Leicht, Robert, Townes, Allison, and Franz, Bryan
(2017) Collaborative Team Procurement for Integrated
Project Delivery: A Case Study. Lean Construction
Journal 2017 pp 49-64 (submitted 29Aug2017;
resubmission 9Nov2017; Accepted 15Dec2017)
www.leanconstructionjournal.org

COLLABORATIVE TEAM PROCUREMENT FOR INTEGRATED PROJECT DELIVERY: A CASE STUDY

Robert Leicht [1], Allison Townes [2], and Bryan Franz[3]

Abstract

Question: How do project owners select collaborative project teams for IPD projects?
Purpose: The goal of the study is to understand how the workshops may be used by owners to gauge the collaborative potential of competing teams and inform their award decision.
Research Method: A graduate researcher was embedded in the owner's screening committee to perform observations, along with using structured surveys to the participating firms and semi-structured interviews with the selection committee members.
Findings: This paper documents the use of an interactive workshop in the final stage of an otherwise traditional design-build team selection process that proves insightful to the screening committee.
Limitations: A single case study is hardly definitive, the processes and criteria employed are embedded in the context of the owner's experience, culture, and extensive construction program, which are hard to replicate across projects.
Implications: New methods for assessing teams' level of engagement, focus on customer value, and interdisciplinary interaction are valuable further methods are needed.
Value for authors: This paper serves as an illustrative example for owners to consider when pursuing the selection of collaborative project teams.
Keywords: IPD, procurement, team selection, collaboration, workshop
Paper type: case study

Introduction

Teams are essential to the successful delivery of construction projects. Much of the research conducted in the fields of project management, delivery methods, and information technology have an underlying focus on making project teams more effective, often by enhancing a team's level of collaboration (Dossick and Neff, 2011). Creating opportunities for collaboration among design, engineering and construction disciplines can result in more successful project outcomes. One of the most significant developments in this area in recent years is the use of Integrated Project Delivery (IPD). Initially

1 Associate Professor, Architectural Engineering, Penn State; rmleicht@engr.psu.edu, 104 Engr Unit A, University Park, PA, USA

2 Project engineer, James G. Davis Construction, Rockville, MD

3 Assistant Professor, M.E. Rinker, Sr. School of Construction Management, University of Florida, bfranz@ufl.edu, 573 Newell Drive, Gainesville, FL, 36611, USA

conceptualized as the Lean Project Delivery System (LPDS) by Ballard (2000), IPD is a project delivery method that aligns the interest of the project owner, architect, contractor, and other principal parties through jointly developed goals and a relational contract. The implementation of IPD is distinguished from other project delivery strategies by three key aspects: a multi-party contract, shared risk and reward, and the early involvement of participants, typically during pre-design phases (Kent and Becerik-Gerber, 2010). While the contractual model for IPD continues to evolve and several standardized versions are now offered through various professional organizations, including the American Institute of Architects (AIA) and the Association of General Contractors (AGC), the best practices for procuring an IPD team are still poorly defined.

To begin understanding the role that owners have in assembling collaborative teams, this research conducted a detailed case study of the procurement process used on an IPD project. The project was a $41-million mixed use laboratory, classroom, and office renovation and modernization project. This case study explores the challenges an owner faces when assessing the collaborative potential of a project team, and the novel approach and value observed, when the owner implemented a workshop as a step in their IPD team procurement process.

Why do we need consider collaborative teams in procurement?

Almost two decades ago, Fleming and Koppelman (1996) wrote that "the concept of integrated project teams requires a new spirit of cooperation among traditional adversaries." They further observed that integrated project teams were capable of significant time savings if functional management awarded teams "commensurate authority" and formally supported the independence of team operations. It stands that adversarial conditions should be less severe among an equitable project team arrangement. An interdisciplinary approach to project delivery is more likely to increase project team cohesiveness, otherwise misaligned "sub-goals" between participants may cause clashes and uncoordinated behavior (Love et al., 1998). However, the transformational change required to form cooperative team partnerships is not easy (Seed, 2014). The ability of professionals to integrate and "complement each other's efforts and skills" should be a larger emphasis, given the relational nature of the construction industry (Baiden et al., 2006). Despite this fairly well understood shortcoming, the industry still lacks criteria for selecting project teams with the authentic characteristics and attitudes necessary for successful IPD projects.

Why is selecting collaborative teams difficult?

While the shift toward IPD has received much attention, the implementation is still new to many within the construction industry. From the perspective of project owners, typical procurement mechanisms are insufficient in assessing the "fit" of individual team members for participation an IPD project. Dating back to some of the earliest work on IPD, such as Matthews and Howell (2005), the indicators of 'truly' integrated teams are challenging to observe in a procurement process. In particular, commonly used procurement methods are not designed to select for those characteristics and attitudes noted in IPD literature: cultural and value alignment, collaboration, effective team chemistry, innovation, and comfort in a learning environment (Seed, 2014). The competitive bidding process is, first and foremost, price-based. While the proposal process more commonly considers non-price factors, most proposal selection criteria still competes companies, or proposing teams, based on their prior project experience. The selection methods that do consider non-price factors through interviews or presentations

are not always reliable in gauging the characteristics and attitudes of competing teams. The interview format makes it easier to "fake" certain behaviors. Presentations are often scripted and well-rehearsed, appealing directly to the owner's expectations. In other words, claiming to be collaborative during an interview is easy, but actually leading a collaborative effort during a project crisis is much harder.

Additionally, the existing body of knowledge falls short in providing guidance to project owners wanting to assess and compare potential IPD partners. For instance, the AIA IPD Case Study Matrix reported by Cheng et al. (2012) offers selection management strategies, such as solicitation methods, on twelve unique cases. However, half of the cases cited "no information available regarding participant selection characteristics." Where information was available, more than one project stated that no specific considerations were given for individual team members, despite several participants citing the need to "have the right attitude and ability to work collaboratively." As Lostuvali et al (2012) point out, the individuals roles, such as the 'Chief Engineer' as the overall project lead, are critical as individuals, not as the firms they represent. There is clearly a need for new and more deliberate selection practices, and their documentation. A recent example is the use workshops reported by Dossick et al. (2013) in an IPD case study that invited teams to engage in a procurement process that included 2-hour workshops. Within this procurement process, it was possible to simulate the team environment in order to address relational qualifications that support a team's ability to work in a collaborative environment. Using Dossick et al.'s work as a point of departure, this study investigates the procurement of a design and construction team by a first-time IPD owner. The goal of the study is to understand how the workshops may be used by owners to gage the collaborative potential of competing teams and inform their award decision.

Case Study Approach

Due to the rarity of IPD projects in the current market a single case study was undertaken. The goal of this case study was to understand how a structured, workshop approach may assist project owners in evaluating competing teams for IPD projects. Four sources of evidence are used in this study: direct observation by an embedded researcher, document review, questionnaires, and semi-structured interviews. The researcher was embedded during every stage of the procurement process. Their observations were made in a natural setting and non-disguised. The document review included a content analysis of correspondence, agendas, and the RFQ and RFP solicitations. Additional sources of evidence, which are subsequently explained, included a post-workshop survey questionnaire issued to competing teams and semi-structured interviews with the project owner's screening committee.

Post-Workshop Survey Questionnaires

A hardcopy survey questionnaire was distributed to members of each short list team at the completion of their workshop. In two open-ended questions, the survey asked respondents to describe the perceived benefit, if any, of the workshop format and to describe how the workshop influenced their understanding, if at all, of the project owner's goals. There were also three Likert-scale questions related to the sense of team chemistry, derived from Franz et al's (2017) work on integrated and cohesive teams, targeting cohesion among the team members, chemistry between the team and the screening committee, and likelihood of the workshop to improve their chance of being

selected. Participation in the survey was voluntary. A total of 36 surveys were distributed and all were returned, representing 100% response rate.

Screening Committee Interviews

Semi-structured interviews were conducted with screening committee members after the completion of all three team workshops, but before the submission deadline for the design concept. During these interviews, questions focused on two aspects of the procurement process—the criteria for differentiating between competing teams and the behaviors that suggest an individual or team fulfill those criteria. The interviews were recorded and a content analysis was performed on the transcripts and researcher field notes. Participation in these interviews was voluntary. Of the 14 screening committee members, 11 agreed to be interviewed, including two end-users, two university faculty, five project administrators and two facilities management staff.

Case Study Background

The case study project used in this research was a renovation and modernization of an existing engineering building on a university campus. The building was originally constructed in 1937. The project owner decided to renovate approximately 15,000 square feet (1,400 m2), which would preserve certain architectural elements of historical significance to the university. The remaining 70,000 square feet (6,500 m^2) of the building were to be demolished and rebuilt new. At the time of data collection, the project owner had prepared a detailed program with a $41 million total project budget (€35 million), inclusive of owner costs, such as furniture and equipment. The renovation and new construction program included classrooms and laboratories for students and faculty. Beyond this program, no design work had yet been undertaken. The project owner approached the delivery process with the desire to fully embody the characteristics of a "true" IPD project. However, they had no prior experience with IPD and only limited experience in procuring design and construction services simultaneously as a single team.

Integrated Team Procurement Process

The project owner modified their existing design-build team procurement process for use in the IPD team selection. The owner solicited self-selected teams that were to jointly respond to a request for qualifications (RFQ) and develop a proposal. The members of these self-selected teams included, at a minimum, the architect, engineers, construction manager and commissioning agent. They were strongly encouraged to include the mechanical and electrical (M&E) trade contractors. The project owner created a screening committee of design and project managers, end users, building operators, and administrators from the university to review each document submission. The procurement process for the case study project is summarized in Figure 1.

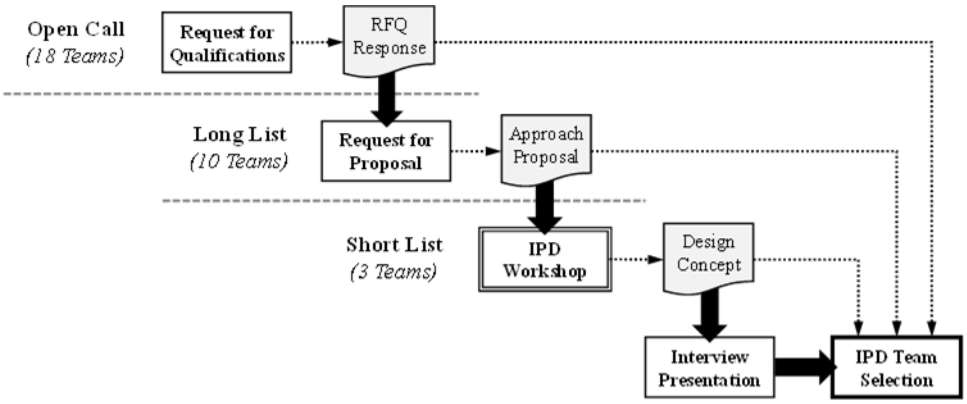


Figure 1. Case study project procurement process

The procurement process required three document submissions from competing teams over a period of 6 months: (1) a response to the RFQ, (2) a detailed technical proposal, and (3) an initial design concept. After reviewing the documents at each stage, the screening committee used a down-select process to narrow their potential options. Eighteen self-selected teams responded to the RFQ, from which the screening committee identified a long list of the 10 most qualified teams. These teams successfully conveyed their expertise to the screening committee and were perceived to have a genuine passion for working in collaborative project environments. Each long list team was then invited to a site visit and walkthrough of the existing building, before being asked to prepare a proposal. In this proposal, the teams were to reiterate their qualifications, particularly in design, as well as detail the organization of their team, approach towards IPD, and any suggestions for improving the delivery process. The screening committee reviewed each proposal and again narrowed the field, this time to a short list of only three teams. The three remaining teams were invited to lead structured workshops with the screening committee. Using whatever information they could elicit from these workshops, each team then prepared an initial design concept submission. The design documents were reviewed followed by an interview presentation made to the screening committee and representatives from the university's Board of Trustees, who made the final team selection.

IPD Workshops

The IPD workshops are the primary focus of this paper, as they were a noteworthy departure from an otherwise typical 2-step design-build team procurement process. Each of the three short listed teams were given a strictly enforced 2-hour time limit to meet with the project owner's screening committee in a classroom within the existing building. The teams were instructed to use a "workshop" format. The purpose of the workshop, as stated in a letter from the owner, was "for the IPD teams to gain more intimate knowledge of the project and the overall goals and requirements of the program." The letter further stated that the screening committee will, "use the workshop to evaluate the leadership potential, team chemistry, and collaborative nature of each IPD team." The teams were given full autonomy in setting the workshop agenda and their methods for engaging the screening committee. There was no limit on team member attendance, other than seating capacity of the classroom. There was also no restriction on the use of tools or multimedia. However, teams were not permitted to directly ask screening committee members for their opinions on potential designs.

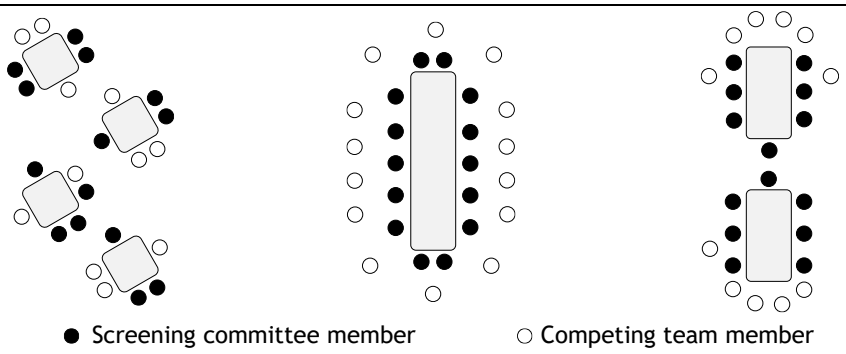
Workshop Observations

The unit of analysis in this case study is the workshop approach taken by each competing team, which is embedded in the larger context of the project. Thus, in presenting and discussing the case study, we first provide a brief description of the three workshop approaches and then discuss the workshop outcomes from the perspectives of the competing teams and the owner's screening committee. As previously stated, an embedded researcher was present during each workshop, making notes on the process alongside their observations. The content of these descriptions are summarized in Table 1. To ensure the confidentiality of each team and allow for comparisons, they have been renamed as Teams A, B and C.

Team A's Approach

Upon entering the room for Team A's workshop, the screening committee immediately noticed the arrangement of the space. They setup four tables, spread throughout the room, and fastened several printed posters as visual aids along the perimeter walls. In the middle of each table was a small label with a different topic: one for design exploration, one for program and layout, one for sustainability, and one for technology and construction logistics. Members of the screening committee were asked to choose their own table. The workshop was initiated by executives from the design and construction firms, but was then quickly passed to and led by a lean facilitator employed in-house by one of the firms. The facilitator used a brief ice-breaker activity in which all attendees, using sticky-note name tags, introduced themselves, their involvement in the project, and their favorite hobby. The ice-breaker was followed by an interactive activity, where the screening committee members were given stickers to place on one of the posters hanging in the room to indicate the two goals that were most important to them. After a brief discussion of the results, the attendees began breakout discussions based upon the four table topics. The breakout discussions were highly interactive, with team members engaging the screening committee with open-ended "how" and "why" questions. After approximately an hour, the breakout groups re-convened and reported out to the entire workshop on the key points emerging from their discussion. Lastly, the team presented a pull-planning schedule to convey how information learned from the workshop would be used to develop their design concept over the following month. Overall, this team exceled at creating a two-way exchange of information and was rewarded with more engaged stakeholders.

Table 1: Comparison of workshop approach by short listed team

	Team A	Team B	Team C
Team composition	2 Project executives 2 Project managers 3 Architects 1 Landscape architect 1 Superintendent 1 MEP Engineer 1 Facilitator	3 Project executives 2 Project managers 2 Architects 1 Landscape architect 1 Structural engineer 1 MEP engineer 1 Civil engineer 1 Mechanical contractor 1 Electrical contractor 1 Commissioning agent	2 Project executives 2 Project managers 3 Architects 1 Structural engineer 2 MEP engineer 1 Civil engineer
Workshop lead	Facilitator	Project executive	Project executive
Elicitation strategy	Parallel breakout group discussions Breakout groups were topically and compositionally interdisciplinary and included full group report out	Full group discussions of discipline-specific topics	Series of breakout group discussions Breakout groups were discipline-specific and did not include full group report out
Workshop room setup			
Multimedia use	Printed posters and drawings, sticky notes	Printed posters, physical site and building model	Printed posters, slideshow
Agenda	1. Workshop summary 2. Breakout Discussions A. Design exploration B. Program and Layout C. Sustainability D. Technology and logistics 3. Path forward	1. Introduction 2. Research / facility vision 3. Deep dive 4. Take-away	1. Introduction 2. Confirm project criteria 3. Prioritize project criteria 4. Discussion 5. Wrap-up

Team B's Approach

For Team B's workshop, the tables were arranged as one large table in the center of the space, creating a "boardroom" effect. The screening committee was asked to seat themselves around the single, large table. Nametags were provided for each of screening committee member that matched those worn by the project team. The workshop was kicked off, and subsequently led, by the executives of the design and construction firms. Each member of team and screening committee member briefly introduced themselves, their firm, and their role on the project. Similar to Team A, the screening committee was asked to engage in an interactive activity using stickers, though this time the activities were intended to solicit information about their vision for the building. The first question

asked, "How will faculty research be done in 20 years?" There was also a poster with terms associated with the department's core values and space attributes, such as "comfortable" and "natural," and lastly an open-ended poster that asked about the disciplines central to the department's work over the next 20 years. Following this activity, the screening committee returned to the table, and the team led a discussion into three areas of the design: site layout and master-plan, operations and sustainability, and the building program. They used a scaled, physical model of campus to solicit information from the entire committee during the discussion. The screening committee was also provided with a handout including photos of the physical model, as well as with a detailed list of questions the team, primarily led by the designers, used to facilitate discussion. The questions provided were thorough and detailed, ranging from, "What are your thoughts on flexibility and adaptability?" to "Which labs need acid hoods?" The workshop concluded with the executives from the design and construction firm summarizing their conclusions from the discussion.

Despite having one of the largest teams in attendance, some members, such as the representative from the electrical specialty contractor, had no active role during the workshop. Due to the large group format, this team was the least successful of the three competing teams in obtaining project-specific information from the screening committee. They did, however, leave the workshop with a very good sense of the project's "story" in some of the specific topics in which they successfully engaged the team.

Team C's Approach

The room layout of Team C's workshop was a hybrid of Team A and B's configuration. The tables were separated into two groups, arranged in the center of the space. There were easels for notes and printed posters at both ends of the room. The workshop was kicked off by the project executive from the construction team, who asked each attendee to briefly introduce themselves by stating their name, firm, and role. No nametags were provided. After the brief introductions, the team divided themselves up between the two tables for a series of concurrent discussions. In the first round, one table focused on the building program, while the other discussed building systems. In the second round, one table discussed the campus and site layout, while the other discussed sustainability. In the final round, one table delved into the budget for the project and the other into the design and construction schedule. Each of the breakout discussions was 20-25 minutes in length. The team had prepared several posters with a great deal of information to support the discussion. In many cases, the project executives acting as facilitators, were quite good at engaging and soliciting information from the participants. However, in other instances, they would present their initial concepts or ideas to the screening committee and allow little time for discussion or solicitation of the customer needs. In the final portion of the workshop, the team used an electronic presentation to highlight similar facilities that their team had built to discuss the cost per square foot basis of the program in relation to the owner's budget that led to a slightly contentious discussion.

Based on the post-workshop surveys, this team felt the least chemistry with the screening committee. Only 64% of those in attendance viewed their chemistry positively, compared to 100% for Teams A and B. In the open-ended survey questions, several members of this team specifically questioned their success in engaging in the screening committee.

Identifying Indicators of an Integrated Team

The owner's goal of conducting these workshops in an IPD team procurement was to use authentic face-to-face interaction to assess working relationships in an unrehearsed setting. Therefore, the results are organized to highlight common indicators that emerged from the participant interviews, identified through a content analysis of the screening committee interviews, which were also cross-compared with the observational outcomes. The triangulation from the observations, interviews, and questionnaires provided insight into how each competing team would perform on the IPD project. While these 'indicators' could be considered traits, we are cautious to label them as such since the data is based on the selection process, not the performance of the overall project. The indicators that emerged were identified as: (1) total engagement, (2) a focus on customer value, and (3) emphasis on interdisciplinary interactions.

Total Engagement

Interacting directly with day-to-day personnel on the design and construction team was a new experience for many screening committee members. On previous projects, they may have been asked to sit-in on an interview presentation or review a conceptual design drawing. In these cases, their feedback for the project team was indirect, often going through an intermediary. However, in the workshop setting, screening committee members were able to interact directly with the architect, construction manager and specialty trades. We are categorizing this level of interaction as "total engagement" to represent both the complete representation of team members desired, as well as the full involvement of both the screening committee and the proposing teams' attendees. Since the screening committee was composed of end users, project administrators and facilities management staff, each sub-group had a slightly different perspective on the meaning of total engagement.

The end user subgroup viewed the workshop as an opportunity to understand their role as well as see the full representation of the IPD teams. They focused on *how* the competing teams engaged them in the workshops and the openness to understanding their priorities and needs, as they felt some teams focused exclusively on the operations staff. Teams A and C were mentioned specifically for their ability to effectively interact with all participants. In addition, several end users noted the high level of energy brought by Team A and their creation a fun and engaging workshop atmosphere. The building operations subgroup, on the other hand, viewed their role as ensuring that the project team delivers a high quality design, both for efficiency and for maintenance. Their comments reflected a desire to gauge the quality of the team they would be working with on the project. They tended to highlight the representation of the disciplines and how well the day-to-day personnel represented themselves. As a seasoned operations manager put it, "We want to hear from everyone on the team" and another stating, "Firm reputation is nice and usually reflected in the executives, but I want to know *who* they specifically have for [this project]."

The competing teams, who unanimously agreed that interaction with end users was the greatest benefit of the workshops, confirmed this indicator. Members of Team A described this benefit as "total group collaboration" and gaining the participation from "all potential partners." To Team B, it meant "hearing all voices" and to Team C, it was about "sharing common interests."

Customer Value

The screening committee viewed competing teams more positively when they demonstrated a commitment to improving project value. However, "value" is often difficult to articulate and has different meanings to both internal and external customers to the project. In this case it was both defining the end-user value for the university, as well as recognition of the value chain throughout the design process. The workshops were strictly limited to 2-hours, so the strategies that competing teams used to elicit information from the screening committee were critical to their ability to define value. Both Teams A and B used kick-off activities to collect priorities or goals from the screening committee. In addition to helping create some engagement, the list of goals served as references the teams could use when discussing value later in the workshop. Teams A and C both used breakout groups as a means of focusing discussions on a specific building system or goal. Their concurrent breakout groups created opportunities to focus on what was valuable to the customers represented by the screening committee. Compared to Team B's approach of a single, large group discussion, the smaller, more intimate groups in Team A and C's workshop gave a voice to more members of the screening committee. While Team B was less efficient in their single group discussion, their depth of analysis was greater in the specific areas that they probed. Team A was the only team to use an in-house facilitator, whereas both of the other teams had the executive-led workshops. One additional key differentiator noted for Team A was their wrap-up that showed the pull plan the team had put together in preparation for the workshop. The plan showed the process the team would use to take the information from the workshop and develop it into the design proposal. Having this plan, clearly developed by the team members in the room, helped to demonstrate their ability to deliver value, as well as convey their familiarity with integrated processes for carrying out IPD projects.

From the perspective of competing teams, this approach to defining value was not an accident. A member of Team A explicitly stated, "…our goal was to ask more questions than give answers, in order to form our [design] concept." Similarly, a member of Team B described "listening" as a tool they used during the workshop. Team C also emphasized this indicator, stating that they were able to "clear up some confusing aspects" of the program and gained insights into how to keep "cost in balance with design" to improve customer value.

Interdisciplinary Approach

The project in this case study is challenging in scope and technical needs and is believed by the owner to require a cohesive, integrated team to be successful. Therefore, the screening committee preferred when competing teams explored options collaboratively and from multiple disciplinary perspectives. All competing teams did this to some degree. However, there were differences in the topics chosen for discussion and arrangement of participants within the breakout groups. These differences were apparent in quality of discussion observed between teams that chose to discuss siloed issues, such as the project schedule, and those that discussed more interdisciplinary issues, such as programming. A discussion of the project schedule, while seemingly interdisciplinary, became quickly dominated by the contractors during Team C's breakout group, leaving little opportunity for end users on the screening committee to participate. Similarly, the end users felt that Team B's discussions, "were targeted for the design experts" that attended, as one end-user noted. Conversely, Teams A and B's programming discussions were designed to let the screening committee do most of the talking, with occasional interjections by the facilitator to steer the conversation.

Likewise, whereas Team C organized discipline-specific groups, Team A created interdisciplinary groups. The interdisciplinary groups were perceived to not only spur better discussion, but also to blur organizational lines. The screening committee remarked that it was difficult to determine whom from Team A belonged to the designer or the construction company. This was very different from the two other teams. In one specific instance, end users commented on the "awkwardness of the team hierarchy" that emerged in how one of the team's executives interacted with other members. Thus, the ability to not only be interdisciplinary in role, but in topic, was viewed positively and seen as representative of the team dynamic necessary for a successful IPD project.

Discussion

Based on workshop performance, as well as the review of each team's resulting design concept, the screening committee recommended Team A for award. Team C was ranked a close second based on the quality of the design concepts they submitted, with Team B a more distant third. While each of these teams was technically capable, the screening committee reported that the workshop setting was a useful tool to compare each team's approach to collaboration and tip the award decision in one team's favor.

As noted in the American Institute of Architect's (AIA, 2007) defining document on IPD, "At the core of an integrated project are collaborative, integrated and productive teams composed of key project participants. Building upon early contributions of individual expertise, these teams are guided by principles of trust, transparent processes, effective collaboration, open information sharing, team success tied to project success, shared risk and reward, value-based decision making, and utilization of full technological capabilities and support." The first and most important of these principles listed is *trust*. As Pishdad-Bozordi and Beliveau (2016) highlight in their synthesis of the relationships between IPD and trust, communicational and behavioral principles are important in developing cognition-based trust. While that trust is unlikely to fully develop during a single 2-hour workshop, the format provides a snapshot of a team's ability to build such trust in the design and construction process. Thus, the indicators that emerged from the screening committee should support the identification of a project team that represents these guiding principles of IPD:

- **Total Engagement** – The comments from the screening committee align total engagement with the principles of early *contributions of individual expertise* and *composition of key project participants*. As Cleves and Gallo (2012) note, IPD establishes personal relationships as a mechanism for meeting commitments. Full engagement of the proposing team with the owner and end-user ensures a balance between of expertise, engagement and commitment of those team members.
- **Customer Value** – Pursuit of customer value supports the principles of *team success tied to project success,* as well as *shared risk and* reward. This indicator is important in an IPD context because, as Briscoe and Dainty (2005) note in their study of integration in the supply chain, collaboration occurs when team members emphasize project goals over firm goals. The ability to identify final customer value, as well as recognize the value chain through the entire process, re-iterates the team's ability to track and deliver the facility, and value, tailored to the owner needs.
- **Interdisciplinary Approach** – Organizing around interdisciplinary needs supports both *effective collaboration* and *value-based decision-making*. Without effectively pursuing and demonstrating effective interdisciplinary integration, it is unclear if

team members will revert to traditional discipline specific approaches or develop adversarial relationships (Duke et al, 2010). The demonstration of effective interaction in interdisciplinary topics and system interface discussions shows the individuals' abilities to collaborate across discipline boundaries as well as their commitment to supporting the owner-defined value in making decisions.

Thus, the screening committee was able to use the behaviors and interactions they observed in the workshops and link them with the underlying principles from IPD, helping them frame the competing teams against the 'ideal' team they were hoping to select. This connection became more apparent in how the screening committee noted the relationship between each team's workshop approach and their resulting design concepts. For example, Team B's workshop approach covered fewer topics in more depth when compared to Teams A and C, who opted for a greater breadth of topics covered in less detail. While Team B did produce a strong overall design concept, there were several functional shortcomings of the design, which the screening committee attributed to their narrow topic coverage. Another difference was the composition of the competing teams attending the workshops, which may have influenced their ability to translate the depth and breadth of topics into a building design. Members of Team C were uncertain about their workshop performance, feeling that it likely did not improve their chances of award. However, their design concept was well received by the screening committee and propelled them into second place. This suggests that requiring a design concept in conjunction with the workshop helped the screening committee to 'see' the product or outcome of their interaction with each team. In some ways, this gives the owner a glimpse of how the team will deliver value following selection. On the other hand, the dichotomy of selecting the 'best' design and selecting the 'best' team did arise as a contentious point of discussion during the final award decision.

Conclusions

Collaboration is critical to the success of IPD teams. However, very few mechanisms exist for assessing the ability of individuals to collaborate when procuring or assembling a construction project team. This case study demonstrates that a workshop, led by a self-selected design and construction team, can provide insights beyond a more common RFQ response or technical proposal. Specifically, a screening committee, tasked with the selection of those teams, was able to observe indicators that closely aligned with the key IPD principles and those of their "ideal" project team. As a simulation environment, the face-to-face interactions of a workshop setting were critical to confirming competing teams' authenticity, approach, and commitment to an IPD philosophy. A variety of qualitative methods, including direct observation, surveys and semi-structured interviews, were employed to capture the case study.

The workshop approach taken in this case study has several implications for owners that are interested in selecting integrated teams, for either IPD contracts or other forms of agreement:

1. Owners should structure their procurement process to allow for the selection of project teams with values and viewpoints aligned with the project. The owner in this study modified their existing process in a small, but thoughtful way, to select a project team that best represented an IPD philosophy;
2. The use of workshops, or similar impromptu engagements that require demonstration of an approach, should be explicit in the selection process and criteria that are advertised to the proposing teams; and,

3. The workshops require meaningful engagement from the owner. The owner needs to ask questions and be an active participant to gain a first-hand understanding of *how* the proposing team members will interact and work with their customer(s) if they are selected.

In this research, a single project was chosen as an illustrative case of how a procurement process may be modified from a design-build team procurement for IPD team selection. This research is not intended to generalize all IPD team selections and there are several limitations that must be acknowledged. Seeing that the preview of interactions was limited to a 2-hour workshop, team reputation and references still serve as valuable points of consideration, and based on the full procurement process, were still used to ensure technical qualifications of the three short-listed teams. The workshop setting is, by nature, more dynamic and behaviors are harder to "fake" given the variety of responses coming from the screening committee. While it is possible that behaviors observed in these workshops may not be a true representation of how the teams will interact on the project, impromptu interactions are more likely to represent a genuine approach to collaboration. However, as of now, we cannot say whether or not the workshop is accurate in predicting the actual performance of the team. The case study project is currently in construction, meaning that final project outcomes are yet to be assessed. Thus, comparing the IPD team's workshop performance with the project's cost, schedule and quality performance is an opportunity for future research. Additionally, it must be recognized that the owner has an important role to play in an IPD project, perhaps greater than the design and construction team. Just as the owner is evaluating the collaborative potential of competing teams, so too must the teams evaluate the owner. That said, the screening committee may not be representative of the stakeholders engaged through the entire design and construction process.

By comparing varying approaches to the workshop, as well as screening committee perceptions of the process, we identified several indicators that help demonstrate that a team is prepared to collaborate on an IPD project. First, the most highly ranked teams used the workshop time to not only probe for information, but to engage the owner as part of the team. This meant asking questions and listening to stakeholders, rather than lecturing about potential solutions. The teams that organized as clusters were able to use the workshop time more efficiently, and therefore were able to learn more about the project and demonstrate their ability to balance the interests of multiple stakeholders. Secondly, the behavior of the team in seeking the owner's perceptions suggested how the integrated team would help deliver value to their customers. Organizing breakout groups, either in series or parallel, and the leadership of a trained facilitator were both seen as additional indicators of efficient time use. Lastly, there was a clear distinction between teams that were prepared to discuss interdisciplinary issues and those that kept discussion more discrete or siloed. Discussing interdisciplinary issues allowed for a broader range of stakeholder participation and demonstrated a commitment to real collaboration across the disciplines. These were ultimately linked to design solutions that were more responsive to the owner's needs, and suggestive of a more successful project overall.

Future research should consider the cultural needs to either embed or sustain the behaviors or indicators presented by the award team during the workshop. Similarly, there are an array of methods being explored to select integrated teams in industry that should be collected and studied to allow owners better options for identifying collaborative members for IPD teams. In addition, the use of facilitation emerged as a differentiator for the winning team, which raises questions for future research: Should the facilitator be an

independent role hired by the owner to assist all proposing teams? Should the facilitator become a member of the IPD team moving forward?

Acknowledgments

We would like to thank the owner for allowing us access to observe and study their selection process. We would also like to convey our appreciation to the competing teams that provided feedback along the way and participated in our data collection.

References

AIA. (2007). Integrated project delivery: A guide. American Institute of Architects, Sacramento, CA.

Baiden, B. K., Price, A. D. F., & Dainty, A. R. J. (2006). "The extent of team integration within construction projects." International Journal of Project Management, 24(1), 13-23.

Ballard, G. (2000). *Lean project delivery system* [White paper]. Retrieved from Lean Construction Institute.

Briscoe, G., and Dainty, A. (2005). Construction supply chain integration: an elusive goal? *Supply Chain Management: An International Journal*, 10(4), 319–326

Cheng, R., Dale, K., Asperson, A., Salmela, K., Martin, C. and Hye-Young, K. (2012). IPD Case Studies. University of Minnesota: American Institute of Architects.

Cicmil, S., Williams, T., Thomas, J., & Hodgson, D. (2006). "Rethinking project management: researching the actuality of projects." International Journal of Project Management, 24(8), 675-686.

Cleves, J. A., & Gallo, L. D. (2012). Integrated project delivery: The game changer. Proceedings of Advanced Project Delivery: Improving the Odds of Success, American Bar Association Forum on the Construction Industry, Las Vegas, NV, 26 April 2012.

Dossick, C. and Neff, G. (2011). Messy talk and clean technology: communication, problem-solving and collaboration using Building Information Modelling. The Engineering Project Organization Journal, 1(2), 83-93.

Dossick, C., Azari, R., Kim, Y., & El-Anwar, O. (2013). IPD in practice: Sustaining collaboration in healthcare design and construction. In AEI 2013 Building Solutions for Architectural Engineering (pp. 377-386). ASCE.

Duke, P., Higgs, S., and McMahon, W. R. (2010). Integrated project delivery: "The value proposition." An owner's guide for launching a healthcare capital Project via IPD.

Fleming, Q. W., & Koppelman, J. M. (1996). "Integrated project development teams: another fad… or a permanent change." International Journal of Project Management, 14(3), 163-168.

Franz, B., Leicht, R., Molenaar, K., and Messner, J. (2017). Impact of team integration and group cohesion on project delivery performance. ASCE Journal of Construction Engineering and Management, 143 (1): 04016088

Kent, D. C., & Becerik-Gerber, B. (2010). "Understanding construction industry experience and attitudes toward integrated project delivery." Journal of construction engineering and management, 136(8), 815-825.

Lostuvali, B., Alves, T., and Modrich, R-U. (2012). Lean product development at Cathedrill Hill Hospital project. Proceedings of the International Group for Lean Construction, San Diego, USA, 18-20 Jul 2012.

Love, P. E. D., Gunasekaran, A., & Li, H. (1998). "Concurrent engineering: a strategy for procuring construction projects." International Journal of Project Management, 16(6), 375-383.

Matthews, O. and Howell, G.A. (2005). Integrated project delivery an example of relational contracting. Lean Construction Journal, 2(1), Pp. 46-61.

Newcombe, R. (1996). Empowering the construction project team. International Journal of Project Management, 14(2), 75-80.

Pisdad-Bozorgi, P. and Belivaeau, Y. (2016). Symbiotic relationships between integrated project delivery (IPD) and trust. International Journal of Construction Education and Research, Vol 12 (3). Pp. 179-192.

Seed, W. R. (2014). Integrated project delivery requires a new project manager. Proceedings of IGLC22, 1447-1459.

Walker, P. (2007). Procurement, contracts and conditions of engagement within a Concurrent Engineering context. Also available from Taylor & Francis, 80.

Appendix A: Post-Workshop Survey Questionnaire

Please answer the questions below based on your impressions for the workshop:

Q1. What was the overall benefit of the workshop approach in the IPD team selection process?

Q2. How did this workshop influence your perspective on the owner's IPD goals and team approach?

Please indicate your level of agreement with the following statements regarding your interactions while in the workshop:

	Strongly Agree				Strongly Disagree
Q3. The team chemistry among our project team was strong.	5	4	3	2	1
Q4. The team chemistry between our project team members and the screening committee was strong.	5	4	3	2	1
Q5. The workshop made the screening committee more likely to select our team.	5	4	3	2	1

Q6. What other aspects of the workshop and interaction with the screening committee do you feel was influential? Why?