

White Paper

Integrated Project Delivery: Reality and Promise

A Strategist's Guide to
Understanding and Marketing IPD

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**The content in this White Paper applies primarily to
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Integrated Project Delivery: Reality and Promise

A Strategist's Guide to Understanding and Marketing IPD

Executive Summary

All of the recent advancements in project delivery lead to this point. Building Information Modeling (BIM), virtual design and construction, Lean Delivery, and teaming arrangements like design-build each bring great benefits, but all of these approaches will become known as stepping stones or ingredients. This century's new paradigm—Integrated Project Delivery, or IPD—will bring it all together: true collaboration, integration of team, streamlined process, and improved final results. The promise of IPD is dramatic: projects going from napkin sketch to completion much faster than before. A design process that benefits from engineer, contractor, subcontractor, fabricator, and end-user input early in design, with more efficient use of materials, integrated design efforts, and creativity allowed to flourish. IPD allows construction with a lower cost, a tighter schedule, and less risk of changes. It provides greater opportunity to incorporate sustainability. And above all, a team that truly works together for the benefit of the project and client.

“Pure” IPD means jumping in all the way. Not only does the team work collaboratively, but members are contractually bound together as well. The owner, architect, contractor (or construction manager), perhaps key engineering firms, and sometimes even key subcontractors are all parties to the same agreement. The agreement focuses more on encouraging collaboration and less on assigning liability. Rewards and risks are shared, so the route for any one company to succeed is for the whole project to succeed. “IPDish” uses key IPD tools, such as BIM and heavy use of interdisciplinary design charrettes, with traditional or modified-traditional contractual arrangements.

Use of Pure IPD is just beginning. Based upon use of the standard forms of agreement released by the American Institute of Architects (AIA), the ConsensusDOCS standards, and privately developed models, there are perhaps two dozen Pure IPD projects nationwide so far. There are reasons for this, which speak very clearly to the hurdles IPD must overcome if the promise is to be realized.

The first is simply that IPD is new, and new approaches take time to become mainstream. Second, while contract forms exist they have not been tested over time (or in the courts), and are not fully proven or even understood. Third, the insurance industry does not yet have coverages tuned to IPD agreements, meaning each project must find workarounds. Fourth, many A/E/C firms are accustomed to their own “silos” of leadership, responsibility, and opportunity, and change is slow. Fifth, public institutions and agencies, which have been at the forefront on advancements such as sustainability and BIM, often lack the authority to restructure their A/E/C procurement processes to enable the IPD model. Sixth, though many owners have the option available, they are generally not asking for IPD yet.

These hurdles are being overcome, aided by the dramatic success of early adopters, such as the \$9 million in savings reported by contractor DPR on a \$100 million Sutter Health project ([Post 1](#)). Just as owners began requesting BIM when stories of its success became prevalent around 2007, once they get excited about IPD, owners could make it a common requirement in short order. Momentum for IPD also comes significantly from A/E/C practitioners: much of the underlying functionality of IPD is the combination of practices and technologies many firms have already adopted, and have seen the benefits of. Formalizing responsibilities, risks, and rewards under a shared contract is the logical next step.

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Marketers will play an important role in all of this. At the strategic level, IPD is a seismic industry shift we must help our companies anticipate, prepare for, and organize to meet. IPD means new teaming arrangements, new relationships, new markets, and even new services. At the tactical level, IPD is a new world that we must understand, and reflect in our proposals, websites, and presentations. At all levels, we have to realize that IPD is real and it's coming, not in some far off future, but likely as a requirement for projects we're already tracking.

This is an evolving topic. We look forward to your comments, additions, and critiques, and welcome your emails!

Ted Sive, FSMPS
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Introduction

The building industry is highly fragmented. As industry practitioners we're familiar with what seem like permanent A/E/C world characteristics: numerous individual disciplines and firms, each speaking its own language, working with its own processes and data, creating confusion and inefficiency. Barbara Golter Heller ([Golter Heller](#)²) describes A/E/C as an "immense aggregation of cottage industries," bringing to mind a vivid picture of highly-qualified designers and crafters, working separately, and not truly linked in communications, management, or the technologies of the 21st century. Numerous industry journals and experts quote statistics comparing design and construction to sectors such as manufacturing, noting that our efficiencies are far below many others, such as car manufacturing.

At its most fundamental, Integrated Project Delivery (IPD) is a path to change this dynamic: transforming the very fundamentals of project delivery—communication, scheduling, teaming, contracting, technology, and more—to exponentially improve the lagging performance of our industry.

The single most devastating consequence of modernism has been the embrace of a process that segregates designers from makers: The architect has been separated from the contractor, and the materials scientist has been separated from the product engineer.

From *Refabricating Architecture*, Stephen Kieran and James Timberlake
([Kieran, Timberlake](#)³)

This quote from Stephen Kieran and James Timberlake is another view to the fundamentals of IPD. KieranTimberlake, the 2008 AIA Firm of the Year, has built a unique practice and an international reputation by focusing on the *process* of architecture and construction, in addition to the built form. Their quote captures a key theme of their process work—improving building delivery and value by applying models of prefabrication and coordination from the manufacturing industries. It also visualizes this problem that IPD seeks to solve: bringing separated expertise and trades *together*, to overcome the predominant model of the 20th century ("low bid" or individual negotiated contracts where each profession is its own silo). KieranTimberlake's AIA award is a welcome sign of the attention being paid to *process* change in the A/E/C arena.

If one is to believe the excited proselytizers, the A/E/C industry is in the beginning stages of significant change in how buildings are created. We are reinventing how teams, expertise, labor, and materials come together to design, build, and maintain a building, with IPD as the vehicle of this fundamental transformation. The goals of this paper, specifically for A/E/C marketers, are to:

- Define the IPD process, distinguishing IPD from traditional and "alternative delivery" methods such as design/build.
- Articulate fundamentals that are forming the IPD market today.
- Forecast factors affecting the IPD market going forward.
- Identify strategic opportunities for firms desiring IPD work, and some of the potential efforts and issues for marketers in those firms.

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This paper continues interest and passion by this author around the topics of better collaboration and improved communication between the A/E/C disciplines. Our SMPS Foundation 2007 White Paper entitled *BIM (Building Information Modeling): A Marketing Primer and Call to Action* explored the significant impacts of BIM and how it would affect the processes of delivering work. Those technologies underlie many of the fundamentals of IPD, and that paper may be a good starting point for readers unfamiliar with BIM (please visit www.smpsfoundation.org to view the BIM paper). This paper further explores those process changes. It is dramatic how much has already happened in two years.

IPD is a rich and complex topic. This paper attempts to knit together a number of themes, to present what we hope is a “full” picture for A/E/C marketers and strategists. The paper is also written to an audience that may be mostly new to IPD. In doing all this, many topics worthy of much greater detail are summarized briefly. At the end, a bibliography lists numerous articles and publications reviewed for this paper, organized into topic areas for readers desiring greater depth or further opinions.

“Pure” IPD or “IPDish”?

Integrated Project Delivery (IPD) 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 reduce waste and optimize efficiency through all phases of design, fabrication and construction.

Working definition from AIA California Council, a partner with AIA National and others in defining IPD process and creating new contract forms
([AIA California Council](#) ⁴)

This definition addresses the key goals of IPD: a contractual and working process whereby the individuals and A/E/C firms work together, at the same time or at least in a highly-coordinated fashion. They use fundamentally the same information, with shared goals, and with markers of success—design, utility, cost, on-time delivery, long-term efficiency, and more—based on team performance.

This paper distinguishes between IPDish and Pure IPD. As commonly used, IPD refers to a family of activities and particular tools fostering greater team collaboration and efficiency, which can be undertaken in a variety of traditional or modified traditional contract formats. Pure IPD refers to collaborative teams (including A/E/C firms and the owner) working in a *contractually* connected manner, generally within a risk/profit sharing format. IPDish teams improve collaboration and efficiency with tools like BIM. Pure IPD builds on these tools by legally and formally connecting individual firms into a shared entity where success for the individual can only come through success by the team.

The chart below illustrates some of the key differences between traditional, IPDish, and Pure IPD approaches. It should be read from left to right and is intended to illustrate the progression of key communication and team activities. For most of the rows, activities in the middle and right-hand columns include everything to their left as well. For example, charrettes are a collaboration tool in both IPDish and Pure IPD delivery. Each of these characteristics is further defined in the next section.

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	Traditional	“IPDish”	“Pure” IPD
Team Organization	<ul style="list-style-type: none"> – Hierarchical – Sequential addition “as needed:” architect, then engineer, then contractor, then fabricator, etc. 	<ul style="list-style-type: none"> – Collaborative – Earlier hiring/ participation of some areas of expertise – Stakeholder review after design 	<ul style="list-style-type: none"> – All key expertise on-board at earliest practical time – “Lifecycle” stakeholder participation in earliest programming – Designer/supplier/ tradesman collaboration in design and construction – Multi-Party Agreement (MPA) or Single Purpose Entity (SPE)
Contracts	<ul style="list-style-type: none"> – Establish liability protection – Separate (and not always consistent) contracts 	<ul style="list-style-type: none"> – Encourage shared information and resources – Preconstruction agreements 	<ul style="list-style-type: none"> – Legally direct and bind team activity – Mandate joint decision making – Eliminate or strictly limit ability to sue
Risk/Reward	<ul style="list-style-type: none"> – Entities pursue and protect individually (“silo/bunker”) – Separate risk/reward pools 	<ul style="list-style-type: none"> – Optional shared profit/bonus pool 	<ul style="list-style-type: none"> – Pooled profit; distributed with team success – Based on project value
Decision Control	<ul style="list-style-type: none"> – Hierarchical 	<ul style="list-style-type: none"> – Team, with final decision by owner 	<ul style="list-style-type: none"> – Key project decisions by SPE
Collaboration Tool	<ul style="list-style-type: none"> – Meetings (core team, followed by sequential additional meetings with consultants and/or subcontractors) 	<ul style="list-style-type: none"> – Charrettes – Multidisciplinary coordination workshops 	<ul style="list-style-type: none"> – Project charter – Detailed process design at start – Metric-based, informed decisions
Process	<ul style="list-style-type: none"> – Linear information – Resides in “silos” controlled per discipline 	<ul style="list-style-type: none"> – Concurrent information – BIM – Charrettes 	<ul style="list-style-type: none"> – Shared models – Pull scheduling – Set based design
Estimating	<ul style="list-style-type: none"> – After design and publication of documents, per phase 	<ul style="list-style-type: none"> – Contractor participation during preconstruction 	<ul style="list-style-type: none"> – Budget first; then design to budget – Target Design Value (TDV) – Real time estimating

**Figure 1. Project Delivery Characteristics and Tools:
Progression of Traditional, IPDish, and Pure IPD approaches**

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IPD Fundamentals

Team Composition and Timing

The MacLeamy Curve (see Figure 2 below) illustrates a fundamental precept IPD seeks to address. As time and design proceed, the opportunity to reduce construction cost decreases, while the cost to implement the design changes increases. This is exacerbated in traditional delivery, because participants join the team at different times. For instance, the contractor joins at bid, or the structural engineer joins at design development. IPD means bringing the whole team onboard earlier so the best ideas come out sooner and can be more quickly and efficiently incorporated into the design. The result is more efficient use of design effort, and much greater opportunity to reduce building cost and/or improve building function.

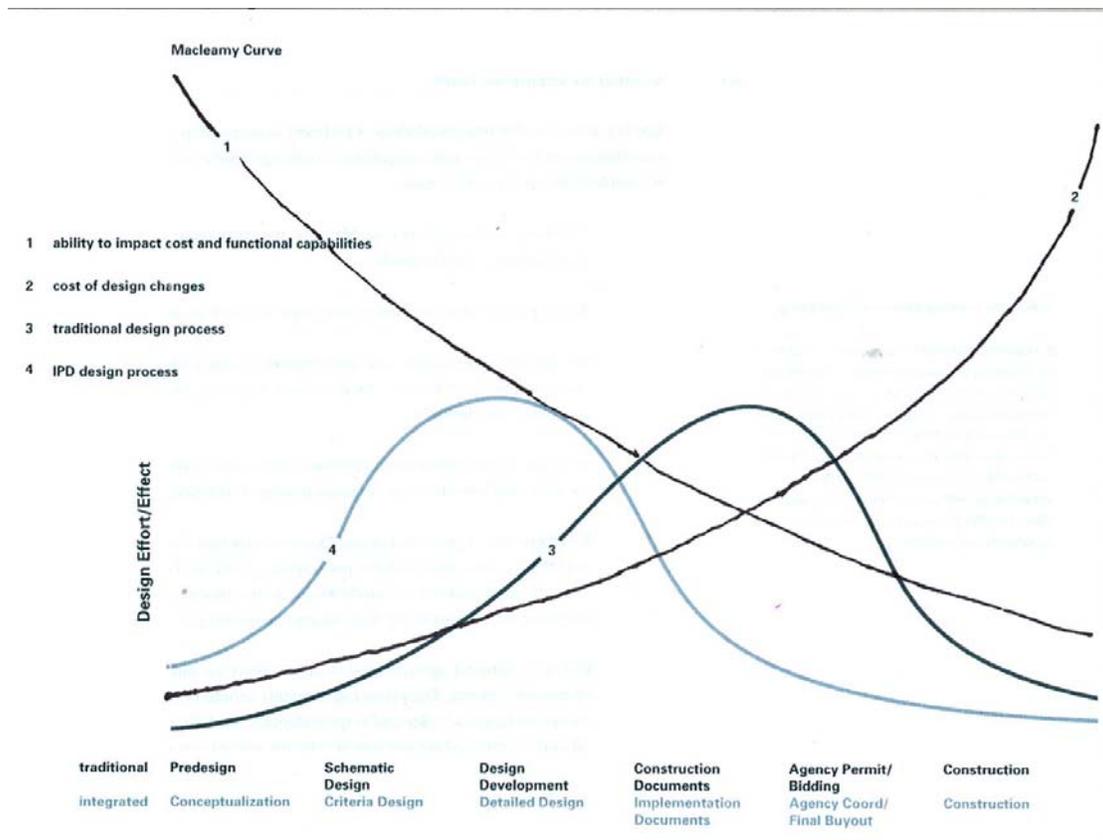


Figure 2. *The MacLeamy Curve*

Figure 3 below, also from the AIA California Council ([AIA California Council](#) ⁵), compares traditional and IPD delivery, and illustrates this earlier onboarding of expertise (“Who”), the dramatically earlier determination of “How” (meaning what building form and constructed with what systems or materials), and redefinition of project phases (aided by BIM), particularly of “Construction Documents” to “Implementation Documents.”

“Virtual Construction” is another term frequently used in the same way as “Implementation Documents.” It emphasizes that IPD—utilizing BIM and its 3D capabilities and rich database—creates a virtual building that a “full” team interacts with during all phases.

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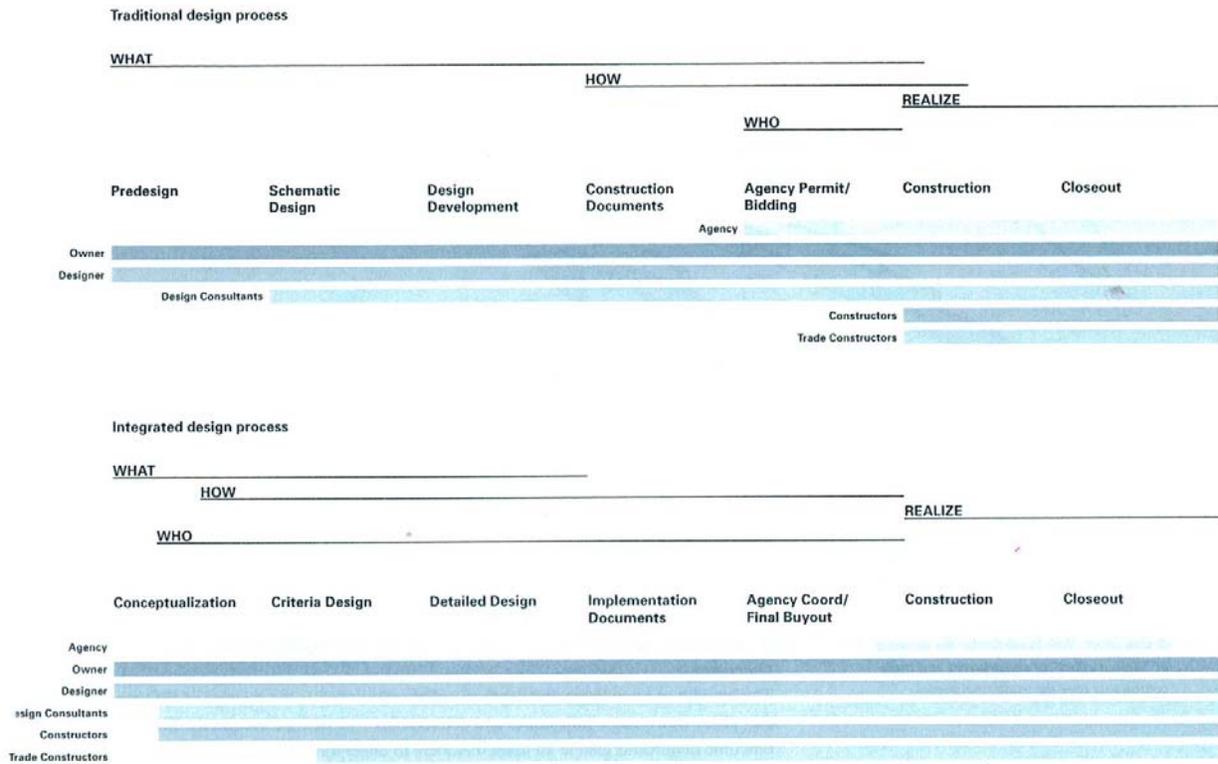


Figure 3. Comparison of Traditional and Integrated Design Process

Team Collaboration

Far beyond information and goal sharing, IPD seeks to maximize collaboration. “It’s all about trust and teamwork” notes Rick Oehmcke, a Seattle structural engineer and a practitioner and proponent of IPD. “You can’t have IPD without it.” Oehmcke’s comments refer to a core principle of IPD work—analysis and decisions made in a team, not individual context—and the importance of the interpersonal relationships and work style among IPD team members. Architect Brian Zealle of NBBJ, a colleague of Oehmcke’s and fellow IPD participant in the Pure IPD Seattle Children’s Bellevue Clinic (Bellevue, Washington), notes that “Nimble thinking and a willingness to think and work outside ‘your’ discipline are important to IPD; critically it requires relinquishing ‘rigid control.’”

A number of tools and approaches for improved team collaboration by IPD teams come from Lean Project Delivery (LPD, or “Lean”), a “production management-based approach to project delivery” developed by the Lean Construction Institute (LCI). LCI is the A/E/C industry leader in applying and further developing “Lean” tools first developed by Toyota in the 1960s. Toyota’s Lean techniques focused on eliminating waste and identifying problems before they occurred. The techniques included radical changes to production and inventory control, including famously allowing production line workers to stop production if they found a defect.

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As used in the A/E/C industry, the fundamentals of Lean are:

1. Defining, producing, and measuring value and success from the owner/user perspective.
2. Eliminating waste, redundancy, and inefficiency, all from a “total project performance” basis (not just for component efforts).
3. Conceiving and mobilizing teams “as ‘networks of commitments’ between individuals on the project team.” ([Young](#)⁶)

Important components and tools for IPD collaboration, including Lean methodologies, include:

- **Process Planning.** IPD begins with significant planning at the beginning of the project, before any proverbial pencils are lifted. As described in a recent article in *Engineering News-Record* magazine, a \$320-million IPD replacement hospital project by Sutter Health required six months of three-day meetings once every two weeks to design just the *process* of design. “As many as 30 people placed and replaced dozens of sticky notes on the wall for hours on end, mapping out the workflow based on what was best for the project, not the particular discipline.” ([Post](#)⁷)
- **Charrettes.** Instead of individuals working sequentially and separately, in IPD significant portions of design, coordination, and analytical activities are conducted in charrettes with broad teamwork by the owner and A/E/C team members. Design options are created, analysis is conducted, and decisions are made by the IPD teams, in a group format. For some IPD projects, the importance and value of this type of collaboration has led to co-locating teams, creating “offices” dedicated to one project, and combining multiple team members from separate A/E/C firms.
- **BIM,** while serving each discipline’s individual needs, is also a form of “jointly-owned” information—a central information repository for all team members. BIM information is shared, not “siloes,” improving visualization, fostering improved interdisciplinary coordination, and allowing easier integration of initial concepts by all team members into the whole.
- **Target Design Value (TDV).** IPD begins with the owner’s business plan. This statement of purpose is written in owner language, and uses owner metrics (perhaps production measures expected in a factory, or sales expected in a retail store). The IPD team verifies that a particular building can be built to the owner’s plan and expectations, and then establishes the TDV. Only then does design begin. Design is always based upon the TDV, not “here’s my design, what does it cost?” but “here’s how I’m going to meet budget and the owner’s program needs.” Target costs are typically defined and tracked by building systems (e.g. structure, envelope, finishes), not materials (steel, glass, paint). As the design progresses, the TDV is broken down into more detailed system components. Often budget is achieved by team collaboration: savings in one “pot” fuels another pot with more funds.
- **Pull Scheduling.** Another fundamental to IPD is for each participant to produce only the level of design documentation of a particular component as the next member of the team needs. Often developed in charrettes, schedules start with milestones and long-lead items. Detail is developed by all those responsible identifying specific needs and together exploring the most efficient sequence. The team can decide when to invest more or less effort to produce the information needed. LCI calls this the “Last Planner”

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system, meaning the last planner, the individual who creates the work of the assignment, is the person best suited to establish the information needs for that work to occur, and how that work fits into the schedule. On a construction site this may be the carpenter, foreman, or electrician—not the superintendent or project manager—because that carpenter or electrician knows best how much “float” is in the activity. This approach is also sometimes called “push scheduling” because it “pushes” responsibility down an organization chart.

- **Set-Based Design.** Set-based design is the parallel development of multiple design solutions for a given element, until it is absolutely necessary for one solution to be chosen. The benefit is ensuring the best decision, not the most expedient. Balancing the additional effort of set-based design are the efficiencies gained from pull scheduling and other methodologies. Detailing and production commitments are made at the “last responsible moment” so that effort is spent only on what is needed, and early work by one discipline does not needlessly limit another.

Team Contracts

Perhaps the most dramatic difference between traditional delivery and IPD in its purest form is the contracts that define A/E/C and owner participation. Traditional contracts establish rigid delineation between disciplines, attempt to clearly define different areas of expertise and responsibility, and represent a “me” approach. The contract participants sign for what they individually will do and are responsible for, and no more. Pure IPD contracts take a dramatically different approach, and begin with the *project*. The approach is “us;” the contracts define the goals and approach for the project, and outline the team’s activities and responsibilities only in relation to the project and its goals.

In Pure IPD, the primary participants, including typically the owner, architect, and general contractor, are bound together in a Multi-Party Agreement (MPA). It is one contract signed by the three or more entities and defining all aspects of responsibility, delivery, and liability. Another approach is the creation of a Single Purpose Entity (SPE), a “company” formed by the three entities and funded by the owner. This entity then contracts directly with the architect, the contractor, and potentially other disciplines. In both approaches, IPD contracts define process and create shared decision-making, and perhaps most un-typically, can share risk and reward. While the specifics of approaches can vary significantly, the key concept is that profit and financial reward are based on team (rather than individual) performance, and are typically funded only if the project meets or beats the project budget (“savings”) and/or other specific performance metrics.

Beyond the entity structuring, a dramatic difference of IPD is in the content of the contract, what the document actually spells out. Whereas most traditional contracts are written to assign risk and to ultimately adjust risk through litigation, IPD contracts are written to guide team effort and decision-making and to adjust risks internally, rather than in court. Specific components can include a “Statement of Intent,” written from a basis of aligned expectations by owner, general contractor, architect and others who sign. NBBJ’s Zeallear notes that in the NBBJ IPD contract form “We even went so far to spell out what it means for a promise to be reliable in the contract’s ‘Guide to Standard Work.’” Zeallear continues, “Another notable section is ‘Collaboration and Integrated Design’ in which we state that no parties ‘can proceed in isolation from the others, and that there must be extensive collaboration and continuous flow of information.’”

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James Salmon of Collaborative Construction Resources helps stakeholders, owners, architects, engineers, contractors, and others apply and use collaborative contracts and IPD, and has guided drafting of several IPD contracts. Salmon notes that “The drafting process itself is a *team* effort and a lesson in the critical skills IPD teams must wield effectively throughout the IPD process. Negotiating communications protocols, BIM addenda and implementation, application of pull scheduling, and the contours of an effective pain-share-gain-share agreement require coordinated and collaborative team effort and team decision making at the start. IPD contracts cannot be pulled off a shelf or out of a drawer and executed among strangers. They must be created by and among trusted business partners as a road map to project success.”

Several contractual formats for IPD have appeared in the last two years. One approach builds IPDish teams based upon traditional contract formats. Most notable is the AIA's “Transitional Documents” series. It modifies traditional AIA contracts to enable greater preconstruction services by the contractor; formally incorporate BIM in the preconstruction phase; sequence design work earlier; formally encourage earlier shop drawing and submittal phases; and permit group (consolidated owner, architect and contractor) dispute resolution. “Pure” approaches to IPD include the AIA's C195 and related documents, and the *ConsensusDOCS 300: Tri-Party Collaborative Agreement*, published in 2007, as the first broadly endorsed standard collaborative contract format in which an owner, designer, and contractor all sign the same agreement. Other models for IPD come from the private sector, such as Sutter Health's “Integrated Form of Delivery,” available through LCI.

The forgoing is an attempt to briefly summarize the legal and formal specifics of IPD, and does not attempt to clarify the legal complexities of the differing approaches. Please see the “Contract Forms and Information” section in the bibliography for more detailed explorations into the different contractual approaches.

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Driving IPD

The current increase in interest and use of IPD grows from a number of separate, yet related trends:

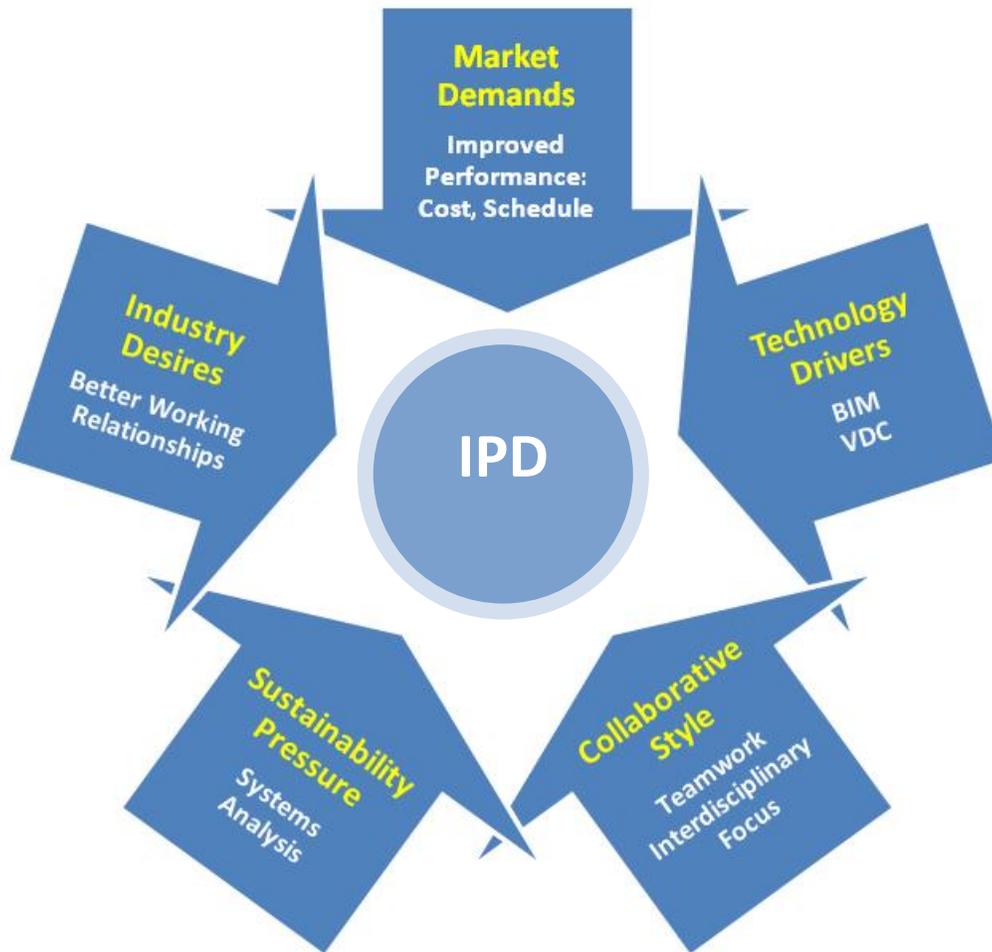


Figure 4. Factors Driving Increased Adoption of IPD

Market Demands

Projects are still frequently over-budget and delivered late. This is despite decades of “new and efficient” processes, such as negotiated Guaranteed Maximum Price (GMP) where contractors team with A/Es for preconstruction; design/build where the owner contracts with one entity for full services; techniques such as Partnering; and significant new technologies for design, coordination, and communication. Understandably, owners are searching for a reliable process that produces predictable outcomes.

Sometimes, change is driven from “outside” of our A/E/C universe. One client, Sutter Health in California, has become a poster-child for IPD, and an example of market change driven by the customer. “Our message was clear” notes Dave Pixley, project management director for Sutter Facility Planning & Development, speaking of a 2004 program in which Sutter introduced its new project delivery model to prospective construction companies. “We intend

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to deliver projects differently.” Sutter has half a dozen Pure IPD projects complete or under way, including medical office buildings and hospitals. ([Post ⁸](#))

The Seattle Children's Bellevue Clinic (Bellevue, Washington) (noted earlier in the definition of IPD), illustrates another driver of IPD. Key to Children's commitment to IPD, and in fact the genesis of using an IPD approach, was Children's own internal adoption of Lean techniques, which it had used to improve the efficiency and delivery of its own healthcare services. This mission was then extended to its consultants and vendors, seeking broader application of a rigorous structure to reduce waste, create efficiency and reliability, and increase quality.

A/E/C Industry Desires

Perhaps the biggest support for IPD is from within the A/E/C industry itself, from the pantheon of architects, contractors, engineers, fabricators, cost estimators, and others, who share owners' frustrations about a lack of coordination, poor communication, missed information, change orders, and cost overruns. Many of these firms have seen IPD approaches yield significant internal efficiencies, improved quality, and greater profit. These firms are promoting IPD as a “win-win” for themselves, their collaborators, and their clients.

They can be seen in BIM user groups promoting education about and use of robust 3D modeling and team integration tools around the country. And in individuals such as John Tocci, chief “enabling” officer of Tocci Construction, a passionate proponent of “complete process transformation” and use of IPD. Tocci is chairman of the Associated General Contractors (AGC) BIM forum, which has over 1,600 members in seven sub forums for academics, constructors, designers, lawyers, and insurers. These AGC forums, as well as similar activities in AGC, AIA, and/or engineering associations across the country, are serving an important role in connecting and furthering conversation among the different disciplines, developing IPD tools, and furthering the cause. “We're going to do this,” notes Tocci in regards to changing communication and contract formats and using IPD. “We're not going to be caged as we have been for twenty years.” ([Post ⁹](#))

Technology Drivers

As noted earlier, BIM is an important tool for IPD. BIM use, though, is not limited to only Pure IPD projects. The past short few years have seen an explosion in the use of BIM across disciplines, project types, and delivery methods. This increased use of BIM and its proven power as a collaborative tool then pushes “typical” project teams toward IPD. McGraw Hill's SmartMarket Report entitled *Building Information Modeling: Transforming Design and Construction to Achieve Greater Industry Productivity* (SMPS was an Association Collaboration Partner in the publication) details the broad adoption and use of BIM, and its results across the industry. One of the report's key points is that as BIM and related technologies are adopted, the use of the technology engenders process changes that lead users toward more formal IPD, because traditional delivery formats and processes can diminish BIM's benefits, while IPD unlocks them.

One aspect of BIM leading teams to IPD or IPDish is early participation of trades or specialties that are otherwise typically added later in design and construction. For example, steel suppliers/fabricators are typically hired by the general contractor after completion of construction documents. But suppliers/fabricators have unique information on commodity costs, materials availability, and cost and schedule implications of designs and

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specifications. Their participation early in design can have many significant, positive effects. Crate & Barrel, a 160-store national retailer, notes that early participation by steel fabricators during design to “throw out frame options and save weight” have been responsible for dropping steel tonnage by almost 25 percent on IPD projects (Young, Jones, Bernstein¹⁰). Additionally, BIM allows the design data to be directly transmitted to the fabricator for use by the computers driving the steel fabrication, in some cases eliminating “separate” shop drawings. On traditional projects, these capabilities come up against legal and teaming barriers. Why should a steel fabricator participate early if it is not committed to the project? What are the liabilities and responsibilities when digital data is transferred directly from a BIM model to a fabricator's laser-guided cutter? Answering these questions, or more aptly getting rid of the barriers, is a driver to IPD models for these team members.

Another push to IPD from BIM is enhancing interdisciplinary coordination, the ability to create a virtual 3D environment both to use the built-in clash detection (building systems conflicting in space) capabilities of BIM, and to use the model as the basis for interdisciplinary constructability work sessions. This capability is often touted as the #1 benefit of BIM modeling. Regular users become fans of shared information, linked models, joint-work sessions, and interdisciplinary brainstorming, which are the “people process” tools of IPD. Ironically, for a process dependent on software, BIM has created more and better opportunities for disciplines to talk directly to each other, and many of those users want more.

The SmartMarket report clearly illustrates that the more professionals use BIM, the more they tend to see the benefit of both the technology and IPD processes. Two-thirds of users note that BIM has had at least a moderate impact on their work processes with other disciplines and owners. This metric increases dramatically as users' BIM expertise increases. Forecasting into the future, the more BIM becomes the standard for design and construction documentation, and the more design and building data resides in BIM databases, the more fuel there will be to work collaboratively and to use an IPD model for project delivery.

Sustainability Pressure

Sustainability is quickly maturing from a trend to a baseline, particularly for reducing the natural resources consumed in building and operating structures. Thousands of public agencies, higher education institutions, healthcare systems, corporate users, developers, retailers, and others now require LEED certification for their projects. Others have similar in-house initiatives or use other third-party systems. The general consensus is that achieving true high-performance buildings requires robust interdisciplinary development of options, analysis of trade-offs, interpretation of data, and choice. BIM is a common tool for storing data and analyzing options, as are interdisciplinary work sessions. Success from the use of these IPD ingredients and excitement by the teams involved is yet another incentive promoting more formal collaboration (i.e., IPD).

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Collaborative Style

We live and work in a culture of collaboration. Ever more firms and individuals in A/E/C tout their desires and abilities to work collaboratively, partially in reaction to ongoing industry inefficiency, and partially due to social trends and personal values. These trends are illustrated in many industries, such as collaborative teaching and interdisciplinary models in education, or collaborative approach to healthcare. A/E/C promotional materials routinely list collaboration as a company value. Those earnestly seeking collaborative models will gravitate to IPD because IPD is a defined, distilled version of a process many A/E/C firms have long claimed.

IPD Use Today

We know anecdotally that the use of Pure IPD is small but growing. However, measuring the IPD market is difficult at best. Different definitions and widely varying approaches and sophistication levels mean that the term "IPD" is used to describe significantly different contact arrangements and team processes. To date, no industry organization has measured the adoption of Pure IPD. As gauged by the use of Pure IPD contracts, there are perhaps two dozen IPD projects in the U.S. Key IPD tools however, such as robust and shared BIM modeling and application of Lean technologies, are being used on thousands of projects, as evidenced in many of the projects described in the articles included in the bibliography for this paper, and based upon anecdotal data from companies.

The current recession is having some impact on the implementation and adoption of IPD. Fallout from the financial crisis has negatively affected funding and desire for new projects. Even many in-construction projects have been halted. Indices of both design and construction have fallen dramatically. As a result, real costs for design and construction services have fallen. For owners who saw IPD as a way to gain efficiencies to offset the high costs of the boom market, that wind is no longer in the sails. The cost-basis in some cases has dropped so dramatically that owners are changing procurement models mid-project, and competitively bidding projects previously under negotiated contracts. This may not bode well for IPD delivery, which depends on a far-seeing owner who is balancing first cost with life cycle cost, including his own operations and efficiency. Balancing this are the continuing trends noted earlier, and the number of IPD forums and education efforts continues to grow. Further, the trend toward bidding may be short-term, attractive only while construction pricing is in freefall (i.e. bids are coming in substantially lower than last month's negotiated budgets).

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IPD Adoption Tomorrow

Mark Twain was not an A/E/C analyst, but his outlook applies here. “There are three kinds of lies: lies, damned lies, and statistics.” Using statistics now to quantify and forecast the IPD market would require too much guesswork and could be extrapolated to support a number of hypotheses, which could be misinterpreted. So, instead we will address the activities that we think are key to increasing the size of the IPD market in the future and will likely drive its widespread adoption.

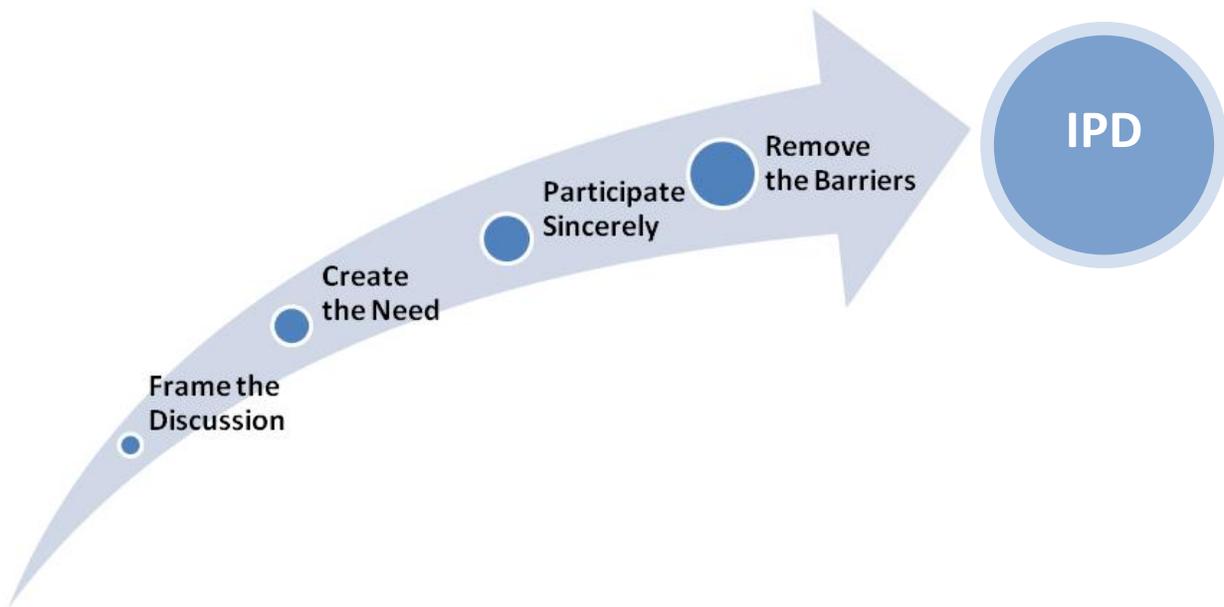


Figure 5. *Fundamentals for Increasing the IPD Market*

Frame the Discussion

Despite the complexity of modern buildings and their systems, despite acknowledging that the initial cost of good design can be outweighed by program efficiency or reduced maintenance costs, and despite the growing focus on energy consumption and costs, building owners and developers often focus primarily on first cost. This is due in part to the nature of construction financing and the typically different “pots” that pay for capital construction and maintenance. First costs are also easier to “get a handle on” and quantify. So, key to widespread IPD adoption is creating metrics—measurable, comprehensible numbers based on careful analysis—that speak to the real savings of an integrated approach.

Efforts are under way on a number of fronts to quantify the application of IPD and related processes in terms of their impacts on cost, schedule, quality, and more. The Center for Integrated Facility Engineering (CIFE) at Stanford University, as sponsored by the federal General Services Administration (GSA), is researching and developing models to apply the results and lessons-learned of teams using BIM. The University of California at Berkeley's Center for the Built Environment (CBE), operating under a grant from the National Science Foundation, is focusing on post-occupancy evaluations as a tool for improving the design and management of buildings, and applying lessons-learned from collaboratively developed high-performance building systems. These efforts and others will create databases of

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information that will help bring construction cost and even long-term operating and life cycle cost into the realm of design. This will be powerful for IPD teams using Lean techniques, which requires a strong focus on designing to performance and operations measures.

Create the Need

However clear the benefits of IPD might be to your firm, an aphorism of marketing is that you can only sell something that people want to buy. One of the significant challenges to A/E/C practitioners who believe in and want to provide IPD is speaking to owners who don't "get it," or do get it and fear change or think it is enough to state during selection that "collaboration is expected." Some owners don't have the internal sophistication about design and construction processes to really understand the differences in approach, or to manage a new process they do not understand.

For IPD to gain greater traction with owners, the A/E/C community must engage with building owners and developers in their forums, and in their language. Here is an important role for the professional marketing staffs of A/E/C firms seeking IPD work: identifying opportunities, coordinating technical teams, and creating IPD education/marketing programs. Certainly much of this is happening in the context of professional organizations mentioned in this paper (and in the articles in the bibliography), but one-on-one educational efforts and discussions with targeted clients may be more effective. One reason for this is the Lean-inspired and measured-in-the-client's-language approach of IPD. Another is the opportunity in these educational discussions to engage substantively with the owner about the very activities that their building houses. The message is that the more the A/E/C team understands the owner's activities, the more we can improve our delivery process. Lastly, a common post-process comment by IPD practitioners (as with practitioners of other "alternative" delivery methods) is that success requires a sophisticated owner, one who understands the nuances of the process. More industry dialog with owners will increase the likelihood of IPD projects being successful.

For public sector clients in many states, and perhaps to enable private sector adoption, legislative action is, and will be, required. This is another important activity for A/E/C firm leadership and professional organizations.

Participate Sincerely

At the same time as a market requires desire by the customer, it also requires willingness by the provider. To be willing, A/E/C firms have to embrace the significant changes of IPD. As an example, for a structural engineer, this includes:

- Acceptance of risk "deeper down" and by parties unaccustomed to taking on risk—putting a portion of their fee at risk to activities by the entire team.
- Molding internal tools to what's best for the team, not the individual discipline—meaning the structural engineer builds their BIM model in a way that the general contractor and fabricators can work with it.
- Maintaining conceptual design on several structural system options until the team chooses which system to use.
- Limiting detailing of the design(s) until it is needed by the overall team.

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- Accepting “overlapping” scopes and process. Being willing to make structural decisions with the general contractor and fabricators, and not dictate approach.

Successful IPD will only be sold and produced by “true believers.” To ensure good strategy, another role for marketing leaders is guiding firms through a true analysis of the “fit” of IPD work within their own culture and working style. There’s a risk with IPD, as with other industry trends and buzzwords, that firms adopt the nomenclature without the underlying activity. This confuses everyone, demeans what is truly different about IPD, risks the company’s image and relationships, and in the long run benefits no one. IPD is not right for all project types and all owners. Many A/E/C firms may prefer, and should market, more traditional approaches.

One concern about IPD for some potential practitioners is working “outside” their expertise. Actually, the opposite may be true. IPD allows disciplines to focus on the work they most enjoy and are trained for. Commenting on the Autodesk offices in San Francisco’s historic One Market Street building, Peter Anderson of Anderson Anderson Architecture notes that IPD on this project was like having the control of a single source design/build contractor, while providing “only” architecture. IPD yielded a “great deal of project delivery knowledge and expertise and input and control in the delivery process” without being the contractor. (Yoders ¹¹)

Remove the Barriers

As noted earlier, IPD pushes disciplines to work together and share information. This leads to a blurring of the lines of “who is responsible for what when,” and is in conflict with most of the risk analysis and insurance models in our industry. A specific illustration addressing the liability of details: how can a designer share BIM information—the actual bits and bytes of data—with a contractor and even a fabricator to help realize production efficiency in an IPDish project, using a traditional contract form? The form specifically bars sharing anything but printed documents, and cautions against taking on greater liability. The SmartMarket report notes that “little is being done to mitigate (those) liabilities in contracts, and (BIM) users are most likely to use conventional contracts without any modifications to accommodate the use of BIM. Resolving these complexities is the work of a significant number of industry initiatives, and deeper adoption of contracted information protocols is expected.

Another challenge: IPD blurs the distinction between owners, designers, and builders. This raises insurance liability challenges. There are not yet on the market “IPD” insurance products, and the early teams seeking Pure IPD relationships have had to work with legal and insurance vendors to create complex work-arounds. Until there are clear forms of insurance for IPD projects—particularly Pure IPD—many potential buyers, and their legal counsel, will be averse to initiating IPD projects.

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IPD Marketing

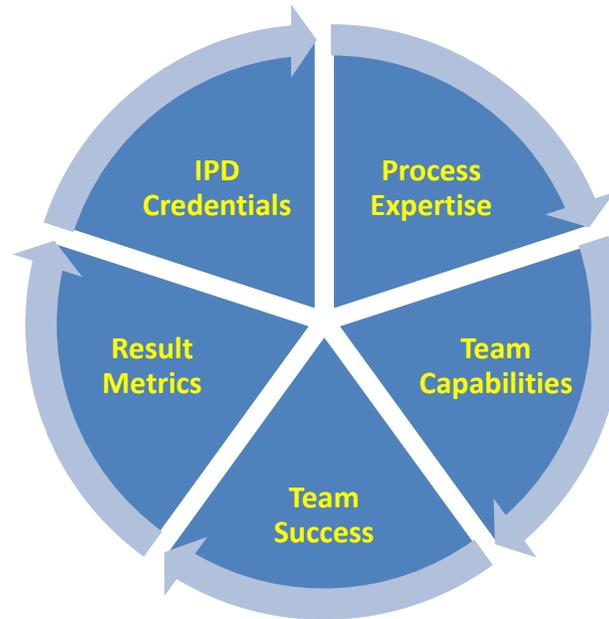


Figure 6. Five Keys to Marketing IPD

The IPD market has a bit of a chicken/egg conundrum. Do we create an IPD team first, and then sell to the market? Or, do we find the owners seeking IPD and form teams to meet their needs? How do we develop capacity without clear market demands? The answer, we think, is “all.” Savvy IPD marketers will be working, concurrently, on the following five activities.

IPD Credentials

The first step of entry into the IPD market is knowing what you’re selling. This paper notes a difference between Pure IPD and “IPDish.” Firms seeking IPD work need to understand and sell their work with this differential in mind. Clients seeking Pure IPD will not be convinced by mere mentions of collaboration techniques or design charrettes. They will expect specific description and application of core IPD technology such as BIM and IPD-friendly contract forms. For a higher education client requesting IPD teams, James Salmon is developing a unique RFP format which requests, for example, information on methods and practices for “ensuring that the owner’s existing business plans are integrated throughout the project,” an “approach to integrating all necessary owner stakeholders ... and (how you will) help them expand their thought process around efficient workflow and the relationship of workflow to the design,” and “experience and approach to Target Value Design.”

Process Expertise

IPD projects are more complex than traditional delivery in terms of interaction between disciplines, include more participants simultaneously, and are more “process-intensive.” By “process-intensive” we mean a greater amount of time is devoted to designing and managing the specific process of a specific job. This is more than balanced by efficiencies (materials, time, and money) gained during the entire design/construction period. All this creates need and opportunity for a different or more enhanced type of project management than architects or general contractors may be familiar with. Among numerous examples, three processes to master are:

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- The substantial process planning required before even the programming begins.
- Complex new contract forms and methods, and how to adapt industry standards or protocols to specific project needs.
- Facilitation skills to run interdisciplinary charrettes and work sessions that are core to IPD, as well as the owner workshops including larger number of owner users and participants.

Additionally, IPD requires an owner willing to take on more risk with, for now, non-traditional legal formats and risk/insurance/bonding models. Owners often lack in-house management resources and seek hassle-free management by others. This increases process expectations and the need and opportunity for A/E/C practitioners to sell IPD process management, either as part of a larger set of services, or as third-party owner representatives. An example of this is the work of Ghafari Associates, a Dearborn, Michigan, based firm that provides “traditional” A/E services while also consulting on integrating IPD, Lean, and BIM technologies for projects designed by other architects. Another form of consultancy is independent facilitators with expertise in team dynamics, communications, and integrating technologies. These facilitators focus on leading charrettes to maximize collaboration and innovation.

Team Capabilities

A clear trend of BIM use, and a requirement for Pure IPD, is collaboration directly between engineering consultants and subcontractors/suppliers. An example from the New York Giants/New York Jets Stadium, involving structural engineer Thornton Tomasetti and steel fabricator CanAm working with design-build contractor Skanska, includes not only BIM models created by the engineer and given to the fabricator, but radio-frequency identification (RFID) tags. The tags enable “live” tracking of components from manufacturing through delivery through installation, and tracking onsite with PC tablet computers. Tomasetti’s BIM model, with information including “the number of bolts, the precise tonnage, and other exacting details, (allows) CanAm to order steel at the optimal time and start working on finished portions of the design without waiting for a final model or RFI process.” This story illustrates not only the technology induced communication efficiencies of BIM, but “Leanish” savings from tightly-collaborative teams in production, materials and efficiency. (Yoders¹²).

Few examples, though, exist of these teams coming together at the proposal or marketing stage. This seems a strong potential for selling the IPD process, and specific IPD teams, much like architects and structural engineers, team and sell their proven track records together in traditional delivery. As the IPD market matures and owners seek the “bona-fides,” these partnerships will be sought and evaluated. A/E/C firms will need to develop new business development models to cultivate these relationships, maintain team marketing and team IPD experience information, and be prepared for specific project pursuits. How many structural engineers, to continue the example, strategize about or include steel fabricators in their client/influencer targeting?

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Team Results

In manufacturing industries' adoption of IPD-type practices, the relationships between designers and suppliers and assemblers are ongoing beyond one specific product. While these manufacturing teams can clearly benefit from efficiencies in the repetitive production of identical designs, the merits of long relationships can benefit A/E/C IPD teams substantially as well. In the car industry the designer imagining the shape of a windshield is working alongside the glass supplier; in our industry it's Thornton Tomasetti and CanAm, as previously noted. Repeat practitioners of IPD speak to the value of an ongoing relationship, the importance of learning the unique work and communication styles of individuals, and the efficiencies of bringing those relationships to the next project. As owners learn IPD and see this value, they will seek it in hiring teams. Certainly "proven team experience" is a common, almost ubiquitous criteria already on RFPs and RFQs, but IPD-focused selectors may look to specific examples of efficiencies, savings, alternative approaches, and mutual shared success on IPD projects.

Additionally, with growing focus on "team, team, team," it may become harder to separate a specific discipline's performance or idea from that of the team. It may become harder for marketers to develop brochure sheets, web content, articles, or presentations focusing on their individual firm's ideas and innovation, because the genesis and development of the idea is team-based. While this author is not making a prediction one way or the other regarding industry consolidation or growth of interdisciplinary firms, it is clear that more use of IPD will make it harder to sell "just" ourselves. Likewise, attempts by individual firms to take credit for team successes will risk existing relationships with their partner firms. Influencing this is the trust component noted by Rick Oehmcke previously, and the desire to work, and thus propose, as a team. Lastly, although not seen much yet, there may be fewer owners hiring architects first and then jointly selecting consultants. Instead, owners may well seek to hire "full" IPD teams at the outset of their projects.

Marketing and business development efforts to support and leverage these designer/supplier teams will need to go beyond golfing and cocktails at conventions. The next step may be joint professional development and education on new technologies, education and training in IPD activities themselves, and, as noted earlier, looking for project leads and opportunities in new places. A greater level of coordination may be required—or may benefit teams' approaches—between marketing and technical staff in different firms assembling integrated, joint team proposals.

Conversely, or the exception that proves the rule, is the "virtual teaming" capabilities created by use of BIM software. With robust data and model sharing, instantaneous 3D viewing, and ability to support geographically diverse teams, some have predicted that BIM will give rise to more mobile professionals and teams, able to take their expertise and parlay it anywhere, anytime, on a project basis. Either way, savvy firms will seek specific expertise and illustrate how BIM and IPD processes will integrate this expertise into proven teams.

Result Metrics

Metrics are important to the IPD process: for example, A/E/C teams working with databases of energy consumption, or IPD teams seeking industry benchmarks for owner activities within buildings. There may be a growing need and coming expertise in finding the applicable industry data, working to create and monitor targets geared to the existing data,

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and weaving all this into the IPD process. Describing this process and identifying the experts will become a part of project proposals.

Efficiency metrics, with specific results of IPD techniques, will be sought by IPD-savvy owners. A micro example that comes from several health care architects: analyzing layout of patient rooms, such as the relationship of bed to bathroom, in hospitals. While the discussion includes analysis of construction costs and energy use (among others), it is steps walked by nurses that can be the strongest determinant. Extrapolating this type of discussion, to other and larger terms and measures of personnel, equipment, and other costs for potential clients is important for IPD success.

Natural resource use including energy consumption is another example of metrics for owners seeking proof of high-performance building systems. While not specifically requiring an IPD process, the explosive growth of energy services contracts is an example of owners buying—and contracting teams to deliver—performance, not product. In energy service contracts, a mechanical contractor or engineer will guarantee a certain level of improved energy performance, the savings of which will pay for the design and construction efforts. It is this buying characteristic—the owner focusing substantially on cost and performance, and not qualifications—that may foreshadow IPD buying criteria.

The Further Future?

Finally, we take an eye to the future, and look at some as-yet-unclear implications of IPD. Strategizing the following potentials will be a bit of a “bold new world” for A/E/C marketers traditionally working on one-time projects and this-year initiatives.

Stewardship

As noted earlier, sustainability is a key driver of IPD. Sustainability practices regularly push the frame of reference. For example: we don't just consider the energy efficiency of a particular product. We consider the point of origin and transportation costs, and weigh these two factors. With this dynamic, plus the tie to building use and functionality that is core to the efficiencies sought by IPD, we can see a future where a building is seen and “bought” not so much as a *product* at a moment in time, but as *part of an on-going relationship and production of a physical structure* by an A/E/C IPD team working on an on-going basis with an owner. George Elvin in *Integrated Practice in Architecture* (2007) makes the prediction that owners will increasingly expect integrated practitioners to provide “stewardship,” and to “assume long-term responsibility for all aspects of building design, construction, and management.” (Elvin¹³) Elvin sees this as an outgrowth of the sustainability goals of integrated practice, and a result of “holistic practices (that) require interdisciplinary collaboration and ... looking beyond immediate symptoms to recognize deeper dysfunctions and potentials.”

Some of this can already be seen in industry trends to more owner outsourcing and, for instance, DBOM (Design/Build/Operate/Maintain). But “stewardship” as articulated by Elvin envisions a deeper relationship between building experts and building users. It leads to new forms of professional service and additional new contract methodologies. One example noted by Elvin is of Ellerbe Becket and its ongoing strategic relationship with an international healthcare organization, which includes Ellerbe Becket in evaluating health management

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deals. What are the possibilities of this type of consulting for an IPD team equipped with and knowledgeable about the intimate processes of its client, and the use of IPD metrics? Elvin also imagines increased use of multiple award contracts in the private sector, such as those commonly used by the military agencies, universities, and hospitals.

Another element of this is the facility management potential of BIM. Theoretically, as construction is complete, BIM becomes an exact virtual model of the building and all its components, with rich data on operations and maintenance within. Many have predicted that these same BIMs will become core to building owner facility management efforts. While this aspect of BIM has been slower to gain traction, greater IPD adoption will inevitably bring more facility management expertise into the process, adding these individuals and/or companies to IPD teams. As technology capabilities and adoption grow, we'll see more vertical integration and companies or teams offering, and owners wanting to buy, facility management expertise along with traditional A/E/C.

Leadership

A bit of an unanswered question about the IPD process is “who will the leader be?” “True collaboration” is clearly the goal and the mantra of IPD—and a team so highly functioning that almost all decisions can be made by consensus is practical. But, at times, a tough decision will need to be made, and leadership by an impassioned individual often leads projects to visionary success. IPD practice, with broader and more integrated team definition, may allow or even encourage leadership from a variety of sources. In a Pure IPD project, with an SPE funded by the owner, it seems the decision will “follow the money” and that the owner will (as in traditional delivery) make the leadership decisions. But the nuances here are yet to be fully understood.

Specifically in regards to architects, several articles cited in the bibliography ponder whether IPD further reduces their influence, and/or opens more doors of opportunity. Concerns include loss of focus on the aesthetic components of design due to earlier participation of the general contractor and other non-architectural disciplines; loss of control of project documentation with distributed BIM modeling; and the potential for an overriding focus on efficiency over all else. In response to the likely growth of IPD, Barbara Golter Heller, FAIA, calls on architects to “craft a new role for themselves as leaders,” to become “an orchestra conductor who is willing to take both credit and blame of the quality for the symphony,” ([Golter Heller](#)¹⁴) and to sell services with a “business case” scenario. This “business case” is fundamental to IPD, and an opportunity not just for architects, but for all disciplines. Fundamentally, owners care about predictability and quality; if those are covered, who is “in control” is secondary.”

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Close

We think the best way to close this paper is with a series of questions. These are presented for A/E/C firms and marketers to help chart your location in the IPD “world” and begin to determine where you should focus your efforts:

1. ***What are you doing already?*** As we've noted, much of IPD is bringing together tools or approaches that exist in traditional delivery formats. Which of these are you already undertaking? How are you already acting in an IPDish manner? If you were to pursue more formal IPD work, what tools and resources would you need to develop internally? What “portions” of IPD can you already start developing?
2. ***How does IPD fit with your culture?*** What is appealing about the trends described in the paper, and what is not? Do you really want to work more collaboratively? Are you comfortable with, for example, putting a portion of your fee at risk based on team performance? For this question (and Question #1), use Figure 1 (page 3) of this paper as a guide.
3. ***What are the trends in your markets, and with which clients might IPD desires be forming?*** Are any of your competitors working on IPD projects? Which of your current or potential clients would be attracted to the lean concepts of IPD? Be sure to investigate both Pure IPD and IPDish work, using the concepts of both as a means to understand what exactly is being offered and bought by owners, and as a means to quantify actual trends. Conversations directly with owners will be invaluable.
4. ***Which of your collaborators and partners are already involved with IPD work?*** Strong teams and collaborative work are the core of IPD, so talking with your current partners establishes where there might be joint interest as well as opportunities for joint marketing and/or education.
5. ***Lastly, what's the intersection of all this information, and where do you want to start?*** As with all strategic efforts, a small goal accomplished well is better than many undone.

With the answers to these questions in hand, with the ideas and prompts from the content above, A/E/C firms and marketers can translate IPD strategy into “traditional” marketing activities. The role of education, both internally with your firm, and externally with your clients, cannot be overstated, as well the caution to only sell as IPD what really is IPD. Enjoy your brave new world.

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Endnotes

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This document outlines "first principles" regarding IPD, from a full range of stakeholders. A workshop involved 3xPT Strategy Group members and a broad range of additional owners, general contractors, architects, engineers, subcontractors, attorneys, professional liability professionals, general liability professionals, and sureties. The workshop defined guidelines for integrated project delivery approaches and improved industry outcomes, looking through the lenses of four delivery models (design-bid-build, design-build, construction management at risk, and project alliance). The workshop explored approaches to integration within these models. Four teams explored and defined integration options to generate ideas and insights of the four models. In follow-up sessions, characteristics of IPD identified during the workshop were sifted and refined to arrive at a set of "first principles" of IPD applicable to all delivery constructs. This paper sets forth those first principles, regarding process and organization, scope, performance metrics, tools and methods, and contractual agreements.

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A comprehensive book about integrated practice in architecture, with academic detail on topics such as collaborative estimating, bridging consultant, early team formation, visioning charrettes, graded practice, building information modeling, integrated practitioners, information user input, new master builders, project extranet, intersection criteria, team collocation, translator model, strong matrix organization, integrated

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project team, contractor input, practice providers, open documentation, project delivery method, design during construction, integrated firms, information dependencies, teaming agreements, simultaneous design, and building life cycle. Content includes significant case study and "real-life" information from 50 IPD practitioner interviews. Chapters are organized around critical issues in integrated architectural practice, including team building, project planning, communication, risk management, and implementation.

IPD Projects, Stories and Lessons Learned

Carbasha, Tracy, "Integrated Project Delivery Improves Efficiency, Streamlines Construction," *Tradeline*, Published July 16, 2008,

<http://www.tradelineinc.com/reports/0A03D1C0-2B3B-B525-85702BCEDF900F61>

Intro to IPD, discussion of relational contracts, and discussion of IPD approaches such as True Value Design and the Last Planner System.

DeBernard, Deborah M., AIA, NCARB, LEED AP, "Beyond Collaboration—The Benefits of Integrated Project Delivery," AIA Soloso website, March 12, 2008,

<http://soloso.aia.org/eKnowledge/Resources/Documents/AIAP037286>

Distilled results from December 2007 AIA conference in which the definition, benefits, and keys to success for IPD were discussed. Discussion participants included Doug Parris, AIA; Todd Buchanan, Assoc. AIA; and Tom Owens of NBBJ.

McGraw Hill, Continuing Education Center, "Best Practices in Integrated Project Delivery for Overall Improved Service Delivery Management," May 2008,

<http://continuingeducation.construction.com/article.php?L=115&C=408>

Deep, technology-focused look at IPD. Article preface: "Growth of AEC organizations and the desire to better manage building projects leads firms to implement next-generation collaboration tools and integrated server products. The technologies are shown to save time and money while improving knowledge management."

Post, Nadine, "Chief Enabling Officer Drives Hard for Process Transformation in Construction," *ENR*, Jan. 7, 2009, <http://enr.construction.com/people/awards/2009/0107-JohnTocci.asp> (subscription required)

John Tocci's self-written title at his own company might also apply to his industry role promoting BIM as Chair of the AGC BIM Forum. He is helping bring together a broad range of professions and stakeholders to seek mutually beneficial approaches.

Post, Nadine, "Leading-Edge Collaboration Hurt by Lots of Software Workarounds," *ENR*, April 29, 2009, http://enr.ecnext.com/coms2/article_tebm090429SoftwareWork (subscription required)

For a \$320 million Sutter Health project due to complete in 2013, Sutter is exploring BIM-based estimating, automated code checking, and direct digital-model exchange for detailing, coordination, automated fabrication, and scheduling. The nonprofit hospital owner wants to prove it is possible to reduce waste and risk while delivering a better facility, 30 percent faster. The project is in VDC and permitting stage. The article discusses the challenges, solutions, and experience so far.

Post, Nadine, "Lean Gurus See Big Gains in Use of Lean Project Delivery," *ENR*, Nov. 21, 2007, http://enr.ecnext.com/coms2/article_febiar071121b (subscription required)

Lean is becoming more prevalent in large part due to a major customer in Sutter Health. In one project, the contractor claims savings of \$9 million and a reduction in peak labor of 30 percent, and the MEP trades reported only 43 hours of rework out of 25,000 total. In Target Value Design, designers and builders design together, working toward a detailed budget and providing multiple solutions to meet that budget.

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Post, Nadine, "Sutter Health Unlocks the Door to a New Process," *ENR*, Nov. 21, 2007, http://enr.ecnext.com/coms2/article_febiar071121a-1 (subscription required)

Sutter Health is using Lean Project Delivery (LPD) with great success on its multi-billion-dollar capital improvements program. The key to making it work is relational contracting with an "Integrated form of Agreement," or IFOA. The contract does not attempt to be a basis for litigation, but to deliver a successful project. The article further discusses the experience and hurdles of implementing LPD.

Post, Nadine, "Sutter Contract is 'Lean' Enabler," *ENR*, Nov. 21, 2007, http://enr.ecnext.com/coms2/article_febiar071121c (subscription required)

An "Integrated Form of Agreement," or IFOA, puts more control over the processes, governance, format of invoicing, and timing of payments in the hands of the overall team rather than the owner.

Yoders, Jeff, "Integrated Project Delivery builds a brave, new BIM world," *Building Design & Construction Magazine*, April 1, 2008, <http://www.bdcnetwork.com/article/CA6547987.html>

The article presents three project examples where a high degree of IPD was achieved through use of BIM and other modeling tools.

Contract Forms and Information

AIA, "Contract Documents" (website page), <http://www.aia.org/contractdocs/index.htm>

This section of the AIA website is a library of information about AIA contract formats, position papers, training options, and purchasing support.

Cardwell, Richard D. (President, Construction Owner Resources) and Salmon, James L. (President, Collaborative Construction Resources), "Analysis of ConsensusDOCS 300 and the AIA IPD DOCS," Collaborative Construction Blog, July 21, 2008, <http://collaborativeconstruction.blogspot.com/2008/07/analysis-of-consensusdocs-300-and-aia.html>

Advocates for ConsensusDOCS 300 summarize attributes of ConsensusDOCS 300 and AIA IPD contracts in detail with matrix and a bulleted format.

ConsensusDOCS.org, <http://www.consensusdocs.org/>

Website introduces ConsensusDOCS, names the organizations in the ConsensusDOCS partnership, discusses the differences between AIA and ConsensusDOCS formats, contains links to guides for various ConsensusDOCS formats, and sells the documents.

ConsensusDOCS 300, "Standard Form of Tri-Party Agreement for Collaborative Project Delivery," <http://65.193.17.226/consensusdocs/CD075--300.pdf>

Standard ConsensusDOCS 300 agreement.

Harness, Suzanne H., AIA, "2008 AIA Documents Advance the Use of BIM and Integrated Project Delivery," AIA website, <http://www.aia.org/groups/aia/documents/pdf/aiab078753.pdf>

This white paper is a short primer on AIA tools for BIM and IPD. One category is AIA "Building Information Model protocol exhibits" which provide draft agreements and file format protocols teams can use to frame their project relationships and processes. The next section is contracts, including the A295 family based on traditional team arrangements, and the SPE family, which is used to frame true IPD-type approaches.

Meynardie, Bob (of Nelson Mullins law firm), "ConsensusDOCS: New Form Construction Contract Documents Created By Industry Consensus," October 8, 2007, http://www.nelsonmullins.com/news/nelson-mullins-newsletter_detail.cfm?id=7FB808DB-A15C-3659-19BC03AFFDCA00EE

Discusses release of ConsensusDOCS, absence of AIA in the partnership behind the new format, and the major differences between ConsensusDOCS and AIA formats.

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Novitski, B.J. <http://archrecord.construction.com/practice/projDelivery/0807aia.asp>

A basic introduction to the AIA family of IPD documents, with some commentary on significant impacts.

Salmon, James L. (Collaborative Construction Resources), "The Legal Revolution in Construction, How Collaborative Agreements BIM and Lean Construction Methods Support Integrated Project Delivery," *Journal of Building Information Modelings*, Spring, 2009
http://www.wbdg.org/pdfs/jbim_spring09.pdf

A new contract form is necessary for BIM and Lean to be effectively adopted more broadly, and become a "revolution." Several new formats have filled this need, from ConsensusDOCS, AIA, etc. The revolution toward integrated process is resulting in many benefits, such as reduced legal costs, fewer RFIs, and fewer change orders. Now that the new contract formats are in place, the foundation for this revolution is in place.

Smith, Gampbrell & Russell, LLP (law firm), "Building Information Modeling," Spring 2008,
http://www.sgrlaw.com/resources/trust_the_leaders/leaders_issues/1127/1132/

Overview of BIM from law firm's perspective, covering issues such as contractual relationships.

Unattributed, "AIA Releases New Integrated Project Delivery Documents," Victor O. Schinnerer & Company website, 2008, <http://www.schinnerer.com/risk-mgmt/ConstComm/Pages/Ccom0208-IPD-Docs.aspx>

The new AIA contracts for IPD are introduced, including some comparisons to the ConsensusDOCS contracts and past AIA contracts. The new "A" and "B" family AIA documents for IPD preserve separate relationships between the owner and architect and the owner and contractor (the contracts are called "transitional" but the separate relationships could remain indefinitely). The contracts significantly increase contractor liability, with shared responsibility for design. A "C" class IPD contract accommodates an LLC comprised of the owner, the architect, and a construction manager, but not the builder.

Opinions and Commentary

Alexander, Richard E. (of Stoel Rives LLP), "Is integrated project design the solution?" *Daily Journal of Commerce* (Portland, OR), Aug. 15, 2008,
<http://www.djcoregon.com/articleDetail.htm/2008/08/15/Is-integrated-project-design-the-solution-While-productivity-in-construction-has-decreased-in-last-f>

Construction lacks collaboration and efficiency. IPD is good in theory, and may or may not be the long-term solution to these conditions.

Alexander, Richard E. (of Stoel Rives LLP), "Another look: Is IPD the solution?" *Daily Journal of Commerce* (Portland, OR), Oct. 20, 2008,
<http://www.djcoregon.com/articleDetail.htm/2008/10/20/Another-look-Is-IPD-the-solution-Construction-industry-ponders-whether-integrated-project-delivery-i>

The industry is recognizing the need for more collaboration. IPD offers two approaches, one a partial approach with more collaboration but old contract formats, and the other a full approach with new contractual relationships and formalized integration.

architect11 (screen name), blogger at Revit for Real, "Integrated Project Delivery," Dec. 13, 2007, <http://bimcompletethought.blogspot.com/2007/12/integrated-project-delivery.html>

Author relates IPD to the Toyota experience with Lean delivery, with staffing and material efficiencies resulting in profitability. One aspect was the various professions learning to anticipate the others' questions and needs. Basically IPD equals Lean.

Bishop, Ken, "Is Integrated Project Delivery A Revolution or Gimmick?" *ENR*, Oct. 1, 2008,
<http://enr.construction.com/features/bizLabor/archives/081001e.asp>

An IPD skeptic discusses the reassignment of risk and authority related to IPD.

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Ferreira, Joao, Professor, New York University, "Integrated Project Delivery Still Far Out in the Horizon," *The Zweig Letter*, Jan. 19, 2009, unavailable online

Summary of reasons why IPD is not catching on quickly in the US – concerns about procurement and licensing limits and restrictions, uncertainty about risk and lack of legal precedent, uncertainty about insurance and unclear coverage, and lack of firms willing to be early adopters.

Golter Heller, Barbara, "Red Business, Blue Business," *Design Intelligence*, May 30, 2008, http://www.di.net/articles/archive/red_business_blue_business/

Certain types of A/E/C and customer organizations have "red" characteristics (such as profit motive) or "blue" characteristics (such as focus on community), and IPD suggests some mixing of these characteristics, which means conflict. The article looks at the past and future of IPD with a focus on the philosophies and strengths of various players and how they interact in an IPD environment.

Igel, Lee, "Integrating the Needs of the Purpose-Driven Owner," *ENR*, Oct. 1, 2008, <http://enr.construction.com/features/bizLabor/archives/081001c.asp> (subscription required)

Owners have high expectations for project outcomes. New delivery methods have increased the options for how to meet these expectations. Single-source methods are growing in popularity.

Jacobs, Karrie, "The Prefab Decade," *Dwell*, February 2009, unavailable online

Prefab housing construction has never achieved popularity despite repeated attempts. However it has succeeded in changing the culture of architecture from a predominant focus on one-off projects to one where more architects think in terms of designs that can be used repeatedly.

McPhee, Antony, "Integrated Project Delivery: Bad News for Architects," Integrating BIM Practice blog, May 21, 2008, <http://bimpractice.blogspot.com/>

The author takes a critical look at what IPD really means for architects, and whether a BIM model is really necessary for integrated practice.

Lean Techniques and Process

<http://www.leanconstruction.org/>

The website of the Lean Construction Institute includes a variety of pages and white papers with definitions and detailed process descriptions.

Bowers, Melissa; Gilbert, Kenneth; Miller, Alex; Sprinivasan, Mandyam, "Lean's New Look," *APICS Magazine*, September 2007, <http://lean.utk.edu/images/Users/1/LEAN/Leans%20new%20look-%20APICS.pdf>

Lean is often seen as a money-saving effort, but it can also be a tool for growing the company, because growth can be accommodated through efficiency rather than new staff, etc. The authors do the math.

Chiu, Stan, "Going Lean: How to Save Millions in Operating and Construction Costs," *California Real Estate Journal*, March 23, 2009, <http://www.carealestatejournal.com/> (main page)

Introduction to Lean project delivery, its benefits, and its drawbacks. The main benefits are elimination of waste and increasing efficiency, saving money, and creating opportunities for innovation. Lean also requires early commitments and a lack of ego, and a shift from top-down control to a more collaborative model.

Young, Jim (of Lillibridge), "Best Practices Cut the Cost of Capital Projects," *Strategic Financial Planning*, Winter 2008, <http://www.lillibridge.com/pdf/Best%20Practices%20Cut%20the%20Cost%20of%20Capital%20Projects%20-%20Winter%202008.pdf>

Lean, BIM, and IPD can cut capital costs by up to 20 percent. The article summarizes and briefly discusses each and how they relate, as well as subcomponents such as Kaizen and TVD.

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BIM Topics

Eastman, Chuck; Teicholz, Paul; Sacks, Rafael; Liston, Kathleen, "Managing BIM Technology in the Building Industry," AECbytes Viewpoint #35, Feb. 12, 2008, http://www.aecbytes.com/viewpoint/2008/issue_35.html

BIM and integrated practice can involve significant staffing changes for all of the firms involved as owners, designers, and builders. The article looks at new roles and altered roles specifically for each type of firm, including skill sets required.

Handler, Laura, BIMX Blog, <http://bimx.blogspot.com/>

The Virtual Construction Manager at Tocci regularly posts on BIM and IPD issues, both general and related to how Tocci projects are going. Recent topics (among over 200 since 2006) include dividing scope on-site based upon who can most cost-effectively do the work as opposed to who has typically done that work, and the usefulness of every team member reading contracts.

Post, Nadine, "Modeling Pathfinders Impatient to Have a Much Fuller Digital Toolbox," *ENR*, Feb. 25, 2009, http://enr.ecnext.com/coms2/article_teit090225ModelingPath (subscription required)

"...Designers and contractors agree that the fractured, adversarial traditions of the construction industry and limits on digital technology are the two monsters blocking a building information modeling utopia." The article focuses more on the technology side. Some of the concerns are that BIM technologies do not fully support what designers and builders need to do their work, and much of what software companies sell is hype.

Sawyer, Tom, "Software Firms See User Needs Driving New Development," *ENR*, Feb. 25, 2009, http://enr.ecnext.com/coms2/article_teit090225VirtualDesig (subscription required)

"While pioneering firms strive to reduce risk and increase productivity by embracing virtual design and construction, the vendors enabling VDC struggle to anticipate user needs and differentiate themselves from their competition without losing customers in swamps of technological confusion." VDC discussion has moved from "whether" to "how." The article discusses "how" issues in detail, including the major issue of whether a unified platform is desirable.

Yoders, Jeff, "Bringing BIM to Public Buildings," *Building Design & Construction*, Dec. 1, 2008, <http://www.bdcnetwork.com/article/CA6621134.html>

The why and how of the Federal GSA's adoption of BIM (with inset about the Army Corps of Engineers), with numerous examples. Article summary: "The GSA streamlined its design and construction process by encouraging the use of 3D, 4D, and BIM. Now Uncle Sam's landlord is mandating BIM in all its capital projects, and many in the A/E/C industry are marching in step."

Young, Norbert W.; Jones, Stephen A.; Bernstein, Harvey M., "Building Information Modeling (BIM), Transforming Design and Construction to Achieve Greater Industry Productivity," SmartMarket Report, Dec. 2, 2008, http://construction.ecnext.com/mcgraw_hill/includes/BIM2008.pdf

Deep analysis of BIM's role in the market, with excerpts and a project example regarding IPD. From intro: "This report, produced in collaboration with 23 construction industry organizations — including 15 associations and the U.S. Army Corps of Engineers — is based on extensive interviews with hundreds of owners, architects, civil, structural, and MEP engineers, construction managers, general contractors and trade contractors who are currently using BIM. The goal was to determine knowledgeable users' perceptions of BIM adoption, implementation, value and impact within their firms. We also wanted to measure BIM user perspectives on the developing elements of a BIM infrastructure including standards, content, software, training and certification; and on the use of BIM on green 'sustainable' projects."

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Ted Sive has developed strategy and communication programs for architects, engineers, and builders for over 20 years.

Sive believes all people—and all companies—have a unique voice, point of view, and value proposition. He is particularly passionate about the designed and built environment, and about working with creative people and organizations. With strong skills as a facilitator, strategist, and communicator, Sive helps organizations and individuals create effective marketing and business development programs.

He currently provides strategic facilitation, communication training, and brand development for architectural, engineering, construction, and development firms. His clients range from market-dominant billion dollar contractors to several quickly growing consultancies. Before starting his consultancy, Sive was a partner and director of marketing for Lease Crutcher Lewis, a leading Pacific Northwest general contractor. Prior to that, he was director of marketing and an associate at Meng Associates, an architectural and value analysis firm.

IPD, BIM and the many related processes are a particular focus for Sive. His work has included facilitating and implementing operational strategy (employee development, training, business planning) as well as strategic marketing efforts (direct mail, websites, internal communications) for A/E/C firms leading the BIM and IPD markets. Sive wrote the SMPS (Society of Marketing Professional Services) Foundation White Paper on BIM (BIM: A Marketing Primer and Call to Action) and has presented on the topic at national and regional professional organization meetings.

Active in a number of professional and nonprofit community organizations, Sive is a Fellow of the Society for Marketing Professional Services (FSMPS). He is an accomplished lecturer on topics including client care programs, alternative delivery methods, leadership development, and marketing processes. He has spoken at numerous national conferences and regional education events for ACEC, AGC, AIA, SMPS, and other industry organizations.

Matt Hays

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Matt Hays is fascinated by the growth of cities, and suffers from a lifetime infatuation with Seattle. Early symptoms included drawing buildings and city maps in his free time, and periodic library visits to read armloads of the *Seattle Daily Journal of Commerce*. Passion became a job in 1992 when he joined an organization that advocated a big park and revitalized neighborhoods. While the “Seattle Commons” didn’t make it past the IWhitocal voters, the experience was great training for an A/E/C marketer.

Hays was starting a consulting career in 1996 when a marketing position at Lease Crutcher Lewis, a regional contractor, fell from the sky. This new job mixed his passions in development,

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Seattle, and newspaper reading, plus his talents in writing and research. It began a collaboration with Ted Sive that continues to this day. One writes, the other edits, the writer finalizes, and the sum is greater than its parts.

Hays' volunteer positions have included proofreading for *Arcade Magazine*, membership on the Seattle Pedestrian Advisory Board, and a column in the *Pike Place Market News*. He attended Seattle Central Community College. Today, Hays is proposals manager at Lewis, blogs about urban issues for SeattleScape (at the *Daily Journal of Commerce*), and occasionally consults as a copy editor for A/E firms.