, “Sutter Health Eden Medical Center: Structural Engineer’s Active Role in an IPD Project with Lean and BIM Components,” STRUCTURE magazine, p.32, August 2013.
- 3 See Daswani, Raj, et al, “Hospital achieves success through IPD,” Consulting-Specifying Engineer, 19 Jun 2015, available at <http://www.csemag.com/single-article/hospital-achieves-success-through-ipd/aaae04bd329f71c320dd9b610e6f5678.html>, accessed 12 Jan 2017.
- 4 See Aliaairi at p. 34.
- 5 See “Sutter Health Eden Medical Center,” <http://www.ghafari.com/projects/sutter-health-eden-medical-center>, accessed 12 Jan 2017.
- 6 See Aliaairi at p. 34.
- 7

For previous three stats, see Daswani et al.

- 8 See “Motivation and Means: How and Why IPD and Lean Lead to Success,” Research Report, November 2016 by University of Minnesota in collaboration with University of Washington, University of British Columbia, and Scan Consulting, available at http://arch.design.umn.edu/directory/chengr/documents/motivation_means2016.pdf, accessed 12 January 2017.