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**TEAM SELECTION FOR
INTEGRATED PROJECT DELIVERY**

A Thesis in

Architectural Engineering

by

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ABSTRACT

Recent developments in project delivery have shifted toward integrated approaches that improve the performance of project teams through supportive contractual agreements. Integrated Project Delivery (IPD) is intended to align the interests of the project owner, architect, contractor and other principal parties through jointly developed goals and collaborative decision-making. However, project owners do not fully understand the procurement and selection processes for ideal IPD teams. This study assists in capturing the unique elements of IPD team assembly that support the success of project goals.

The premise of this study is that conventional approaches to team selection are insufficient for the selection of a high-performance IPD team. A case study was chosen in order to understand why project owners might distinguish the process for an IPD team selection from conventional methods. The context of the case study encompasses the use of IPD workshops and design concept proposals as engaging means for team evaluation. Outside of the case study, data collection also included expert interviews to document lessons learned in previous IPD projects. Opinions and ideas garnered from case study participants and expert interviewees serve as a basis for understanding the rationale for decisions regarding solicitation method, selection criteria and teaming arrangement.

Findings suggest that team selection criteria communicate expectations seen as vital to project goals. Based on the case study, major categories for IPD team selection criteria are: experience, due-diligence and collaborative performance. Selection criteria can be evaluated through IPD workshops that reveal indicators on commitment to integrated design processes and potential for collaboration among multidisciplinary team members. Overall, it appears that an unconventional approach to team selection influences early enactments of desirable ideologies in IPD projects.

Outcomes show that despite the many variables within IPD team selection, the measure of effectiveness is ultimately based on ability to satisfy project goals and program requirements. This study details key factors in team selection and will help IPD project owners to make informed decisions for future IPD projects.

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1. Introduction

1.1. Background

Achieving project performance success through effective project delivery methods is the ultimate target of the construction industry (Ibbs et al., 2003). To realize objectives successfully, effective communication arguably pervades all other aspects of project management and the project team (Emmitt and Gorse, 2007). However, the construction industry suffers a trend of fragmentation in the horizontal, vertical and longitudinal supply chain; making project team collaboration challenging and even adversarial (Levitt and Scheffer, 2011).

To meet desired performance goals, owners and contractors cannot afford to compromise technical competence due to poor communication. Current topics that have emerged from this are directed at eliminating unsupportive contractual agreements and other organizational barriers that have proven to diminish the performance of project teams. Improvement initiatives may call for a replacement of traditional project delivery and procurement strategies. Integrated Project Delivery (IPD) is as an example of a new organizational and contractual model in construction project delivery.

The AIA (2007) defines IPD as “...a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.” This document will maintain the AIA definition, while also addressing IPD projects which consist of six characteristics of integration: (1) multi-party agreement, (2) early involvement of key participants, (3) collaborative decision-making and control, (4) shared risks and rewards, (5) liability waiver among key participants, (6) jointly developed project goals (Ghassemi and Becerik-Gerber, 2011).

Although design-bid-build (DBB), design-build (DB) and construction manager at risk (CM) remain fundamental delivery methods, the concept of IPD is growing in popularity. Kent and Bercerik-Gerber (2010) administered a survey in which industry members “overwhelmingly” indicated preference for IPD because they believed that IPD avoids adversarial relationships and

delivers projects more efficiently. However, the affirmative results suggest a popularity of IPD that is contrary to its actual frequency of use. Limited IPD project examples are available to investigate the organizational requirements of IPD implementation (Ghassemi and Becerik-Gerber, 2011). There is a contradiction between the desire to implement IPD and the current rate of adoption of IPD. This suggests that beyond perceived effectiveness there are barriers to overcome in order to implement an IPD contract model.

Unlike traditional contract relationships, the team structure for IPD projects approaches project leadership from a whole group mentality. IPD leaders are challenged to facilitate innovation through the promotion of horizontal and vertical AEC industry integration (Hall et al., 2014). Substantial front-end planning is required to support the early involvement of multidisciplinary integrated teams. The ideal project management structure must be determined early as well (Larson and Gobeli, 1989). Among IPD projects, most contract types include project management authorization in the legal agreement. For example, the AIA Document C191 (2009) entrusts high-level integrated planning to the voting members of the “Project Executive Team”, which minimally includes an architect, contractor and owner representative. In addition, C191 recommends that day-to-day management be overseen by a “Project Management Team” comprised of voting members from each entity in the multiparty IPD agreement (AIA, 2009). Therefore, the assembly of an IPD team should be directed at a cohesive team that will embrace integrated practices and collaborative behaviors. This presents a particular challenge to project owners who are responsible for administering team assembly; there is limited guidance for selecting these “intangible” attributes upon which IPD performance is suggested to hinge.

To contribute to the body of knowledge on IPD team selection, this thesis performs an embedded case study to understand and explain the pre-contract assembly of an IPD team. The case study was chosen by opportunity and compatibility. The context of the case study is the first-time adoption of IPD team selection for a self-selected, integrated team proposal. The events in the case study mark a university project owner’s first application of IPD. The data collection occurred at the time of the owner administering a \$41 million renovation and rebuild of an educational building. The program required that historical aspects of the existing building be preserved while constructing new spaces to support technical research and educational functions. In order to be considered, multidisciplinary project teams submitted qualifications and proposals

at 0% design. The approach to team selection implemented a four-step process that spanned a 6-month period:

Step One. Request for Qualifications (RFQ)

Step Two. Request for Proposals (RFP)

Step Three. IPD Workshops

Step Four. Final Interviews and Appointment

The nature of the selection process was similar to solicitation methods the project owner used previously for design-build projects. However, among the notable differences was the addition of an “IPD workshop” to the process. This indicated that the project owner perceived a need to approach IPD selection differently from other types of project delivery. Beyond the typical assessment of proposal submissions and final interviews, the IPD solicitation method included interactive opportunities for prospective project teams to showcase innovative design ideas and illustrate the unique competencies of team members. An emphasis on collaboration and team chemistry also made IPD team selection unlike previous selections.

In the case study, team environment was important to the project owner. For example, the project owner established an integrated project management team concept that was noted in the initial solicitation documents and designed to encourage transparency and collaboration among the risk/reward group entities proposing for the project. Expectations were communicated early in open solicitation documents, without knowing how teams would pursue this unprecedented delivery method with the project owner. In this qualification driven selection, the attributes of individual team members were considered as well as the collective strength of the proposing teams. Cost estimate and fee information was requested to support the owner’s understanding of the teams approach to the project, but considered ancillary to the selection. The teams were expected to display qualifications in the areas of experience, team structure, project approach and IPD approach.

1.2. Problem Statement

A multidisciplinary approach to project delivery is more likely to increase project team cohesiveness, but misaligned “sub-goals” between participants cause clashes and uncoordinated behavior (Love et al., 1998). Thus, IPD is intended to align the interests of the project owner, architect, contractor and other principal parties. One of the underemphasized aspects of IPD is the selection process for integrated teams.

IPD represents a shift in management focus toward administering projects as a coherent organization quite different from traditional silo operations. Although previous literature has identified a relationship between integrated delivery and project performance, there has been limited research to document IPD team assembly. Even less is to be found on the practices and procedures suggested, such as interviews, regarding how to assess prospective project teams. Some might argue that the IPD agreement lessens the need to invest in an intense vetting of teams; suggesting that built-in contractual incentives “should be” enough to modify otherwise adversarial behaviors into a productive team environment. However, this thesis addresses the notion that IPD behaviors should be embodied from the outset of the relationship with the owner. It can be a challenge for a project owner to screen rudimentary teams and identify high-performing firms and individuals that will uphold the goals and ideals of the project. Therefore, this inquiry focuses on how a project owner can implement procedures for IPD team selection for the assembly of an integrated team. This goes in hand with reconsidering current conventional selection processes and team selection criteria into differentiators specifically for distinguishing ideal IPD teams.

To address the problem statement, this research utilizes a case study. The case study project owner desired a qualified integrated team that exuded a passion for collaboration with the purpose of generating innovative designs and engineering solutions. However, the project owner implied that standard procurement mechanisms could not adequately distinguish a cohesive team that will uphold integrated practices and demonstrate trust-based IPD characteristics. Realizing this, the project owner requested that prospective teams lead their own IPD workshops in addition to the typical team selection requirements: a qualifications submission, team proposal and design concept proposal. The occurrence of IPD workshops seemed to be inspired by

integrated team philosophies, but how to fully capitalize on such an opportunity for IPD team selection is unknown.

There is a lack of guidance for owners to understand IPD procurement strategies. This case study based research enables a context-rich explanation for IPD team assembly. As part of the data collection, perspectives on team selection were compiled from the project owner and proposing teams. In addition, expert interviews were conducted to document the perceived value and impact of other practices being used for IPD team selection. Essentially, this research employs qualitative methods to analyze how the perceptions of IPD team assembly influence team selection criteria and team selection processes. The results of this study contribute to a set of lessons learned for IPD team selection that are beneficial to the interests of project owners as well as prospective IPD teams. Findings are expected to reveal opportunities to align evaluation of proposing IPD teams with project goals, as well as present viable options to enhance selection effectively.

1.3. Research Questions

Research Question One (RQ1): How can team selection criteria align with IPD goals?

Research Question Two (RQ2): How can unconventional approaches to the team selection process contribute to IPD team assembly?

Research Question Three (RQ3): What are the options for IPD team selection?

1.4. Contribution

This study assists in capturing the innovative processes and interactions being used to support IPD team selection. The research emphasis is on perceptions regarding solicitation methods and procurement processes for an IPD project, rather than project outcomes. Influential factors and decisions for IPD team assembly are identified and explained. In concluding, the study will build upon the following contributions:

- Propose a list of performance indicators for team selection criteria, which are believed to play a supporting role in attaining IPD goals;
- Describe how and why qualifications criteria are used in the selection process for IPD teams; and,
- Describe the challenges of using evaluation metrics for an intangible set of criteria.

2. Literature Review

Recently team-oriented delivery methods have introduced new procurement strategies that lessen the ineffectiveness and fragmentation of conventional competitive bidding (Akintoye et al., 2012). Relational delivery methods, such as IPD, are a departure from traditional delivery methods that select team members based upon the lowest bidder or a best-value combination of the cost of work with limited qualifications selection criteria (CMAA, 2012). This literature review will describe the various factors capable of motivating firms to leverage an “unorthodox practice,” such as the adoption of integrated project teams in construction (Fleming and Koppelman, 1996).

The first objective of this chapter is to establish background and analyze the causes of adversarial conditions in the construction industry. Part of this assessment considers the impact that organizational constructs, such as functional management, have on performance outcomes. The assessment then illustrates thoughts on how the construction project manager is the metaphorical linchpin at the convergence of project performance and project team collaboration. Due to the pluralistic nature of IPD teams, the literature will then progress beyond the concept of the project manager as a central authority figure.

It follows that a particular concern for IPD team selection is how to foster a collaborative team environment. Studies on these topics indicate that in the pre-contract phase, the selection process for IPD teams should apply selection criteria that will lend to collaboration and enhance the future performance of the construction project team.

Lastly, to formalize the basis for the assumptions in the research questions, construction delivery methods are defined, with an emphasis on relevant differentiators. The ending note of the literature review concludes that a large proportion of recent research only discusses IPD with respect to project performance outcomes. As a result, there are insufficient models for the formation process and ideal composition of IPD teams. Due to the lack of recent contributions regarding best practices for IPD team selection, the suggested influences on integrated team success are linked together in order to establish a baseline for a focused study on IPD team selection.

2.1. Construction: A Project-Based Organization

Transformational change may be influenced by a firm's desire to be competitive within its industry. Recently, Flanagan et al. (2007) illustrated a four-leveled framework for the evaluation of competitiveness in construction. The framework, as shown in Figure 2-1, indicates that competitiveness is a relationship of economic and management sciences. Frameworks, such as the illustration in Figure 2-1, are useful for conceptual realization and defining parameters for measurement. The contributions of Flanagan et al. (2007) identify how the self-interests of project stakeholders are affected by external competition and pressures that exceed the scope of the project. Because competitiveness is dependent on a range of factors, there is no single definition of competitiveness in construction. After a review of various definitions of competitiveness, Henricsson et al. (2004) described competitiveness as “fulfilling a mission” of international trade performance targets and firm level market performance targets.

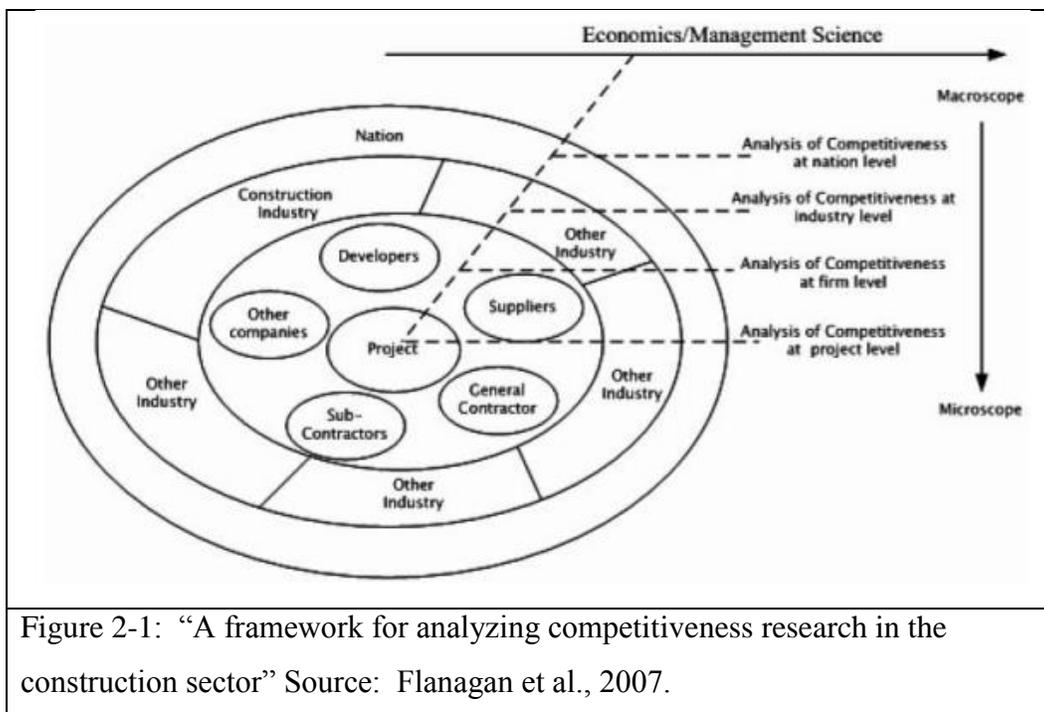


Figure 2-1: “A framework for analyzing competitiveness research in the construction sector” Source: Flanagan et al., 2007.

An exhaustive review of competitiveness in construction is somewhat extraneous to the contributions outlined in this thesis. Instead, this brief section is an establishment of the critical importance that construction firms are flexible and act responsively to dynamic redevelopments of performance targets set by the competition and client requirements. However, the

construction industry is particularly challenged at the concept of agility (Owen et al., 2006): the process of design and construction requires significant coordination among people and systems. Effective implementation of a process change requires interoperability with the **processes of other parties** involved in the construction project.

While identifying the drivers for integrated project teams, the literature review will comment on organizational constructs that IPD teams are challenged to overcome. As the next section introduces the construction project manager, it is important to remember that project management competencies are sensitive to corporate strengths/weaknesses (Isik et al., 2008).

2.2. Fundamentals of Construction Project Management

Day-to-day aspects of a construction project are overseen by the construction project manager. Although the project manager seemingly operates in an autonomous role, the support of the company organization and head office influences the quality of project management performance (Isik et al., 2008). For operational purposes, “centralized authority is necessary for the proper conduct of a construction project, and the project manager is the central figure” (Clough et al., 2000). The profession of project management can be described as a union of leadership and business acumen.

The responsibilities associated with the role of project manager are of such great significance that the dimensions of management have developed into independent researcher areas. The spectrum of applied management practices encompasses topics such as material management, strategic management and knowledge management (Thomas et al., 1989; Chinowsky and Meredith, 2000b; Kululanga and McCaffer, 2001). For example, knowledge management is shown to have the capacity to enable innovation and improve performance results (i.e. productivity) in construction organizations (Maqsood, 2009). In scholarly construction articles, authors tend to emphasize the benefits of methodical management.

Project management is a leading topic because construction industry members generally agree that there exists a direct relationship between management and project performance. In 2001, a sample of construction industry members rated management skills and scheduling as the foremost relevant factors to construction labor productivity values (Rojas and Aramvareekul,

2003b). In unsuccessful projects, causes for project management failure include: inadequate project management techniques, an unskilled project manager and/or insufficient commitment to the project (Munns and Bjeirmi, 1996). However, given the expansiveness of management literature, it can be somewhat difficult to comprehensively discuss project management. This limitation is evident in the aforementioned examples of construction project management: Due to the diversity of the subject, there is a large body of research on micro-perspectives of construction project management. Perhaps Baccarini (1996) best succinctly addressed the intricacies of project management, when he described project-based management as “the management of complexity.”

The effect of assigning project managers from various entities into a single integrated project management team is unknown. The role of the project manager is changing and increasingly project managers will be “...required to perform roles outside of the traditional scope of project management” (Edum-Fotwe and McCaffer, 2000). To a reasonable extent, the fundamental role of a project manager and common characteristics of a project manager are presumed to be maintained when translated into an integrated project management team environment. However, it would be unfounded to assume that project management team interaction is inconsequential to the identity of the conventional, self-reliant construction project manager. The subsequent categories consider conditions that may shift in relevance, importance or context with respect to integrated teams.

2.2.1. Project Management Competencies

An organization relies on the core competencies of individual employees in order to advance the organization’s long term vision (Chinowsky and Meredith, 2000a). Dainty et al. (2003) achieved moderate success at constructing a predictive model capable of differentiating a superior project manager from an average project manager. The model considered twelve “predictive competencies” associated with key behaviors that indicate the performance of construction project managers. From the study, performance criteria for construction project managers were assigned to nine factor groups (Dainty et al., 2005). However, the approach was hardly concise, as each factor group was compounded with numerous indicators. Due to the lengthy criteria required to assess a single “superior” project manager, one can anticipate a more complicated analysis of factors for project management team assessment.

Although it is difficult to identify a “superior” project manager, researchers have defined more about the development of project management competencies. Skills and knowledge, acquired through experiences, have a dominant effect on project management performance (Edum-Fotwe and McCaffer, 2010). Chen and Partington (2006) applied a phenomenographic approach to assess the degree to which a project manager conceptualizes his or her work. The observation followed that project management competency includes both capacity of knowledge and an individual’s perceived experience of project management work. Although fundamental project management competencies are definable, less is known about how individually acquired competencies measurably contribute to the strength of project teams. The ambiguity associated with project management competencies complicates the process of selecting a qualified project manager.

2.2.2. Project Management Expertise

Many years of work experience are required for project managers to develop a high caliber of insight and gain a rank of expertise. Younger workforce members are sometimes excluded from sample sets due to lack of sufficient expertise. For example, Chua et al. (1999) suggested that their data was well founded due to the fact that the twenty participants of the research sample averaged 20 years of experience in the construction industry and all held senior management positions. The study employed an analytical hierarchy process (AHP) method in order rank critical success factors in a project (Chua et al., 1999). In another example of maturity-based criteria for sample selection, Solis and O’Brien (2012) captured the knowledge of three “expert field managers” in order to conduct a cognitive analysis of experience-driven decisions. It is generally accepted to include expert consultations as a data source to support research objectives. Expert accounts may be necessary to the development of a criteria and protocol for the project management team selection process.

2.2.3. Knowledge Sharing and Learning to Improve Project Manager Performance

Previous findings imply that project management performance is improved when mechanisms for knowledge sharing are in place. Knowledge dissemination practices, based on lessons, learned encourage employees to share past successes and replicate proven solutions into future projects (Paranagama et al., 2012). Exploratory case studies indicate that “increased professional reputation” and positive social reception are outcomes of knowledge sharing behavior (Levitt et al., 2012). Rewarding knowledge sharing behavior among employees is a valuable internal strategy; although it is necessary that employee reward systems differentiate the quality of information dispersed (Ho et al., 2010). Positive outcomes from knowledge sharing experiments suggest that a project manager will likely benefit from working environments that facilitate information exchange.

A potential mechanism for knowledge sharing among project managers may be project management teams. Eskerod (2010) assessed the benefits of learning in a team environment. Nearly 90 project managers belonging to a Denmark-based engineering consultancy firm were assigned to 11 mutually exclusive “learning sets” which participated in a series of four workshops over a nine-month span. The problem-solving workshops promoted “action learning” within small groups of 7-9 people and a facilitator. Despite the complex experimental design and heavy front-end planning, Eskerod (2010) found that the success of action learning was highly contingent upon the unique composition of a team’s participants, facilitator and atmosphere. Cited characteristics of successful teams included participant proficiency at communication, participant experience-level, skill of facilitator and a trustworthy atmosphere (Eskerod, 2010). Eskerod’s findings suggest that an organization’s efforts to integrate employees are limited to the receptiveness of the organization’s employees. Thus the importance of effective team selection processes is reiterated. Project management teams may uphold principles of project management and even bolster project management outcomes via the facilitation of team knowledge sharing.

2.3. Inter-organizational Project Dynamics

2.3.1. Silo Operations Among Construction Core Domains

A major challenge facing integrated teams is to overcome fragmented work habits. The traditional structure of construction project management typically operates as a functional hierarchy with inward-oriented management (Seed, 2014); the result is that divisionism is prevalent throughout the industry. Researchers Harty and Laing (2009) remarked on the inherent nature of the widespread silo mentality, stating that “Within the core domain, each profession has nurtured and nourished their name, title and competences.” Baiden et al. (2006) found that even the most effective of “individually competent workgroups” still express a desire to collaborate with other teams in the same construction project environment. Although standard arrangements have delivered cohesive internal working relationships, inside practices are less effective at mitigating conflicts of control on complex projects (Harty and Laing, 2009). Integration is necessary for collaboration and joint-problem solving, but existing silos in the construction industry are not designed for integration.

2.3.2. Project Network Analysis

The qualities of the project network are possibly an indicator of the level of integration among a project team. Characteristics of inter-organizational working relationships can be deduced from the arrangement of the project network. Network analysis techniques help to characterize the communication styles of project teams. Network analysis can include descriptions of communication pathways. For example, bilateral information exchange between parties can be observed under two conditions: a unidirectional exchange or a mutual exchange. Additionally, the strength and frequency of communication also can be calculated and displayed. Chinowsky et al. (2011) are credited with developing a Project Network Interdependency Alignment (PNIA) model to evaluate the strength of communication and knowledge exchanges in a project by linking task relationships to organizational social network. Although the author is unaware of any attempt to compare the project network of an integrated team to a traditional team, this concept may have an influence on the differentiators of integrated teams: Ideally members of an integrated team will communicate effectively and efficiently within the project network.

2.3.3. Vertical, Horizontal and Longitudinal Fragmentation

The typical construction project is fragmented horizontally, vertically and longitudinally (Sheffer, 2011). Vertical fragmentation refers to disconnects between design, construction and operations phases of a project. Horizontal fragmentation is the outcome of autonomous trades that have few to zero mutual incentives for collaboration. Longitudinal fragmentation refers to time interruptions between projects. All dimensions of fragmentation can be detrimental to project success. Strict, transactional approaches to fulfilling deliverables have been observed to produce polarized work that lacks consideration for the overall optimal design solution (Forgues and Koskela, 2009).

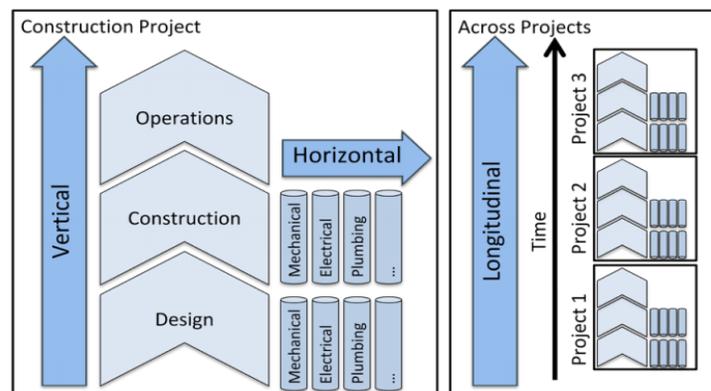


Figure 2-2: Fragmentation in the construction industry. Source: Sheffer, 2011.

2.3.4. Authoritarian Hierarchical Systems Lead to Adversarial Conditions

For years, reports have attributed inefficient delivery methods to divisive conflict and poor attitudes between project team members. Newcombe (1996) hypothesized potential for project performance improvements if traditional “authoritarian” hierarchical systems are replaced by pluralistic, relationship based systems which democratically empower participants. 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.” Similar to Newcombe, Fleming and Koppelman (1996) 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. Although the arguments of Fleming and Koppelman (1996) were general to concurrent engineering for product development, the research duo established a transformational set of fundamental rules for the

empowerment and authorization of multidisciplinary integrated project teams. Lastly, in another corresponding viewpoint, Love et. al. (1998) stated that “the project manager faces the challenge of obtaining the most of the team without implying any hierarchal authority.” It stands that adversarial conditions should be less severe among an equitable project team arrangement.

Despite having painted the ideal project team, barriers impede the implementation of equitable work groups. Traditional project management is preoccupied with adherence to a non-agile baseline plan that often restricts workers’ motivation to formal titles and pay grades (Levitt, 2011). Until the construction industry embraces team inclusion, a major shift in project-level interactions is unlikely. Results from a sample of Singapore-based contractors emphasized that cooperative teamwork is limited to the “...convictions and motivations of people who drive it” (Kumaraswamy et al., 2005). In summary, project conflicts can be mitigated if organizational constructs support positive behaviors and employees embrace teamwork.

2.3.5. Indicators for Team Collaborative Satisfaction

Now that team operations are defined, one study is presented on measuring the collaboration in an integrated team. This study established a relationship between collaborative satisfaction and the level of team collaboration. Zhan and Wu (2013) measured collaborative satisfaction of IPD project management teams in order to reflect the synergy between team members. It was found that if abilities among team members are inconsistent, the higher performing team member will have a comparatively lower outlook on community satisfaction (Zhan and Wu, 2013). An individual that perceives himself or herself to be outperforming his or her team members is likely to be less satisfied. Zhan and Wu (2013) concluded that adjustments are needed within a team if differences in ability are lowering satisfaction scores toward different team members. This study identifies how balancing capabilities is important to maintaining high levels of team community and collaborative satisfaction.

2.4. Project Performance Metrics

2.4.1. Traditional Metrics for Project Success

Traditional project performance metrics are unconcerned with reporting collaborative accomplishments such as the quality of teamwork. In project management, the performance metrics of time, cost and quality are regarded as traditional, key variables to successful project performance (Anuar and Ng, 2011). Time, cost and quality metrics are interdependent; characterized by a complicated and non-linear interaction of the variables (Wen-zhou and Jia, 2007). This strong intertwinement has led some to refer to time, cost and quality as inextricable components to project success (Atkinson, 1999). In projects, it is not unusual for factors of time, cost and quality to compete against each other. This trade-off interaction can be modeled in order to illustrate “optimal resource utilization plans” (El-Rayes and Kandil, 2005). Although integrated methodologies are helpful to capture variable interactions, a limited quantity of inferences can be generated from aggregated time, cost and quality data alone. Without additional information, the traditional measures of time, cost, and quality are inadequate for the interpretation of all significant elements of company, project and relational performance (Kagioglou et al, 2001). Rather than dwelling on traditional success criteria, metrics that address the ability of professionals to integrate and “complement each other’s efforts and skills” ought to be a larger emphasis in the construction industry (Baiden et al., 2006). Cicmil et al. (2006) wrote that more research is necessary on the actuality of projects, which calls for focus “...on practical action, lived experience, quality of social interaction and communicative relating, operations of power in context, identity, and the relationship between agency and structure in project environments.”

2.4.2. Effectively Utilizing Performance Indicators

Many project performance metrics are lagging-indicators that are applied retrospectively; that is at the time of project completion or milestones. In the case of Francom et al. (2014), a questionnaire identified five performance measures (i.e. schedule, safety, change, productivity and communication) perceived to differentiate alternative project delivery methods (e.g. construction manager at risk, design-build, IPD, etc.) from design-build. The nomenclature used by Francom et al. (2014) is included in this literature review as an example of an assessment of project performance indicators (i.e. delivery method) independent of actual project data.

Instantaneous indicators are suitable for quicker feedback. Productivity rates can distinguish a well-run project from a poorly managed project at controlled time intervals (Thomas et al., 1989). However, the accuracy of the assessment of labor productivity rates varies by project and specific task. Furthermore, labor-intensive construction productivity sectors, such as residential and commercial construction, tend to display lower productivity than capital-intensive construction sectors (Rojas and Aramvareekul, 2003a). The limitations of productivity measurements disqualify productivity as a viable single-source indicator of outstanding capability (Flanagan et al., 2005). Due to these limitations, it is worthwhile to direct construction performance research toward the strengths and weaknesses of adopting and applying behavioral performance indicators to projects.

Additionally, the current stage and scope of a project also affects the types of performance metrics most relevant to achieving project objectives. For example, at a project's preconstruction phases, project planning and control measures are shown to largely impact project performance outcomes (Doloi, 2013). In regard to the success of retrofit projects, Sanvido and Riggs (1989) stated the project team to be the "single most dominant factor" that influences project outcomes. As previous literature demonstrates, there is no single solution for dependable project performance metrics that precede success. Essentially, project stakeholders define project success and select the important performance metrics related to achieving said success (Esmaeili et al., 2013).

2.5. Project Delivery Methods

Project delivery method describes the type of system that a project owner uses to contract with a designer and contractor (Sanvido and Konchar, 1998). Project delivery methods are made up of several factors: project characteristics, owner's needs and owner's preferences (Al Khalil, 2002). Al Khalil (2002) described the choice of delivery method as an "essential decision" for the project owner. Likewise, Shah and Coleman (2013) described the strategy embedded in project delivery method as "one of the most important decisions that an owner can make." In the United States construction industry, project delivery methods are defined by a variety of ways (Konchar and Sanvido, 1998). Various delivery methods exist to accommodate unique designs and variations among project demands (Mulvey, 1998). In addition, construction type (e.g. highway,

industrial, public sector, etc.) also influences desired cost, schedule and quality performance (Goftar et al., 2014). Discussed next are the major project delivery methods in the United States. Also addressed is the distinction between predominant and alternative delivery methods.

2.5.1. Predominant Methods for Project Delivery

Design-bid-build (DBB), design-build (DB) and construction manager at-risk (CM) are the three predominant project delivery methods for buildings in the United States (Konchar and Sanvido, 1998). Of the three, *design-bid-build* is defined as a “traditional project delivery system” that is a transactional system of separately contracting with a designer and fixed price bid contractor (Konchar and Sanvido, 1998). In *construction manager at-risk* the designer and contractor are contracted separately, with the contractor having a significant role during the preconstruction design process (Konchar and Sanvido, 1998). In *design-build*, a self-selected team is often contracted to provide design and construction services (El Wardani et al., 2006). In design-build, the contractor is usually responsible for teaming with designers to perform work (Ibbs et al., 2003). Often DBB, DB and CM are described as “basic methods” (Al Khalil, 2002). Design-build project delivery is nearest to the implementation of integrated project delivery due to the teaming arrangement in its contractual relationship. Although design-build is defined as a predominate project delivery method, in many nomenclatures design-build is also considered an alternative delivery method (Ibbs et al., 2003). Alternative delivery methods are further explained in next section, which is an overview of concurrent engineering, a relevant predecessor to IPD.

2.5.2. Alternative Project Delivery

Concurrent engineering is an alternative project delivery method that precedes research topics on IPD. According to Love and Gunasekaran (1997), concurrent engineering in construction is an integration of project stakeholders in order to eliminate waste and involve otherwise downstream aspects of design and construction processes into early decisions for design. Concurrent engineering in construction is a client-driven, multidisciplinary team approach that seeks to overcome fragmentation and contribute to project effectiveness through goal alignment, communication and team cohesiveness (Love et al., 1998). Concurrent engineering in construction implementations contains elements of early involvement and multidisciplinary team

goal alignment; therefore showing that integrated team ideologies are found in alternative project delivery methods other than IPD.

Boundaries that distinguish project delivery methods are becoming "increasingly blurred," therefore the deconstruction of project delivery strategies can be a more relevant means to discuss the impact of team factors, such as team integration and group cohesiveness, on project performance (Franz, 2014). Another example of deconstruction of delivery methods is that the extent of collaboration in a construction project can be represented by a "degree of integration" metric (Manning, 2014). Alternative classification systems for project delivery suggest that the influential, shared aspects between IPD and other integrated approaches to project delivery may cause similar team selection outcomes.

2.5.3. Integrated Project Delivery

The AIA (2007) defines IPD as: "...a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction." The AIA definition of IPD emphasizes the purpose of IPD. The function and implementation of IPD is distinguished by two key aspects: a multiparty contract and early involvement (e.g. team formation at 0% design) (El Asmar et al., 2013). In addition to multiparty contract and early involvement, the simultaneous employment of four additional characteristics defines a "true IPD" project, according to Ghassemi and Becerik-Gerber (2011): collaborative decision-making and control, shared risks and rewards, liability waivers among key participants and jointly developed project goals.

- (1) A *multiparty contract* is an integrated form of agreement that intends to bind the commercial interests of all participants and therefore team members prioritize the overall success of the project above individual motives (Nofera et al., 2011).
- (2) *Early involvement of key participants* improves communication by integrating design and construction project phases (Mihic et al., 2014).

- (3) *Collaborative decision-making and control* opens the possibility of “choosing-by-advantage” strategies instead of first cost selection (Hall et al., 2014).
- (4) *Shared risks and rewards* are a goal alignment strategy to share wins and losses among a cohesive team (Johnson et al., 2013).
- (5) *Liability waivers among key participants* formalize trust among participants to curb non-collaborative behavior.
- (6) *Jointly developed project goals* underline the commitment of signatory parties. Early integration of the team through alignment of the project goals is suggestive of project success across delivery methods, particularly in the case of High Performance Green Buildings (Gultekin et al, 2014).

Although there is a “high level of interest in IPD”, the majority of construction professionals in the United States have yet to acquire a pure IPD experience (Kent and Becerik-Gerber, 2010). In the construction industry, few “pure” IPD projects have been recorded. The AIA (2012) remarked that often agreements are customized to reflect a “degree of IPD” with the omission of certain IPD principles, such as shared risk/reward. Transitional steps toward IPD can be accomplished through collaboration addendums that incorporate a partial adoption of integrated concepts into traditional project delivery (Franz and Leicht, 2011).

Omission of certain IPD characteristics does not necessarily diminish team performance or project outcomes. Baiden et al. (2006) defined ten dimensions of the integrated construction project team (see Table 2-1). Notably, Baiden et al. (2006) concluded that all dimensions of an integrated project team do not have to be present for a team to be considered integrated and effective. An integrated team is dynamic with non-standardized needs.

Table 2-1: Evidence of integration practices.

Examples		Full Achievement	
Dimensions of	A	Single team focus and objectives	All members have the same focus and work together towards team objectives
Integration	B	Seamless operation with no organizational defined boundaries	Members form a new single project team with no individual member identity or boundaries
	C	Mutually beneficial outcomes	Pursuance and attainment of project goals that benefits all members
	D	Increased time and cost predictability	Openly accessible design and construction cost information gathering and management
	E	Unrestricted cross-sharing of information	Availability and access to all project information to all parties involved in the project
	F	Team flexibility and responsiveness to change	Requisite personnel join and leave the project team as their skills are no longer required or are needed
	G	Creation of single and co-located team	A single project team with all members located together in a common office
	H	Equal opportunity for project inputs	Consultation of members for contribution at all phases of project before decisions are made
	J	Equitable team relationships and respect for all	All members are treated as having equal and significant professional capability needed on the project
	K	No blame culture	Collective identification and resolution of problems. Collective responsibility for all project outcomes

Source: Adapted from Baiden et al., 2006.

2.6. Selection Methods

In predominate delivery methods, team procurement usually considers cost. The award method of separate competitive bidding is common and regularly defined as traditional (Gordon, 1994). For example, a traditional lump sum project selects based on a contractor's low-bid project estimate at the time of bidding (Ibbs et al., 2003). Traditional lump sum methods are driven by cost certainty, however it is believed that lump sum projects manage to be delivered within budget and on time due to manipulation of contingency (Love, 2002).

Other procurement options for predominant delivery methods include unit price, fixed fee, cost plus and guaranteed maximum price (Ibbs et al., 2003). These options are weighted in selection methods that are not solely based on cost, such as best-value. In addition to the cost proposal, best-value procurement considers qualifications and technical criteria, such as legal and financial qualifications, organization and experience, key personnel, project understanding, project approach and project management (Shane et al., 2006). Lastly, qualifications-based selection is a procurement approach in which, there is no decision criterion for price (Christodoulou, 2004). Therefore qualifications-based selection is best described as negotiation, rather than a true

procurement. Overall, certain procurement approaches are better suited for predominant delivery methods than others. Therefore Table 2-2 matches typical procurement approaches to both predominant delivery methods and IPD. According to Table 2-2, the selection approach for IPD teams can be either best-value (fees) or a qualifications-based selection.

Table 2-2: Delivery method by procurement option.

	Low Bid	Best-Value: Total Cost	Best-Value: Fees	Qualifications- Based Selection
Design-Bid-Build	✓	✓	N/A	N/A
CM at-Risk	N/A	N/A	✓	✓
Design-Build	✓	✓	✓	✓
IPD	Not Typical	Not Typical	✓	✓

Source: Kenig, 2011

2.7. Procurement Systems and Team Assembly for Performance

In this section and its subsequent subheadings, two approaches to studying team performance are explained. The first approach explores the relationship between project procurement type and project team performance. In the second approach, factors of team performance are aligned with team assembly. However, there is a gap in the literature: Outside of inductive reasoning, there lacks evidence for proving a continuous relationship between all three factors: procurement system (e.g. procurement type, project delivery method), criteria for team assembly *and* team selection. Therefore this section presents empirical data that converges at the edges of this gap:

1. The relationship between procurement method and performance
2. The relationship between team assembly and performance

The logical progression is that there is a potential for a commutative link between these factors; thus reaffirming the relevance of studying IPD team selection.

2.7.1. Project Procurement Considerations for Team Performance

The appropriate criteria for different team members should be selected based on procurement arrangement, project organization and project requirements (Rahman and Kumaraswamy, 2005). An optimal procurement method can reduce the likeliness of encountering unsatisfactory project

performance and owner frustration caused by “ill-qualified” teams (El Wardani et al., 2006). The objectives of El Wardani et al. (2006) examined the relationship between procurement methods and traditional project performance metrics for design-build projects. The study is notable for its examination of qualifications-based procurement methods that are similar to existing procurement methods for IPD. However, team selection was only mentioned as an afterthought and regarded as a future area of study to potentially “ensure a smooth project delivery process and eliminate problems during construction” (El Wardani et al., 2006).

Other research on team procurement methods similarly emphasizes team performance without investigation of the team selection processes. Forgues and Koskela (2009) observed the relationship between procurement method and the performance of integrated design teams in two separate case studies. Results indicated that even if integrated teams are maintained throughout the whole project lifecycle (procurement through delivery), integrated teams may exhibit dysfunctional behavior if transactional agreements remain fragmented (Forgues and Koskela, 2009). Like in much of the previous literature, this reinforces the need for procurement to support integrated teamwork and integrated project teams. However, still there is no detailed analysis of the team selection process prior to a multidisciplinary contract.

2.7.2. Prevailing Concepts for Assembling Teams

Existing team selection studies do not emphasize IPD procurement systems. Albeit not specific to procurement, Daniel and Davis (2009) provide foundational knowledge on team assembly in their study of sub-set specialized R&D teams. Sub-set R&D teams are comparable to how project management teams are a sub-set of project teams. Daniel and Davis (2009) completed a case narrative on specialized, high-performance R&D teams that communicate downward, laterally and upward. The case concluded that in addition to collaborative communication, a factor of team success was the confidence that teammates had in each other’s abilities as profession specialists (Daniel and Davis, 2009). From this, it is understood that individual areas of team member expertise should be considered during group assembly. Also introduced is the concept of “collaborative communication” for success.

Not all team structuring approaches consider individual psychological needs. Compton and Byrd (2000) discuss project team communication as a success factor perceived to be critical in

certain product development team structures. The purpose of the team structuring study was to identify the most effective clustering technique based on “projected communication flows” and “design task discipline requirements” (Componation and Byrd, 2000). The cluster analysis was built around increasing the likeliness of communication flow by managing the distance between communication levels. Unlike Daniel and Davis (2009), this approach to team assignment for performance does not take into account the soft qualities associated with interactions. However, both studies define important components to assembling promising teams.

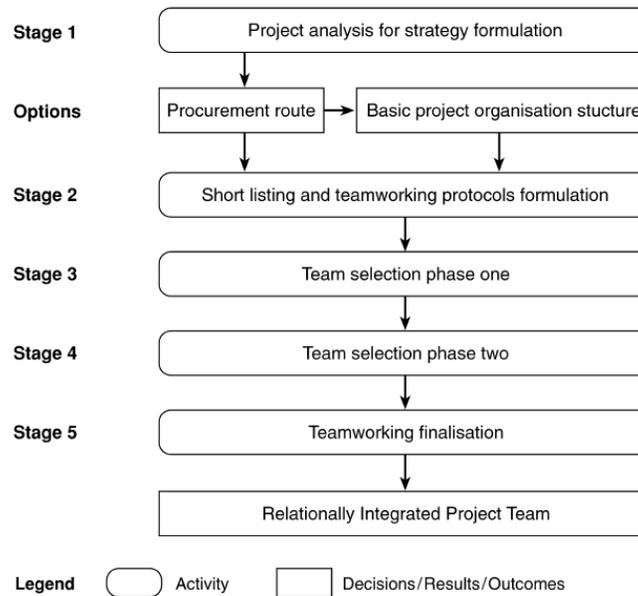
The drawback to these discoveries is that it cannot be definitively stated to what degree the characteristics of engineering teams (e.g. R&D teams, concurrent engineering teams) resemble construction project teams. It follows that construction project delivery does not align with these studies.

2.7.3. Gap: Procurement Systems and Integrated Team Selection

There needs to be a team selection study adequate for IPD procurement systems. Traditional procurement can be approached using techniques based on alternative project delivery methods. For example, traditional procurement can involve specialty trades upstream if facilitated by a concurrent engineering approach to early appointments and a nomination process prior to identification of the general contractor (Walker, 2007). According to Walker (2007), this assists in concurrency by promoting an interactive design process in the multidisciplinary team. This displays that a traditional procurement system of separate parties can be enhanced using principles from integrated approaches to project delivery. However these types of approaches cannot be considered pure (Walker, 2007).

Previous studies have discussed selecting integrated teams for construction, but have yet to incorporate IPD as a sole focus. For example, Rahman and Kumaraswamy (2005) created a flow chart for assembling a “Relationally Integrated Project Team” (RIPT). The flowchart includes teambuilding exercises, such as a workshop, in order for an owner to determine the quality of individual team members on a prospective team. Rahman and Kumaraswamy (2005) assert that the flowchart can be used for multiple procurement systems, but also state that team members should be selected at earlier project stages. The flaw in this reasoning is that transactional procurement methods, like design-bid-build, are not designed to incorporate early team

involvement. Although the team integration goals of the RIPT assembly process overlap with principles of IPD, the attempt to match all procurement systems is too broad and has no specific mention of IPD.



Notes:

Options – Traditional, D&B, BOT, Management Contracting, etc.

Stage 1 begins after feasibility study.

Examples of activities:

Stage 2 – Invite and shortlist different parties from RISC, workshop, outline of RIPT, outline contractual adjustment, outline win/ lose agreement, outline partnering/ alliancing arrangement, etc.

Stage 3 – Assemble consultants and/ or management system team, prepare specifications, and/ or preliminary/ detail design, and/ or project requirements, etc.

Stage 4 – Tender assessment, negotiation, selection, contract award, etc.

Stage 5 – Workshop, detailing of RIPT, finalisation win/ lose arrangement, contract adjustment, ‘issue’ resolution mechanism, partnering/ alliancing arrangements, etc.

Figure 2-3: Flow chart for assembling a “Relationally Integrated Project Team” agreement.

Source: Rahman and Kumaraswamy, 2005.

2.8. Summary of Literature Review

In the case of IPD, the pre-contract formation of the integrated project team has received little attention. Instead there seems to be a preoccupation with IPD project performance outcomes and supporting metrics. The existing body of knowledge falls short of investigating the origin of team formation: the procurement systems for integrated team selection. Moreover, although collaboration and team chemistry are drivers to the success of integrated teams, little has been done to establish selection criteria and performance predictors for distinguishing these qualities

in IPD teams. In result, a project owner has minimal guidance for the implementation of an optimal project management team selection process for IPD.

Attentiveness to emerging developments within IPD should improve the selection process for integrated teams accordingly. Until more knowledge is made available, lack of guidance of team selection criteria is a disadvantage for (1) project owners in making selections and (2) project teams in knowing how to properly present their qualifications to meet the needs of an IPD project owner. This prevents organizations from maintaining a comprehensive plan which concentrates on effective management and response tools that are competitive at current business conditions (Chinowsky and Meredith, 2000b). If there is to be continued use of IPD delivery methods, the impact of integrated teams needs to be distinguished from traditional methods and traditional teams, with particular evidence of how the selection process translates into successful team formation and potential for project success.

3. Research Methodology

3.1. Introduction

This research builds upon an existing body of work that has already confirmed a relationship existent between project delivery method and construction project performance. Trends also suggest that integrated teams are directly related to improved performance. In particular, integrated project delivery is thought to improve project outcomes through “effectively structured, trust-based collaboration [which] encourages parties to focus on project outcomes rather than their individual goals” (AIA, 2007). However there is limited insight regarding how organizations should approach project team assembly from the perspective of procuring intangibles, such as team chemistry and the collaborative spirit of IPD.

This chapter details the data collection process that was used to understand how and why certain processes, protocol and events may contribute to IPD team selection. Due to the exploratory nature of the research questions, a case study inquiry was chosen to address the qualitative research on IPD team selection. The methodology makes use of multiple techniques (e.g. screening committee interviews, team surveys/questionnaires, expert interviews) in order to triangulate evidence. Each technique has its own distinct advantage for the situation to which it is applied. Overall, the case study provides the opportunity to accomplish descriptive research on a chain of events that provide insight to answer “how” and “why” questions (Yin, 2003). Analysis techniques were then applied in order to converge evidence and address research questions. This process was supplemented by the literature review. In this qualitative study, multiple sources for data collection improved the validity of the case study and maintained credibility.

3.2. Terminology

3.2.1. Team Selection Criteria

A variety of meanings can be interpreted from the term “team.” Consequently readers may find varied meaning in the terminology “team selection criteria.” In the context of this research study, team selection criteria encompasses evaluation standards for a team of *firms/organizations*. Where appropriate, the terminology “team *member* selection criteria” will

be used to describe evaluation standards reserved to *individuals*. Admittedly this distinction is nuanced by the fact that an organization and individual coexist inextricably. However this study found evidence that an organization perceived to be weak can be disqualified without critique of specific individuals. Likewise, individuals perceived to be undesirable can cause their organization's elimination from the pool, despite the organization's macroscopic attributes. Therefore in this report on team selection, a conscious effort is made to distinguish between *team* selection criteria and *team member* selection criteria.

3.2.2. Team Selection

Another distinction of terminology for this document is the meaning of "team assembly" and "team selection." *Team selection* is the procedure for choosing the exact firms/organizations that will become the project team. Team selection is a course of action for choosing teams whereas team assembly refers to the assemblage of chosen parties. Team assembly describes the onboarding of project team entities into a predetermined composition. The primary difference between the terms *team selection* and *team assembly* is that team selection has a greater emphasis on the mechanisms for team assessment prior to project team appointment.

3.3. Purpose Statement

The research methodology was designed with the purpose of interpreting a single-case study in order to understand how an IPD team selection is perceived as a success factor in an IPD project. The intent is to explain the aspects of IPD team selection that are perceived to be most meaningful to team assembly and project success. Research questions are restated below:

1. How can team selection criteria align with IPD goals?
2. How can unconventional approaches to the team selection process contribute to IPD team assembly?
3. What are the options for IPD team selection?

3.4. Conceptual Framework

It is common practice for qualitative research to begin with a set of key assumptions that are believed to be true. In this study, a proposition for IPD team selection was developed based on

empirical data in the literature review and the investigator’s original perspective. Further defining this proposition, a set of assumptive statements for IPD team selection were built-into the defined research questions. Formation of a conceptual framework is completed by predetermination of topics from which conclusions may be drawn. Key assumptions then contributed to the development of coding guides for qualitative data analysis.

The assumptions underwent a quality assessment developed by Bloomberg and Volpe (2012), to ensure that biases were revealed and explained. The quality assessment guide helped to maintain a feasible research approach, while verifying that the initial proposition and assumptions functioned as a conceptual framework for the research process. Table 3-1 displays the conceptual framework for this study. Bloomberg and Volpe (2012) state that the conceptual framework is integral to establishing topics that are directly related to the research questions. The research methodology will later address a data analysis technique used to refine the IPD team selection proposition and revise the original ideas in the conceptual framework.

Table 3-1: Conceptual framework for IPD team selection.

Proposition: IPD team selection will result in an unconventional approach to team selection criteria and the team selection process.	
Statements of Initial Assumptions	Predetermined Topics of Interest
Prequalification criteria are consistent for all project delivery types within the parameters of facility type and project complexity.	Technical credentials Experience Expertise
Certain distinguishing elements of IPD are perceived to be an advantage over conventional approaches to project delivery.	Early involvement Multiparty agreement Shared risk/reward Jointly developed goals Collaborative decision-making Teaming arrangement
An IPD project owner perceives certain flaws in traditional approaches to project delivery and seeks to overcome said flaws unconventionally.	Collaboration Team chemistry Transparency Trust Pluralism
An IPD project owner desires to utilize IPD ideals in order to attain the best possible project performance outcomes	Project management team Integrated design process

3.5. Research Steps

A qualitative research methodology was applied in order to accomplish an explanatory case study. Data collection included a series of interviews and questionnaires among stakeholders within the case study. Additional details were ascertained from direct observation, as well as document review to verify data. Lastly, expert interviews were a data collection technique integral to the completeness of the study.

The research process was chosen as a means to systematically build internal validity and iteratively sharpen constructs for content analysis. The research steps, adapted from Eisenhardt (1989), were executed as follows:

- Select a case study,
- Design semi-structured interviews and questionnaires,
- Data collection and iterative process of defining constructs,
- Within-case analysis,
- Expert interviews,
- Enfolded literature,
- Refine the definition of construct measures, and
- Reach closure.

These steps were oriented around fitting the data to the construct measures in the conceptual framework. When data collection did not support the tenets of the original proposition, the research steps were designed to refine preconceived ideas through an iterative process. In addition to the within-case analysis, evidence outside of the case study contributed to the triangulation of data. Then construct measures in the conceptual framework were again refined based on the discussion being inclusive of findings from the case study, expert interviews and literature review. Reaching closure indicated the convergence of evidence, as well as the exhaustion of new findings in the data collection.

3.6. Description of Research Techniques

3.6.1. Case Study

The case study design is an embedded, single-case study (Yin, 2012). The proposition of this case is that IPD team selection will result in an unconventional approach to both team selection criteria and the team selection process. The case study was selected as a means to understand why project owners might distinguish the process for an IPD team selection from conventional methods for team selection. Four sources of evidence were embedded in the case study: document review, direct observation, interviews and documents. Figure 3-1 displays the case study design in which IPD team assembly is the surrounding context of the case study on IPD team selection.

The project selected for the case study had recently embarked on a mission to fully embody the characteristics of a “true” IPD project (i.e. early involvement of all team participants, multiparty agreement, shared risk/reward, jointly developed goals). The project owner, a United States university, had no previous experience in IPD team selection. The purpose of the project was to renovate and rebuild an antiquated engineering building. Project scope included a partial renovation of about 15,000 gross square feet of the building, with the aim of preserving architectural elements of historical significance. The remaining 70,000 gross square feet of the building were to be demolished and rebuilt. The new and revived program was to include classrooms and laboratories for both teaching and research purposes. Approximately \$30 million was budgeted for construction. The aforementioned project details are provided mainly for contextual support and project type classification. The primary interest in the case study is that it presented an opportunity to investigate how the choice of project delivery method (i.e. IPD) related to the project owner’s selection criteria and process for team assembly.

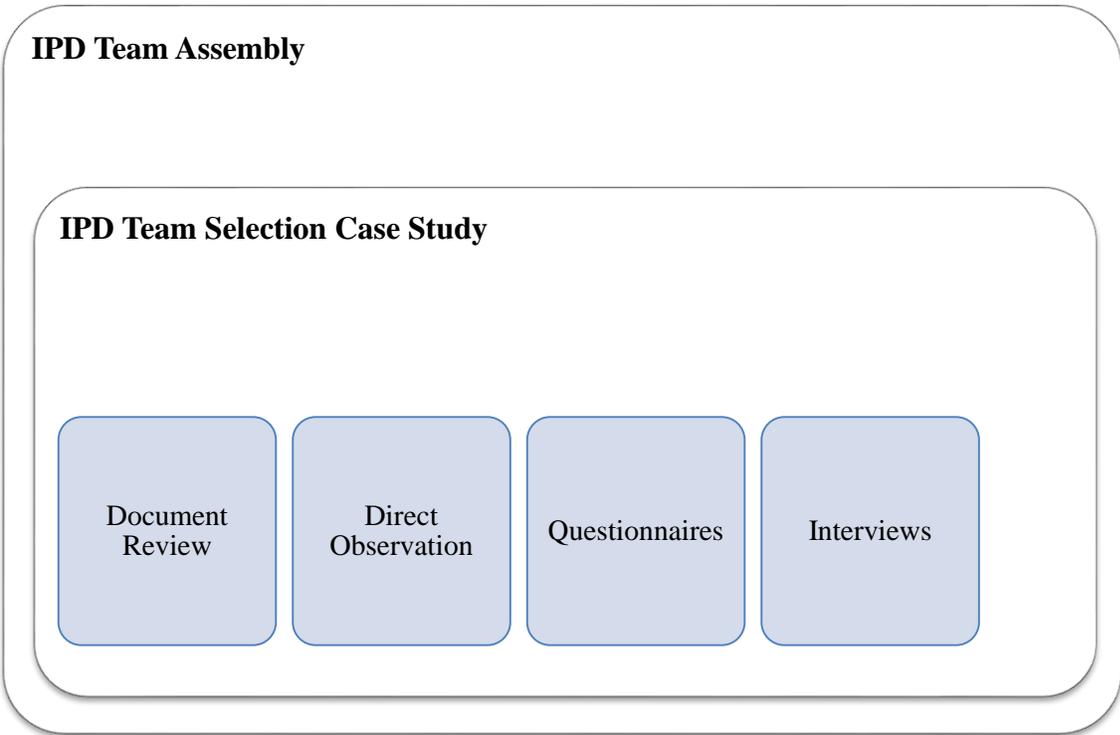


Figure 3-1: Diagram of embedded, single-case study. Adapted from Yin, 2012.

The case study approach to IPD team selection is expanded in chapter 4. An overview of the team selection process used by the project owner is diagrammed in Figure 3-2. With the exception of team site visits, the investigator conducted direct observations of the selection committee procedures at every stage in the process. This was a natural setting and non-disguised observation.



Figure 3-2: Sequential representation of the case study team selection process.

Document Review

According to Yin (2003), inferences drawn from valid documents are useful as “clues worthy of future investigation” in a case study. A review of letters, agendas and other relevant documents

was conducted in order to gain more knowledge about the presence of IPD characteristics in the case study. Data was retrieved from documents that contained statements and references to the IPD team selection process and criteria. To avoid an over-reliance on documents as truthful sources, content analysis focused on identifying the objectives communicated in documentary evidence (Yin, 2003).

Archival Evidence

For context, a small amount of archival evidence was also included in the data collection for document review. The case study project owner maintained publically accessible historical information on all of their other completed projects. Partial information was also released for campus projects which were currently active. Records of other project data were analyzed for patterns that suggested potential for comparative analysis across projects.

3.6.2. Screening Committee Interviews

One-on-one semi-structured interviews were conducted with eleven of the fourteen voting members on the screening committee. The duration for each interview was between 20-30 minutes. Interviews were scheduled to occur during the month-long time period allotted between IPD workshops and the submission deadline for design concept proposals. The eleven members of the data set represented the following stakeholders within the university: end users, academia, project administration and facilities management. Almost all interviews were tape recorded. All participants answered an identical question set, with the researcher adjusting probes and sequence of questions as appropriate to support the flow of thoughts.

3.6.3. Team Questionnaire I: Online Survey

Team questionnaire I was an online survey that measured the attitudes regarding eight close-ended procurement-related statements. The intensity of attitudes was measured on a 5-point Likert scale. There was an option to leave an open-ended response for each question. Also a ninth open-ended question was provided for general commentary.

The survey was designed to be taken by individuals on the ten long listed teams. The statements addressed components relating to solicitation method and team selection process. Team questionnaire I was posted during the 10-day window immediately preceding the short list

announcement. It is important to note that the survey participants were unaware if their team would advance to the short list.

Long list team members were openly invited to participate in the electronic questionnaire. A snowball sampling method was used to recruit participants. One initial contact for each long list team was identified and contacted via email. The contact was asked to share the link with their team members who were involved in preparing the team submissions.

3.6.4. Team Questionnaire II: Written Questionnaire

Team questionnaire II collected feedback on the benefits and influential aspects of the IPD workshop. The questionnaire included three open-ended questions and three-close ended questions. Questions were designed to be answered by IPD workshop participants from the short list teams. The questionnaire was distributed via paper to voluntary participants immediately after each of the three IPD workshops ended.

3.6.5. Expert Interviews

The final research strategy was to conduct semi-structured interviews with experts. In relation to the case study, experts are defined as having at least one direct IPD project experience. The subject matter of expert interviews captured lessons learned from previous IPD team selections. Participants were asked to recall how they perceived past IPD team selections to influence project performance as well as subjective outcomes (i.e. team chemistry, satisfaction). As a result, the expert interviews documented recent practices for IPD team selection for a variety of projects.

A snowball sampling method identified individuals with direct experience on an IPD project. The expert sample has potential for overlap with the samples in team questionnaire I and team questionnaire II. However, because the questionnaires were anonymous, the investigator had no way of identifying twice-sampled participants. A commonality among the sample was having been a risk-reward group member on at least one IPD project. Of these principal participants, the sample was a multidisciplinary representation (e.g. architects, construction managers, design engineers, project owners). A total of eight semi-structured expert interviews were conducted. Each interview lasted approximately 30 minutes.

3.7. Presentation and Analysis Techniques

3.7.1. Presentation of Data

Yin (2012) urges against improper mixing of evidence and interpretation whilst reporting of case study results. Therefore great care was taken in presenting the descriptive elements of case study in a way that the reader may form an opinion independent of the investigator's interpretation. In particular, data is arranged so that a reader may benefit from the special features of a descriptive case study, as defined by Merriam (1998). These special features include the opportunity for data collection to:

- “Show the influence of personalities on the issue.” and,
- “Spell out differences of opinion on the issue and suggest how these differences have influenced the result.”

To maintain objectivity in the data, the analysis techniques coherently organized the data without prematurely suggesting the investigator's conclusions. In-depth explanation for meaning behind the data is withheld until the discussion.

3.7.2. Analysis Techniques: Refining the Proposition

This section is a more detailed explanation of the role of research assumptions in the case study methodology. Early assumptions about IPD team selection were made in the underlying proposition of the case study design. Although induced from the empirical data in the literature review, there was no existing evidence to support the argument that a project owner will use nontraditional criteria for IPD team selection. However, it is reasonable to believe that an IPD project owner perceives IPD to be advantageous over traditional approaches to project delivery when it comes to successfully achieving the project's goals. The proposition that IPD team selection will result in an unconventional approach to team selection criteria and the team selection process is supported by the following arguments for the case:

- Prequalification criteria is consistent for all project delivery types.
- Certain elements of IPD are perceived to be advantageous over traditional approaches to project delivery.

- An IPD project owner perceives certain flaws in traditional approaches to project delivery and seeks to overcome said flaws unconventionally.
- An IPD project owner desires to utilize IPD ideals in order to attain the best possible project performance outcomes.

This a priori development of an IPD team selection proposition and supporting arguments was crucial to the usage of data analysis techniques. Without prior establishment of a proposition(s), it can be difficult for data collection and analysis to reach convergence (Yin, 2003). The difficulty proved true in this case study inquiry, where open-ended and unstructured techniques produced a substantial amount of qualitative data. Therefore key assumptions were made in the research questions and further specified by the IPD team selection proposition containing focal points for analysis.

To effectively utilize the IPD team selection proposition, a “refining the proposition” data analysis technique followed a process similar to Eisenhardt’s (1989) “shaping the hypothesis” tactic for building theory from case study research. In Eisenhardt’s (1989) inductive theory process, a priori constructs are recommended to initiate an iterative process in which the investigator systematically sharpens construct definitions by comparison with goodness of fit to case data. Eisenhardt’s (1989) process encourages theoretical flexibility and simplicity. The analysis techniques in the case study likewise embrace iterative revision of previous statements, adapted to suit a descriptive standpoint rather than exploratory. In a similar manner, Yin (2012) recommends methodologically incorporating the adoption of “theoretical perspectives” that will help isolate relevant data needed answer research questions based on key assumptions. In the incident that data collection does not support the investigator’s original perspective, the proposition(s) must be discarded (Yin, 2012).

Having defined a proposition for IPD team selection, the investigator benefitted from an initial plan for handling data. The team selection proposition was refined as necessary in order to converge evidence and reach closure.

3.7.3. Analysis Techniques: Qualitative Content Analysis

A directed approach to qualitative content analysis was used to focus on the research questions (Hseigh and Shannon, 2005). The directed approach was particularly helpful because the case study research strategies were developed with predetermined topics of interest in mind (see Table 3-1). For example, semi-structured interviews included probes to support targeted questions. Another benefit of the directed approach was that key assumptions made in the research questions could be embedded in the coding for content analysis.

As suggested by Hseigh and Shannon (2005), content was read and highlighted according to the predominate subject matter being conveyed. This technique was done for each open-ended research techniques (i.e. interviews, questionnaires) as well as document review. After highlighting content, predetermined coding helped categorize evidence. New categories were created as needed. The results of the directed content analysis could then be reviewed comparatively with the key assumptions within the IPD team selection proposition of the case study.

Qualitative analysis was used for questionnaires as well as semi-structured interviews. Due to the nature of semi-structured interviews, sometimes responses did not match the intent of the question. Misaligned responses were reorganized. This tactic is presented as a methodological procedure by Schmidt (2004) in her chapter on “The Analysis of Semi-structured Interviews”:

“To take account of the openness of the interviews, it is important not simply to take over the formulations from the questions that were asked, but to consider whether the interviewees actually take up these terms, what the terms mean to them, which aspects they supplement, which they omit and what new topics, which were not foreseen in the guide, actually turn up in the collected data.”

Also for semi-structured interviews, probes were developed to ensure the complete answers for each question. This assisted in sufficient data collection for content analysis.

3.7.4. Analysis Techniques: Real-life Rivals

Another analysis technique was to entertain the study's greatest real-life rivals: "Is IPD team selection different from traditional team selection?", "Is the project owner conducting the IPD selection in the correct way?", "Are the revisions to the selection process representative of nontraditional criteria?", "Will the unconventional process revisions pay-off in terms of project performance?" (Yin, 2012). In order to address real-life rivals, the findings are discussed based on the literature review.

Literature review was crucial to realizing indicators that may help cope with uncertainties and confront rivals that were not affirmative of case propositions. Two previous studies were particularly instrumental in using leading indicators within analysis techniques. First, Konchar and Sanvido (1998) demonstrated how data collection can effectively build upon preexisting empirical data (from previous influential studies) in order to predetermine causal relationships. This proven concept increases confidence that the enfolding literature incorporated in the IPD team selection case study can be highly useful for pre-identifying relationships between variables that may be critical success factors to performance outcomes.

Second, Esmaeili et al. (2013) identified performance predictors to team selection that are relevant to the IPD team selection case study. The list of predictors is summarized in Table 3-2. Although the list is generalized to all project delivery methods, these established predictors were an important basis for the usage of predetermined categories for empirical data in addition to directed content analysis using key assumptions. Also, by examining data for predictive signals in disagreement with the case study's explanations, alternative claims to findings were evaluated. This technique for understanding complex social actions increased certainty in results (Bickman, 2000).

Table 3-2: Predictors for team selection.

Category	Predictor
<i>Team Selection</i>	Proposal solicitation method (open call, prequalified bid, RFP, etc.) Selection method (low bid, negotiated, best-value) Selection criteria in negotiated or best-value (price, prior experience, interview performance, etc.)

Source: Esmaeili et al., 2013.

3.7.5. Research Validity

This study upheld standards for internal, external, construct and reliability validity based on how quality tests and supporting case study tactics are defined by Yin (2012). Yin (2012) considers these four tests to include useful criteria for judging the quality of empirical social research.

Internal validity: Data analysis techniques contributed to the internal validity of the study. The major advantage of an embedded, single-case study over a single-unit of analysis is the opportunity to triangulate evidence. The case study design accomplished Yin's (2012) "most desired convergence" by exceeding the minimum of three independent sources within the same set of IPD team selection events. Expert interviews on the same set of topics as the case study also contributed to explanatory findings and lessened the reliance on the field setting.

External validity: The research design for the case study included a theoretical proposition for IPD team selection and embedded key assumptions within research questions. Therefore the implementation of the study began with a preconceived set of logical statements based on previous contributions in the literature review.

Construct validity: Sources of evidences for construct validity included evidence from the multiple embedded units of the case study as well as expert interviews. A narrative description of the case study established a chain of evidence and a logical set of statements.

Reliability: The original IPD team selection proposition was refined over the course of the investigation. As recommended by Yin (2012), the case study protocol iteratively redesigned data collection when new discoveries were found to contradict original perspectives. An example of this feedback loop was the investigator needing to conduct directed content analysis multiple times on the same set of data in order to have confidence in the coding and system for classification. Preconceived ideas were abandoned if found to be unviable.

3.8. Summary: Research Methodology

This chapter described the research methodology for a case study on IPD team selection. As a defining aspect of case study inquiry, the boundaries between the first-time adoption of IPD and the context of IPD team assembly were not clearly evident (Yin, 2003). Several research techniques were used to embed multiple units of analysis within the case study. In addition, expert interviews also increased the validity of the study. Figure 3-3 displays how data collection was used to answer to research questions.

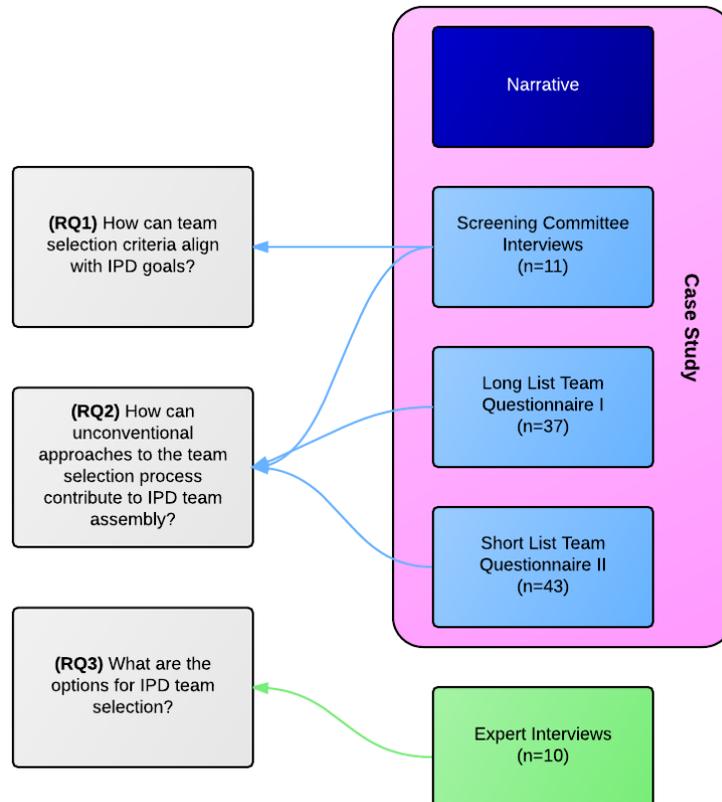


Figure 3-3: Relationship between research questions and research processes.

The analysis techniques relied on key assumptions contained in the research questions which help in the discernment of relative qualitative data. Throughout data collection, refining the proposition for IPD team selection played a significant role in establishing what qualitative research questions could reasonably be answered from the available data. Consequently, directed content analysis tended to align with preliminary assumptions about the relationships between IPD team selection and nontraditional procedures for assembling teams. Finally, real-life rivals challenged the investigator to confront original interpretations in the study.

The plan to produce recognizable value and research validity is outlined in this chapter. To uphold correct case study procedure, interpretative judgments of the data are reserved for the discussion and conclusion. Research validity is accomplished through triangulation and other case study tactics. The next chapter contains a descriptive narrative composed from source documents and observational data collection.

4. Case Study

This chapter further introduces case study details and composes a chain of events found in IPD selection data collection. Data collection sources were both direct observation and document review. The purpose of the data collection was to serve as a basis for understanding the rationale for IPD team selection. The context of the case study details the phenomenon of IPD team selection criteria as well as the IPD team selection process.

Chapter 4 begins with an introduction of the case study project. As mentioned in the methodology, data collection included four embedded techniques: direct observation, document review, questionnaires and interviews. Presented first are the findings on the types of project goals communicated by the owner. After this overview, the roles of the key stakeholders in the case study project are described. Descriptions intend to help the reader understand the types of social relationships present in the field observation. Introductory information regarding the case study also includes an overview of the team selection process for proposing teams. Following the introduction of the project and selection process, the latter half of chapter 4 addresses the relationship IPD team selection has with protocols for IPD team assembly.

Data collection was inclusive of predetermined topics relevant to team selection practices for IPD teams. Data collection is presented within a narrative-based account of the case study adoption of a new IPD team selection process. As previously stated, this portrayal relies on documentary evidence and field notes. Observational evidence is presented as neutral and factual as possible, based on a format suggested by Yin (2012). For documentary evidence, a directed content analysis technique was used to classify data based on the conceptual framework defined in the methodology.

The intent of this chapter is to acquaint the reader with the context of the case study. In addition, targeted data collection on IPD team selection is presented from multiple sources through a narrative based-format. This composition helps to accomplish construct validity by establishing a sequence of events and possible causal links. In chapter 6, key findings based on these discoveries will be interpreted further by incorporating additional units of analysis (i.e. interviews, questionnaires) embedded in the case study.

4.1. Project Goals

Project goals were used to confirm the chosen project delivery methods because the exact contract form for the project was not yet established. An overview of project goals was developed from documentary data, such as solicitation documents. A content analysis was directed at the communication of objectives that would lead to conditions of satisfaction for the project. This evidence reveals the main components of the project goals.

In addition to supporting the desired delivery outcome, project goals also play a large role in the fundamental reasoning within IPD team selection. To outline this potential contribution, the following presentation of case study project goals is arranged into two major categories: general project goals and IPD specific project goals. The classification of evidence that seems to fit these two categories of project goals is presented in Table 4-1.

Table 4-1: Overview of project goals.

Category	Description
General Project Goals	<p>Project Vision</p> <ul style="list-style-type: none"> • Support the end-user’s vision for the growth of research and educational programs <p>Renovation Goals</p> <ul style="list-style-type: none"> • Renovate building according to the new program of requirements based on the end-users space needs • Improve facilities through a sustainable and innovative design
IPD Project Goals	<p>IPD Approach</p> <ul style="list-style-type: none"> • A high-level of commitment to the ideals of IPD (i.e. collaboration, integration, early involvement, enhanced communication) • Use of integrated design processes <p>IPD Team Structure</p> <ul style="list-style-type: none"> • Engagement of all parties at all levels for the “entirety of the project.” <p>IPD Outcomes</p> <ul style="list-style-type: none"> • Effectively maximize efficiency and quality while attaining the lowest cost • Proactive elimination of constructability and rework issues • “Build great partnering relationships”

Delineation of project goals is useful to understanding the rationale behind actions and decisions within IPD team selection. In this research study, project goals are used as a reference point.

Moving forward, data collection will continue to track the communication of project goals based on original document source findings. The supposition is that throughout the course of the case study, the target goals in Table 4-1 may change, evolve or even suffer neglect. Due to the newness of the delivery, variance as a result of the experimental nature of the IPD is somewhat expected; and a shift in project goals is not necessarily “good” or “bad.” Therefore this exercise in establishing benchmark data help detect differences between what was originally conveyed and actual implementation. At the completion of the case study, it was found that the project owner maintained the originally developed project goals throughout the selection process.

Particularly outstanding in Table 4-1 is that IPD goals are seemingly more complex than general goals for the specific facility and departmental needs. It appeared that delivery method was a priority in the case study project. Later, more evidence will be presented to reveal motivators regarding the apparent emphasis on IPD. However, it should be noted that classifying project goals from document sources may not be an accurate guide. This is because ideas can be miscommunicated or incompletely explained within documents. In addition this data collection method does not capture the individual weighting of priorities among screening committee members. Lastly, uncaptured ideas may have been expressed through verbal communications. That being said, the project goals outlined in Table 4-1 help to refine the investigator’s perspective of the case study: Findings suggest that general goals are conventional and oriented around programmatic solutions such as project vision and renovation goals. On the other hand, IPD specific goals emphasize relational skills (e.g. collaboration, communication, engagement) within the context of project approach, team structure and project outcomes.

4.2. Case Study Participants

Case study participants refers to stakeholders eligible to participate as signatories in a multiparty IPD contract. The focus of this section is to provide an overview of all stakeholders involved in the case study, including future risk/reward contract group members.

4.2.1. Project Owner

The case study was performed with the cooperation of the project owner. Screening committee representatives for the project owner included project administration/operations, facilities

management, subject matter experts and end users. At the time of the case study, the project owner was actively managing 9 major construction projects. Over the previous decade, the project owner completed more than 30 construction projects of various type and scope. The project owner routinely used designer selection, construction manager selection and design-build solicitation methods for construction procurement. Due the scale of operations, the project owner held standardized processes. These practices are illustrated by tools such as an A/E selection process map. Although a change of process would require different tools, findings indicate that the project owner showed interest in adopting alternative project delivery methods.

Certain challenges were anticipated in the adoption of IPD while operating within organizational requirements. At the time, the project owner had limited overall experience in relational contracting. Restrictions due to funding source and organizational protocol are obstacles seen to justify the project owner's standardized procedures. Despite all of this, the case study was approved to utilize all characteristics of an IPD approach (e.g. early involvement, multiparty agreement), thereby deviating from some established courses. Rationale for this appeared to be because the project owner was pleased with previous uses of IPD-lite principles, such as collaboration addendums. Simply put, the key driver was to attain the best possible project performance. From direct observation, it was discerned that IPD seemed to be a logical transition in order to reap the full benefit of utilizing integrated, collaborative teams in project delivery.

4.2.2. Screening Committee

The screening committee held meetings on a regular basis for review and gateway evaluations. Internal stakeholder interests were represented by project administration, facilities management, end users and subject matter experts (i.e. academia, external consultant). The majority of the screening committee had experience with traditional team procurement procedures, however for others (e.g. end users) this process was regarded as a "once-in-a-lifetime" opportunity. The primary role of the screening committee was to develop a recommendation to the project owner's trustees.

An intense level of involvement was required of screening committee members. Members were made keenly aware of the characteristics of IPD, through internal meetings and consultation. For

example, the end user would be incorporated in core/cluster groups for the entirety of the project; an unusual amount of engagement in comparison to typical projects at the university. Many members had additional project-specific responsibilities, such as team correspondence (e.g. letters, emails, site visits) and project development (e.g. program of requirements, budgetary oversight). It follows that over the course of the IPD team selection process, prospective IPD teams interacted with multiple members of the screening committee. These interactions with screening committee members were seen to influence how prospective IPD teams interpreted IPD project goals. The certainty of IPD goals seemed to be enforced by the screening committee's one-on-one communications with teams. In addition to conventional, internal evaluation procedures, frequent personal interactions between screening committee members and prospective IPD teams played a significant role in the IPD team selection process.

4.2.3. Consultation

A consultation firm was hired by the project owner for the purpose of assisting with the IPD project approach. The consultant was hired to help reduce the steep learning curve anticipated to coincide with the adoption of IPD methods. The consultation firm possessed direct IPD experience, which contributed to the project owner's comfort level in making informed decisions. The consultant was present for major gateways in the IPD team selection and often facilitated discussion. The consultant also provided educational introductions to the IPD concepts which may have been new to the screening committee members.

4.2.4. Prospective Teams

Self-Selected Teaming Arrangement

The case study solicitation method requested the structure of IPD teams be self-selected and include: architect, construction manager, engineer(s), commissioning agent, mechanical/plumbing contractor and electrical contractor. Although prospective teams were strongly encouraged to propose a team with all suggested entities, some teams indicated a desire to withhold the partnering with certain roles (e.g. mechanical contractor) until after contract awarded thus allowing the owner participation in the remaining selection.

At the conclusion of the case study, it was undecided the extent of entities to be brought on as signatory parties on the multiparty agreement. The contract type was not pre-determined

therefore leaving room for flexibility. Although deferred, this would be a very important decision because the signatory parties impact the selection of contract type and participation in risk/reward group. The project owner intended to collaborate with the selected team in order to create a plan for signatories to ensure success of all parties involved.

4.3. Team Selection Process

The team selection process is a major focus of the IPD team selection case study. General details of the case study team selection process follow. Consistent with other IPD projects, the case study selection process began at 0% design. The team selection used a multi-step, primarily qualifications-based, process. Major areas of focus related to the team selection process include the solicitation method, selection method and distinctive attributes of the case study.

4.3.1. Procurement Steps

The solicitation method began with posting an open RFQ. Eighteen RFQ submissions were received. The screening committee then convened for the first down-selection, from which a long list of ten teams advanced. Long listed teams had two tasks: visit the site (optional) and submit RFP submissions. At the second down-selection, the screening committee short listed three teams by consensus. A short time after, the short listed teams participated in an integrated/collaboration workshops with the screening committee. Each team was assigned a 2-hour time window. The screening committee then met to review each team's workshop performance; no voting occurred. Lastly the three short listed teams attended an interview appointment. The audience at the final presentation included the screening committee as well as members of the project owner's trustee board. In the third and final round of down-selection, screening committee votes recommended the first place and second places teams. The trustees then proceeded to appointment the winning team. Table 4-2 provides an overview of the solicitation method and down-selection process.

Table 4-2: Overview of solicitation method and down-selection process.

Month	Description	Teams Considered
1	Request for Qualifications	18
	Site Visits	10
3	Request for Proposals	10
4	IPD Workshops	3
5	Design Concept Proposals	3
6	Final Interviews	3

4.3.2. Standard Process

Prior to the case study, the project owner did not have a standardized process for IPD team selection. However, for other delivery methods, such as construction manager at risk with guaranteed maximum price and design-build selection, the owner had previous experience with best-value solicitation methods and procurement. This was apparent, as the project owner openly published procedural information and process maps for major construction projects exceeding 5 million dollars. For example, all design selection for major projects was to include at least a letter of interest, RFP and interviews. The down-select process for design selections transitioned from long-list to short-list before selecting an appointment. Therefore certain elements (e.g. RFQ, RFP, interviews) of the IPD team selection were common practice. Below the nonstandard occurrences in the IPD selection are summarized as unconventional events.

Special Event: Site Visits

When the RFP was issued, long listed prospective teams were encouraged to schedule a site visit based on the program of requirements and renovation goals. The purpose was so that before qualifications submission, candidate firms could meet with representatives of the user group. Select screening committee members assisted in coordinating the site visits and escorting prospective teams through the building. The project owner encouraged long listed teams to learn about all project goals and drivers.

Special Events: IPD Workshops

IPD workshops were a unique event in the team selection process for short list teams. Screening committee members participated and interacted with candidate teams. As expressed by the workshop purpose statement, the IPD workshop was for teams to learn about project goals and program requirements. The number of participants per workshop varied by team, but was

essentially limited only by the size of the room in which the workshop took place. The total number of attendees per team ranged from 11 to 18. Short list team attendance was a multidisciplinary representation of the proposed IPD teams. A graph that categorizes the participating disciplines can be found in chapter 5. The workshops were held in a classroom in the project's existing building; thus another opportunity to interpret end-user needs.

Each team had autonomy in workshop approach and determining the agenda. In addition, use of tools and media was unrestricted. The only constraint was that teams should not use workshops to gain feedback on potential conceptual solutions. Instead teams were to collect information that would assist in the development and refinement of “work plan”, “potential solutions” and “approach.” Each team had only 2 hours to interact with the screening committee and gain project-specific information within their respective IPD workshop experiences.

An additional condition of the IPD workshops was that team evaluation would consider the format of the IPD workshop and the quality of personal interactions with the screening committee. In the instructions for short listed teams, it was communicated that leadership potential, team chemistry and collaboration would be the areas of evaluation for IPD workshops.

It was observed that teams indeed used the workshops in different manners. Without compromising the identity of each team, the commonalities and differences in IPD workshop styles will be discussed. The first point is use of time; how teams maximized the 2-hour IPD workshop. One team had a facilitator with the sole purpose of directing the workshop. In the absence of a facilitator, the two other teams leveraged project executives or design principals to lead their sessions. Within the agenda, break-out sessions were common. Terminology for break-out sessions may vary, for example “deep drive” or “work groups.” Although there was consistent format for dividing into smaller groups, the investigator noted tonal differences. For example, the sorting of breakout groups differed—indicating that teams had different categorization techniques for perceived areas of importance. Where one group might have four parallel discussions for a longer period, a second group chose two breakout groups for shorter periods and rotated topics with some movement between the groups. Also the use of Lean planning tools was a greater driver for some teams' approach to break-out sessions.

The second workshop differentiator was how teams collected information. Seeing that the project owner explicitly stated that the purpose of the workshop was to gather information, it followed that all teams brought inquiries. However a variety of strategies for asking questions emerged. Question and information gathering strategies included use of media, which is explained further at the conclusion of this section. Because not every question was recorded, generalized probing techniques for capturing responses are summarized as follows:

- Present preconceived ideas and use criticism to solicit information
- Ask the project owner to vote on priorities
- Ask high-level questions to learn the project's "story"
- Ask the project owner targeted questions to clarify information in solicitation documents
- Ask the project owner "yes" or "no" questions regarding certain options
- Tailor a unique set of questions to engage the end user
- Exploratory discussion that produces answers without necessarily being inquisitive

Inquiry strategies identified in field notes and observation are intentionally left unassigned to any particular team. Because there were over 40 prospective team members interacting with the screening committee throughout the course of the workshops, it is possible that team members used any combination of the above mentioned strategies. However the collective behavior and predominate strategy used by each team, respectively, appeared to be a differentiator.

A final topic to distinguish teams is use of media, particularly visual tools. To a varying degree, each team used a PowerPoint presentation. Some teams prepared handouts and displayed posters. As for writing instruments, large easel flip charts and sticky notes were common. Teams also brought architectural models to illustrate the site and potential concepts. All teams made an effort to use multiple communication strategies during the IPD workshops.

4.3.3. Submission Requirements

Submission requirements could potentially be a lengthy subsection within the team selection process. To summarize, submission requirements addressed team qualifications, team structure, delivery approach and design solutions related to key drivers and detailed program requirements. Rather than itemize the deliverables and format requirements for each submission, the components that did not fit the investigator's original assumptions on the characteristics of IPD selection are presented. Two elements of the submission requirements stood out as arguably different from some of the IPD ideologies mentioned in the literature review. The observations from the data collection related to these elements are presented next.

First, there was a request for cost information. Short list teams were required to submit an estimate for the design(s) in their third and final submissions (i.e. conceptualization phase solution). Two uses of this data were to:

1. Validate the project owner's construction budget and verify that the program requirements were accomplishable within the cost constraint.
2. Compare estimates for any outstanding differences between the teams; points of comparison included net/gross square footage, building systems, contingency, labor rates and extent of program realized.

From a qualifications standpoint, team behavior toward the target cost design process weighed greatly. From a traditional standpoint, it was perceived as unfavorable if a team unable to make the budget "work." Through the request of cost information, a best-value selection method was indicated to teams. This observation is *not* shared to disapprove the practice of requesting early estimates. However this does illustrate how request for cost information potentially influenced IPD team selection in the case study.

Secondly, teams produced project-specific design concept proposals, for which the project owner provided a stipend. Beneficially, the stipend incentive resulted in a wealth of visual aids and potential design solutions for the project owner. Also the submissions demonstrated project approach and approach to integrated design processes. To some, a trade-off emerged when the

favorite team based on qualifications differed from the favorite team based on proposed design(s). As with cost information, design concept submissions influenced IPD team selection.

In the end, the project owner advised that the IPD selection approach should avoid low bid and/or design competition mindsets. The screening committee was urged to cast final votes based qualifications. This was in line with the original intent of the solicitation method, which was to select a qualified team with a strong potential for collaboration and partnering relationships.

4.3.4. Comparing Team Selection Processes

The procurement methods the project owner used for design-build projects shared the most commonalities with the IPD team selection process. For this reason, in Table 4-3, a brief history of previous, similar projects is summarized. In the comparison of the IPD project data with recent design-build project data, a few more distinctions for the IPD selection process can be drawn. Shared qualities between the processes included a self-selected teaming arrangement. Unlike IPD, the procurement system for the design-build projects was guaranteed maximum price (GMP). The design-build projects mainly used interviews to interact with teams. Even so, the interviews were shorter than the IPD interview allotments and the interviewee attendance was limited. Conceptual design requirements varied. When requested, the project owner assumed rights to all concept designs submitted in proposals. In this comparative check against previously used design-build solicitation documents by the project owner, it was verified that certain aspects of the IPD solicitation method were indeed unique.

Table 4-3: Comparison of recent sole-source team selection processes.

Team Assembly	Delivery Method	Approx. Budget (Millions)	Short List Stipend	Workshop	Conceptual Design Requirements	Interview Length (minutes)	Max Interview Attendees
Case Study							
Sole Source Integrated Teams	IPD	\$40M+	Yes	Yes	Design Concept Proposal and Cost Estimate	120	NA
Historical Projects							
Sole Source Design-Build Teams/Firms	DB w/ GMP	\$65M+	No	No	Use of Bridging Documents and Cost Estimate	90	8
Sole Source Design-Build Teams	DB w/ GMP	\$100M+	Yes	No	Design Concept Proposal and Cost Estimate	120	12

4.4. Team Selection Criteria

A premise of the overall data collection was that team selection criteria is somehow a reflection of the project owner's priorities and values for IPD team selection. This topic was reserved for the conclusion of the case study narrative, as factors of it culminate upon the previous sections on project goals, risk/reward group members and team selection process. Data was collected from the standpoint that important aspects, such as project requirements and stakeholder preferences, are funneled into a set of ideals that are manifested by team selection criteria. Ultimately team selection criteria is the opportunity to isolate metrics that are important to the desired outcome.

In the case study, each step in the team selection process was associated with some type of phase selection criteria. This was determined by evidence in available documents (e.g. solicitation method documents, internal documents). Table 4-4 summarizes how forefront team selection criteria shifted throughout the entirety of the project. The horizontal bands represent major categories used to classify the document review. The screening committee had access to these written priorities via publically posted communication to teams, internal screening committee communication and score sheets. Table 4-4 outlines the document review for team selection criteria within the case study team selection process.

Although Table 4-4 is illuminating of the development and communication of team selection criteria, the weakness is that documentary evidence can be misleading for a number of reasons. Therefore field observations are reported in a step-by-step effort to present team selection criteria from an alternate data source. In chapter 5, team selection criteria for IPD team selection will be revisited again from another data source (i.e. screening committee interviews). In the end, this evidence will be triangulated and interpreted from the investigator's unique perspective.

Table 4-4: Step-by-step team selection criteria,

Qualifications	Proposals	IPD Workshops (Conceptualization Phase)	Design Concept Proposals
<p><u>Qualifications</u> Unique qualifications of team (i.e. relevant project experience, previous architectural designs)</p>	<p><u>Qualifications</u> Team qualifications (i.e. firm and team member areas of expertise, relevant project experience, previous architectural design)</p>	<p><u>Qualifications</u> N/A</p>	<p><u>Qualifications</u> N/A</p>
<p><u>Team Structure</u> IPD team structure (i.e. team summary)</p>	<p><u>Team Structure</u> IPD team structure (i.e. organizational chart, resumes, references, team member matrix) Key team members</p>	<p><u>Team Structure</u> Team leadership potential</p>	<p><u>Team Structure</u> Staffing chart</p>
<p><u>Project Approach</u> Identification of project-specific key issues important for design and construction</p>	<p><u>Project Approach</u> MBE/WBE participation Sustainability Identification of project-specific key drivers and constructability issues Potential design concepts</p>	<p><u>Project Approach</u> Project understanding/innovation</p>	<p><u>Project Approach</u> Functional responsiveness to program Responsiveness to site context Efficiency (i.e. operational and energy) Sustainability Aesthetics Budgetary considerations</p>
<p><u>IPD Approach</u> Integrated and collaborative approach Specific processes Exceptions to integrated team characteristics</p>	<p><u>IPD Approach</u> Team IPD approach Approach to integrated team characteristics Integrated design processes Innovative approach to IPD</p>	<p><u>IPD Approach</u> IPD team agenda and workshop outline Collaborative nature of each team Overall team chemistry IPD team enthusiasm/rally behind goals Team cohesiveness</p>	<p><u>IPD Approach</u> Narrative of IPD approach</p>

4.4.1. Step One: Request for Qualifications (RFQ)

The first application of team selection criteria was to down-select RFQ submissions. The field observation captured the screening committee RFQ review meeting. Prior to the meeting, screening committee members independently reviewed all 18 submissions of qualifications. To initiate the review and discussion, the meeting began with a collective tally of individual's preassigned ratings for top teams based on qualifications. From there, a conversation naturally progressed, beginning with the comparison of borderline teams.

In order to reach a consensus for long listed teams, the screening committee engaged in an open discussion directed at criteria. Highlighted next are critiques. For the major categories, qualifications and team summary, there was some interplay between commentary which emphasized teaming arrangement and firm reputation. For example, some teams were perceived to have partnered a firm or firms significantly weaker than the credentials and reputation of the remainder of the team. Organizational reputation was discussed from multiple perspectives: national recognition, reputation among local subcontractors, reputation earned through previous work for the project owner, reputation of individual team members, etc.

In addition to reputation, credentials and each teams' portfolio of similar projects was evaluated. Again referring back to partnerships, this method of evaluation revealed content that was design-heavy as well as engineering-heavy. The screening committee felt a need to know the previous relationships between teams in order to understand how teams combined their areas of expertise in the past. In other words, the screening committee was looking for teams to articulate the relationship that led to the multidisciplinary partnership.

The observation for IPD and project approach in relation to team selection criteria was that the screening committee relied on what could be reasonably ascertained from submission documents. Therefore important aspects in proposals included use of language and attention to detail. These aspects potentially demonstrated understanding of the project, as well as possession of the desired IPD mindset. To gauge the seriousness of team interest, the screening committee read for a level of personalization, above "boiler-plate" responses. Also, flaws in the document, such as grammatical errors and incorrect terminology, were red-flags. On the other

hand, choice of graphics, quality of images and nomenclature/format adherence worked to the benefit of some teams.

This completes the summarization of criteria used to assess the qualifications submissions from 18 multidisciplinary teams. The baseline required teams to *successfully* convey expertise, unique qualifications and demonstrate a genuine passion for working in IPD and IPD-like environments. A more stringent review would occur in the next round of proposal submissions.

4.4.2. Step Two: Request for Proposals (RFP)

During step-two, the screening committee reviewed proposal submissions from the ten long list teams. The purpose of the proposal review was to down-select the ten long listed teams into a short list of three teams. Submissions were based on a lightly detailed program of requirements issued by the project owner. Also, long listed teams collected information for proposals during site visits. Proposal content needed to address the project overview and program of requirements.

Proposals were read for their ability to understand the target community and involve the end user in the team. IPD experience was noted along with previous experience working directly with the project owner. Potential for IPD was evaluated partially by team credentials and organizational chart. Credentials were also judged by regional presence and reputation with local contractors.

4.4.3. Step Three: IPD Workshops and Design Proposal Submissions

IPD workshops initiated the conceptualization phase of the team selection process. Teams were instructed to use IPD workshops to become more intimate with project goals and program requirements. It was requested that teams refrain from seeking screening committee opinions on possible conceptual designs. Information gathered in IPD workshops would then be used for the development of design concept proposals and initial estimates.

On the day of IPD workshops, the three short listed teams were each given two hours to implement a meeting agenda and interact with the screening committee. Design concept proposals were due about a month later. Data collection was done during IPD workshops and

the corresponding screening committee evaluation meeting after workshops. The key aspects of the selection process conceptualization phase are summarized as follows:

Personal interactions and communication/leadership skills: IPD workshops facilitated personal interactions between screening committee members and IPD candidate team members. Team engagement, such as how the group leader incorporated all thoughts, was important to the screening committee. Also, how teams talked about their past experience with IPD left a strong impression with screening committee members.

Agenda and communication skills: Respective workshop agendas were telling of communication styles and skills. Prospective teams communicated ideas by using PowerPoints, posters, handouts and breakout group activities. A common approach was for teams to begin the dialogue on IPD by asking meaningful questions and generating ideas in multidisciplinary breakout sessions.

Team personalities and collaborative ability: IPD workshops were an opportunity to demonstrate team culture. The perceived personalities among team members contributed to how the screening committee interpreted team attitude, teamwork and ability to collaborate. The potential for trust among risk/reward group members was evaluated based on how teams approached project challenges. Some of the major challenges teams attempted answer in IPD workshops were program demands, energy efficiency and site logistics. The screening committee preferred that teams explored options collaboratively rather than teams that presented choices for technical feedback.

Design process and learning: IPD workshop effectiveness was perceived based on the team ability to gain information. The screening committee evaluated the extent to which information gathered in workshops was incorporated in design concept proposals. Attention to detail and project vision indicated understanding of program needs. Also it was desirable to see innovation in design concepts, for both architectural elements and mechanical systems. The screening committee was looking for an approach where program drives design, rather than premature value-engineering. Lastly, the screening committee was concerned with the budget being sensible and well explained. The ideal design process was believed to address key issues from a

functional point of view. On the day of team interviews, the short list teams formally presented the ideas defined in their design concept proposals. Based on knowledge of IPD, screening committee members were encouraged to select teams solely based on advantages in selection criteria.

4.4.4. Step Four: Team Interviews

Interview presentations were used to explain the approach to concept designs, particularly highlighting space analysis and budget constraints. Prospective teams explained how the project vision was captured in designs; for example, natural light for energy savings. Also mentioned were broad perspectives such as design for future adaptability, campus wide systems and precinct needs. Through these conversations, the screening committee was able to better understand allocation of resources and price certainty.

Teams also discussed plans to implement IPD using team structure, transparency and colocation. For example, plans for team structure included proposed selection methods for partnering with subcontractors. Approaches to the IPD project also included use of technology, lean methodologies and strategies for risk mitigation. Teams explained how they worked together using multiple tools in their approach to the project.

4.5. Conclusion: Case Study

This chapter introduced the case study content and participants. This narrative was composed in order to address how the context of IPD team selection fits into the study of IPD team assembly. Evidence was synthesized from documentary sources and field observation.

Research assumptions, prior to data collection, suggested numerous topics that might be present in a nontraditional approach to the IPD team selection. This chapter applied predetermined topics as well as additional emergent topics in order to describe the case study solicitation method and IPD team selection process. Also delineated was the selection method and team selection criteria used for the case study IPD team selection. Again, the overall purpose of collecting this data was to establish a basis for determining how IPD team selection differs from

traditional approaches to team assembly. Findings that illustrate these ties are presented in chapter 6, along with outcomes from the triangulation and interpretation of case study evidence.

5. Findings and Analysis

The purpose of this thesis is to understand how IPD team selection influences an integrated and unconventional approach to team selection criteria and the team selection process. The previous chapter composed the case study content based on observational data collection and document review. This chapter continues this trajectory by presenting interview and questionnaire data from the embedded case study. Based on the content established earlier, findings and analysis emphasizes the perspectives of participants in the case study. Three embedded units of data analysis are analyzed: screening committee interviews, team questionnaire I and team questionnaire II. In addition, research findings from expert interviews are also reported toward the end of this chapter. Findings and analysis are organized by data source, starting with the perceptions of screening committee members and then prospective IPD teams. Lastly expert opinions help in the interpretation of evidence.

5.1. Findings and Analysis: Screening Committee Interviews

As noted in the case study chapter, data collection for screening committee interviews was embedded in the case study field research. Screening committee interviews occurred during the period between IPD workshops and the deadline for design concept proposals. Questions and probing techniques were planned to capture the uncertainty in the moment. A total of 11 screening committee members were interviewed (e.g. end user (2), academia (2), project administration (5) and facilities management (2)). Interviews covered six major topics: qualifications, performance indicators, team leadership, teaming arrangement and IPD approach.

Findings were determined from a content analysis of voice transcripts and field notes. This analysis used two approaches: a holistic analysis and a question-by-question analysis. The findings suggest themes on the ideal qualities for an IPD team, particularly highlighting components of IPD team selection criteria thought to be critical for effectively selecting said team. Evidence also reveals the potential value of unconventional team selection, from the perspective of the screening committee. Findings add to the understanding of motivators for unconventional procurement activities that were adopted in the case study.

5.1.1. Ideal IPD Team Selection

Screening committee interviews identified subject matter that describes the ideal IPD team. Therefore the results on ideas and themes for desirable IPD team selection are based on individual perceptions from case study screening committee members. To identify meaning, content analysis was applied to the compilation of data from all eleven screening committee interviews. This analysis technique identifies *thematic statements* for an ideal team based on focal points in the previously defined conceptual framework. For the case study project, it was found that the ideal team selection should result in a team that adheres to the following statements in Table 5-1.

Table 5-1: Thematic statements for an ideal team.

Category	Attributes of an Ideal Team
Credentials	<ul style="list-style-type: none"> - The team proves an unquestionable level of technical expertise. - The team possesses relevant experience and a reputable portfolio. - The team is both creative and innovative.
Commitment	<ul style="list-style-type: none"> - The team exercises due-diligence in order to win the project. - The team displays a long-term interest in the project owner and intends to support the University's vision and programs (e.g. MBE/WBE participation, safety).
Team Chemistry	<ul style="list-style-type: none"> - Interactions between the project owner and winning team are effective, meaningful and unforced. - The team is an integrated team.

These statements are compressible into a shorter list of key words/phrases: Due-diligence, IPD-mindset, chemistry, vested interest, innovation, expertise and experience. These thematic expressions represent the breadth of concepts which define a desirable team for an IPD project. Figure 5-1 displays one example of grouping commentary which then translated into each concise thematic statement. This analysis brought forth themes woven throughout the interviews. In the next section the same data is further analyzed using a question-by-question approach. Moving forward it is apparent that the expressions contained in thematic statements are the underlying foundation of IPD team selection criteria.

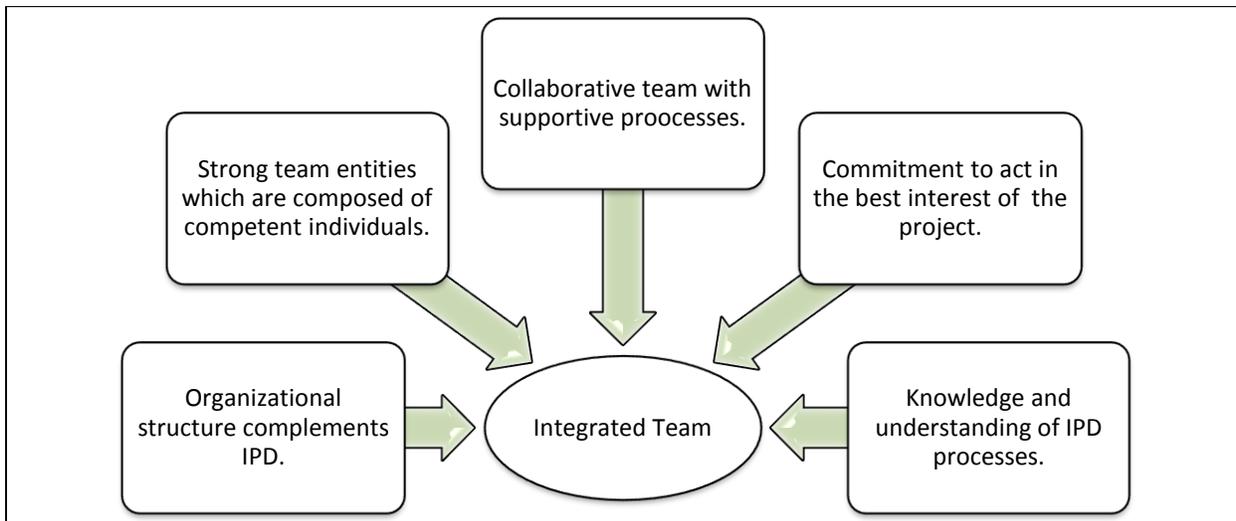


Figure 5-1: Example of the development of the thematic statement “the team is an integrated team.”

5.1.2. IPD Team Selection Criteria

Now that overarching themes for selecting an ideal team are established, these next findings define IPD team selection criteria and describe performance measures perceived to distinguish teams. Still relying on the viewpoint of the screening committee, two questions supported the data collection for IPD team selection criteria and indicators:

1. In your opinion, what unique team qualifications differentiate the short list teams from the teams that were not selected?
2. What are the indicators that a team will perform well in an IPD agreement with the project owner?

With respect to question one, remarks about qualifications are categorized as IPD team selection criteria. Interviewees then directly identified their perceptions of corresponding indicators. The analysis of qualifications, indicators and expectations produced two main categories:

1. Criteria: Constructs, credentials and/or qualifications to which there is a minimum standard
2. Indicators: Performance predictors and signals that a team or team member attained at least some level of the desired criteria

The results for IPD team selection criteria and indicators are in Table 5-2.

Table 5-2: IPD team selection criteria according to screening committee interviews.

Cluster	Criteria	Description
Experience	Direct IPD Experience	Completion of IPD projects and/or previous usage of IPD methodologies among firms and team members. Indicators: Previous work by firms and personnel
	Project Experience	Aggregate of previous demonstration(s) in competence, whether for technical qualifications (e.g. expertise in building type) or subjectively interpreted skill sets (e.g. design portfolio). Indicators: Previous work; portfolio
	Shared Experience	Previous joint project experience among firms or team members. Indicators: Partnerships; shared projects
	Expertise	Design acumen and construction credentials relating to facility type. Indicators: Portfolio; previous work; technical credentials
	Reputation	Image projected based on previous accomplishments or failures of the firm and/or individual team members. Indicators: References; past experience with project owner
Due-Diligence	Effort	Team conduct perceived through team presentation milestones (e.g. site visit, workshop, interviews) as well as the quality of proposal submissions (e.g. depth, grammatical correctness). Indicators: Responsiveness; site visit attendance and demeanor; workshop interaction and chemistry; interview performance
	Multidisciplinary Representation	Participation of disciplines that positively contribute to the completeness and diversity of the team. Indicators: Team structure and depth; team leadership; partnership
Collaborative Performance	Buy-In	Knowledgeable about the characteristics of IPD and demonstration of an IPD mindset. Indicators: Team attitude; transparency; team accountability
	Team Chemistry	Unforced teamwork during collaborative tasks and interactions. Indicators: Teamwork; team building; productivity; energy; collaboration
	Engagement	Displays of serious interest and understanding of the project drivers. Also, active learning and incorporation of project information and ideas. Indicators: Communication style; communication skills; personal interactions
Other	Unique Qualifications	Innovative ideas and forward-thinking approaches to process. Indicators: New processes/ tools/ design ideas
	Unclassified	Safety, MBE/WBE participation, Indicators: Undefined

5.1.3. Other Priorities for IPD Team Selection

As noted in the literature, there are two broad approaches to assembling an IPD team: (1) choosing a self-selected team from a pool of teams or (2) handpicking each project team entity separately. The case study RFQ defined whom the owner expected to participate in the proposal (i.e. architect, construction manager, engineer(s), commissioning agent, and potentially the mechanical/plumbing contractor and electrical contractor). Therefore the data collection on other priorities for team selection emphasized team structure and team engagement.

To better understand how teaming arrangement influenced perceptions, the topic self-selection was raised in screening committee interviews. Interview questions were also related to the interpretation of unique contractual requirements that seemingly related to the IPD project goals for team structure. Findings reveal benefits and challenges expected from using a self-selection strategy for team assembly.

Content analysis of data is now structured in a question-by-question approach. Analyzed data includes field notes and interview recordings/transcripts. Classified below are findings on teaming arrangement and organizational management. Categories are groupings of similar thought patterns. Category titles are assigned based on the topic of the material.

This following subsections present findings for teaming arrangement and management levels:

Teaming Arrangement

Findings on teaming arrangement are useful to gauging perceptions on self-selecting teams. Included are the benefits and challenges of simultaneously selecting a design team and construction team. A single question collected thoughts on the effectiveness of a self-selected teaming arrangement:

1. If you were to repeat this process, would you allow teams to self-select their strategic industry partners (e.g. architect, CM, subcontractors, consultants) in the same manner?

The overwhelming majority of interviewees believed that it was in the project owner's best interest to use a self-selecting team arrangement. Primary benefits of self-selected teams

included creation of a shared vision and higher commitment through team volition. Existing relationships in self-selected teams were believed to increase the strength of inter-organizational collaboration, team chemistry and synergistic qualities. In addition, this teaming arrangement fit into the case study project owner's standard process for contractor and design team selection. However as screening committee members explained the benefits to their rationale, potential drawbacks were also identified. The overall opinion was that the risk-benefit ratio ultimately favored a self-selected team. The key points, reported directly from the screening committee interview data, are further expanded in the following categorical passages:

Strategic partnerships: A self-selected teaming arrangement was thought to facilitate a multidisciplinary team based on strategic partnerships. The selection committee noted that firms likely formed strategic alliances which capitalized on past relationships and business agreements. Therefore a self-selected team possesses an established shared vision. Chosen by their own volition, these teams were believed to be more committed. It follows that the reputation of the self-selected team was subject to criticism based on all relevant, previous joint endeavors. The screening committee expected self-selected teams to present a good case, describing the proposed team's business model and decision to partner.

Team relationships: A self-selected team assembly was perceived as the best fit for collaboration. According to screening committee interview data, teams comfort is greatest in this arrangement. Also a "coherent team" was described as more inclined to work together. A self-selected team was noted to mitigate the risk of a "forced-marriage" team. This was thought because self-selected teams are enabled to use their own judgment to onboard team members and facilitate relationships.

Synergy: According to the screening committee, the synergy of a complete team is greater than sum of multiple selections. Self-selected teams were suggested to offer a "real sense of a winning team."

Team qualifications: Self-selected teams were thought to attract better firms in terms of qualifications. Self-selected teams were seen as more productive and more likely for success.

The categories above summarize why the screening committee preferred self-selected teams.

Perceived disadvantages are as follows:

- Forfeiture of early involvement in building team relationships.
- Disadvantage when a single team entity is perceived as weak while the remainder of the team is preferred.
- Lack of project owner input to leverage the owner's past project experiences into insights for compiling the strength of firms.

Management Levels

Personnel and management approach are important to IPD team selection because of characteristics pertaining to joint decision-making and distributed leadership models. The findings below address expectations for all management levels. Results display thoughts on organizational hierarchies. Management styles addressed include authoritative leadership and commensurate forms of authority, as prefaced by the literature review. Screening committee interview data collection used the following question:

1. How important is it to differentiate the day-to-day people who you expect to manage the project from the rest of the team?

The screening committee expressed a uniform desire to evaluate all levels of team members. Team member roles were considered for the following matters of importance:

Team environment: Team interactions were perceived as an important factor in IPD team selection. Differentiation of team members was thought to be important for understanding communication channels within team functions.

Depth of team: Day-to-day team members were seen as closest to the project. Day-to-day team members were expected to solve everyday problems without assistance from executives. According to the screening committee, there is value in hearing project information from non-executive team members; perception of the team would be improved when day-to-day team members participated in selection interviews.

Team leadership potential: Executive leaders were thought to represent the company vision. Executives were seen as the face of the project. Executives were expected to have presentation and marketing skills. The screening committee believed that a good executive structure was crucial. It follows that executives needed to be trustworthy, responsive and capable of solving serious issues.

Team empowerment: According to the screening committee, empowering all team members to participate in an interview is a signal of executives being confident in their team. Dominant executives were thought to suggest a lack of confidence in their team.

5.2. Findings and Analysis: Team Questionnaire I

Team questionnaire I was administered as an internet survey. Data collection used a 5-point Likert scale in order to measure the direction and intensity of attitudes. A total of 37 responses were collected from the pool of long listed teams. First presented are structured responses. Agreement rating values are “4” and “5.” A neutral rating is represented by “3.” Disagreement rating values are “1” and “2.” It should be noted that although quantitative, the data collection technique in team questionnaire I was not designed for statistical analysis.

In addition to structured ratings, many respondents opted to leave comments for each question. Also at the end of the survey, space was provided for general, open-ended commentary on the overall selection process. Unstructured responses are useful to understanding differences in opinions among the sample. The analysis describes how optional comments supported each structured question. Generally the commentary is categorized based ratings (i.e. agreement or disagreement). A neutral rating is sorted based on what is tonally projected. The questionnaire illuminates various benefits and challenges of IPD team selection.

5.2.1. Team Questionnaire I Sample

The professional disciplines of survey respondents is displayed in Figure 5-2. The IPD project experience of the sample is displayed in Figure 5-3.

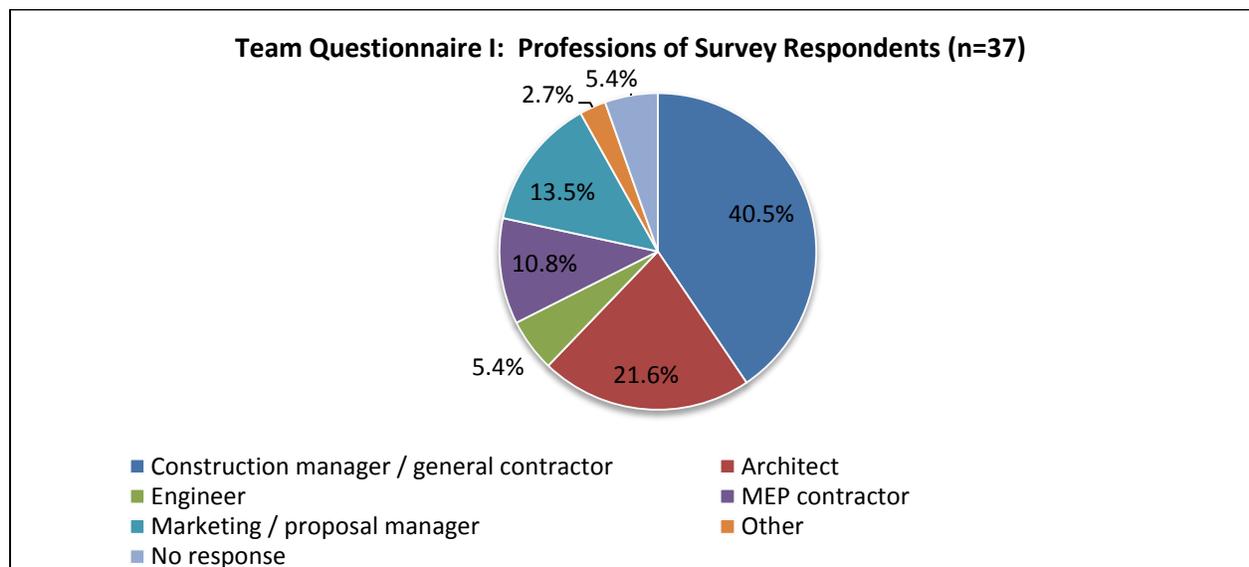


Figure 5-2: Professions of team questionnaire I survey respondents.

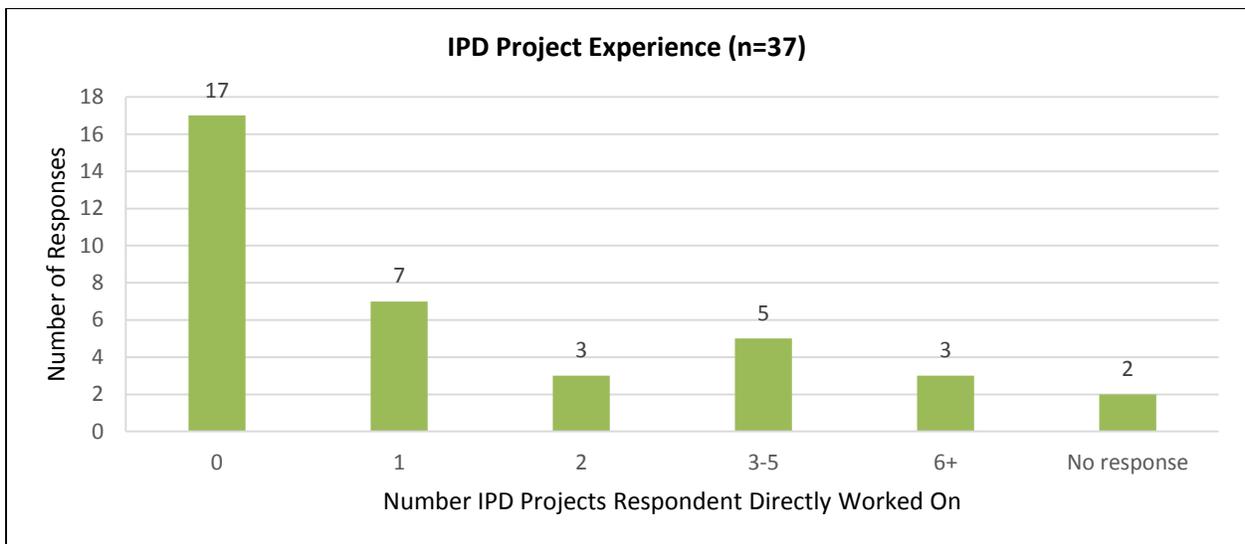


Figure 5-3: IPD project experience among questionnaire respondents.

5.2.2. Team Questionnaire I Results

This section presents data from structured responses; these results for team questionnaire I are on three topics:

- **Formation of integrated teams:** Whether or not the team selection process favored the best interest of prospective teams and the project owner.
- **Teaming arrangement:** Whether or not a self-selected teaming arrangement is the best approach to assembling a multidisciplinary integrated team.
- **Length of team selection process:** Whether or not the duration of the team selection process spanned a reasonable length of time.

The questionnaire results are presented in Figure 5-4.

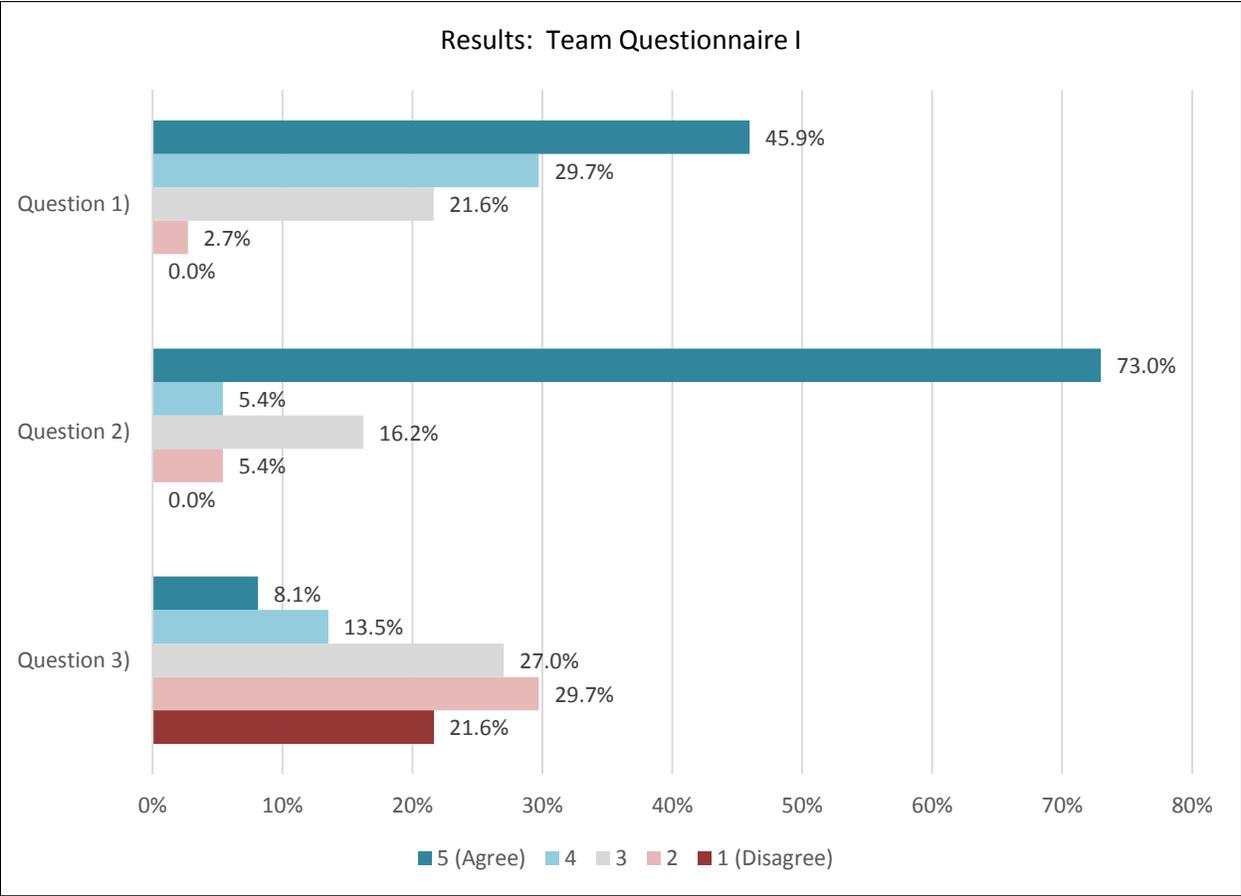


Figure 5-4: Results from team questionnaire I.

The key for each question in Figure 5-4 is follows:

Question 1) The IPD team selection process currently being used by the project owner is a favorable approach to the formation of integrated teams.

Question 2) Integrated teams work best when prospective teams are enabled to self-select their industry partners.

Question 3) The overall timetable for the IPD team selection process is too long.

5.2.3. Approach to Selection Process

The following section analyzes responses to the first statement: “The IPD team selection process currently being used by the project owner is a favorable approach to the formation of integrated teams.” 10 comments address this question.

Over half of respondents agree to this statement. Two feelings of agreement are based on the IPD strategy and comparing IPD selection to standard selection. Neutral feelings toward whether or not the IPD approach is favorable to the formation of integrated teams suggest inability to form a stance at such an early stage. Four statements are along the lines of “too soon to answer.” Two other neutral comments believe that the project owner is heading in the “right direction” and felt a common purpose in partnering efforts was achieved. An agreement comment and disagreement comment both remark on the appropriateness of the process for the scale of the project; commenting on teaming arrangement as well as the considerable cost of pursuing the project. It is interesting that there is only one (2.7%) indication of disagreement.

5.2.4. Self-Selected Teams for IPD

The following section analyzes responses to the second statement: “Integrated teams work best when prospective teams are enabled to self-select their industry partners.” Ratings are accompanied by 17 points of commentary.

Over 75% of respondents agree to this statement. However, within the “agreement” ratings (i.e. 5, 4), four comments (about 9%) attest to other methods for building-out a team, such as owner-led selection and co-selection of the remainder of the team. One neutral statement says he or she lacked information to answer the question. Another three neutral (i.e. 3) comments mention that self-selection of the entire integrated team may be challenging due to the delivery method and lack of owner input. Two disagreement (i.e. 4, 5) comments feel that building the entire team at a single stage limits the team, negatively impacts future decisions and lacks joint vetting of prospective team members.

These perceptions on a self-selected approach to partnering relationships are displayed accordingly in Table 5-3. Also, where possible, Table 5-3 includes specific examples from the commentary that align with major headings.

Table 5-3: Pros and cons of a self-selected teaming arrangement for IPD selection.

Self-Selection for Integrated Project Delivery (IPD) According to Long List Sample	
Pros	Cons
<ul style="list-style-type: none"> • Empowers teams <i>Example 1.</i> Internal identification of what personalities will lead to the best team <i>Example 2.</i> Internal judgment on the compatibility of firms and individual participants • Contributes to trust in a multiparty agreement • Supports the project owner’s partnering goals <i>Example 1.</i> Owner desires to select the team with the most experience working together • Facilitates team chemistry • Teams select based on prior relationships 	<ul style="list-style-type: none"> • Simplifies complex relationships <i>Example 1.</i> Evaluating teams based on how frequently they have worked together in the past discourages partnerships based on unique project-related reasons <i>Example 2.</i> Partnerships may be based on preexisting friendships rather than the best interest of the project • Lacks owner input <i>Example 1.</i> Teams begin to develop project relationships in absence of communication with the owner <i>Example 2.</i> The IPD team should vet trade partners to ensure buy-in to the IPD process <i>Example 3.</i> Early commitment to the entire team is limiting and could risk the outcome of the project

The majority of respondents agree that integrated teams work best when prospective teams are enabled to self-select their industry partners. However, the corresponding commentary suggests less polarized beliefs regarding teaming arrangement for an integrated team. Some opinions state that a capable firm/organization will be successful regardless of the procedure for multidisciplinary team assembly. This range of perspectives on self-selection of an IPD team is worth noting for future discussion.

5.2.5. Length of Team Selection Process

This section analyzes responses to the statement: “The overall timetable for the IPD team selection process is too long.” 20 unique comments are sorted in this analysis. Commentary for this question is categorized by benefits and challenges based on the ratings in Figure 5-4.

Table 5-4: Benefits and challenges of the duration of the IPD team selection process.

Duration of the IPD Team Selection Process According to Long List Sample	
Perceived Benefits	Perceived Challenges
<p>“Right” for the IPD project approach</p> <ul style="list-style-type: none"> + Unique project + First time with this approach <p>Increased opportunity to know the team</p> <ul style="list-style-type: none"> + Sufficient interaction with team members to ask questions and prepare for workshops + Time to research and interview teams <p>Reasonable milestones encourage diligent preparation by both the owner and prospective teams</p> <ul style="list-style-type: none"> + Careful selection for best-value decision + Prospective teams members appreciate time to coordinate schedules + Plenty of time to complete RFP and RFQ 	<p>Perceptions of a long and inefficient timeframe</p> <ul style="list-style-type: none"> Δ Team selection is accomplishable in a shorter timespan <p>Teams invest a substantial commitment of resources</p> <ul style="list-style-type: none"> Δ May require substantial commitment and effort of all members during the third and final stage Δ Inherently expensive due to duration Δ Unfavorable number of teams in competition Δ Deployment of significant resources

Slightly over 20% of survey respondents indicate that the team selection process was too long. Just over half of survey respondents disagree, suggesting the process is *not* too long. Table 5-4 uses a plus/delta system to categorize commentary. Despite rating the process as too long, an agreement comment concedes understanding *if* necessary to accommodate the project owner’s decision. Although indicating that the timeline was not too long, three disagreement comments still cite criticisms such as the number of competing firms, deployment of resources and overall lengthiness. Two neutral opinions state it is too early to tell. However, another neutral response felt that the selection process “...could never take too long.” This summarizes differences in opinions regarding the length of the team selection process.

5.2.6. Additional Comments

Additional comments on the overall team selection process are grouped into three main categories: remarks on process administration, buy-in and team preparation.

Process administration: Three responses see the project owner as open and transparent throughout the response phase.

Buy-in: Seven comments express buy-in to IPD as well as the selection process. One commentator is curious about the identification of IPD project characteristics in the RFQ. Another commentator suggests an alternate teaming arrangement.

Team preparation: Three comments negatively perceive the amount of effort required of long listed entities. A suggestion is made to only ask for A3 document submissions or cap RFP responses at 10 pages.

Remaining outliers were direct feedback to the owner, such as inquiries, recommendations and requests. Additional comments expressed feelings of satisfaction as well as some frustrations.

5.3. Findings and Analysis: Team Questionnaire II (IPD Workshops)

Responses for team questionnaire II were collected as shorted list team members exited their respective IPD workshops. Non-response applies to the possibility of non-participation. However, the investigator is unaware of any declinations to take part in the survey. In total, 43 questionnaires were returned post-IPD workshops. The sample is a multi-disciplinary representation of industry members that is generalizable to IPD teams. Professional disciplines represented are displayed in Figure 5-1: Construction manager (14), architect/architect-engineer (14), MEP engineer/contractor (5), civil engineer (3), structural engineer (2), commissioning agent (1), landscape architect (1) and other (3). Other includes a self-identified BIM manager, engineer and sustainability engineer.

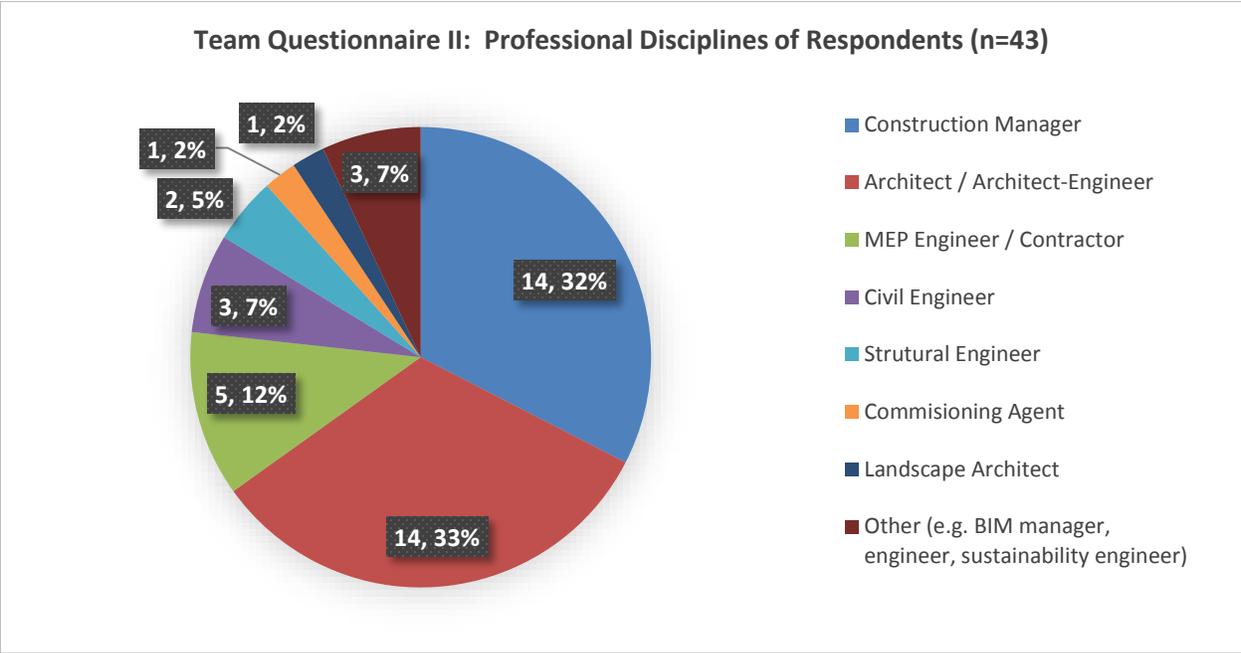


Figure 5-5: Team questionnaire II: professional disciplines of respondents.

5.3.1. Benefits of IPD Workshops

In an open-response, participants stated the overall benefit of the workshop approach to the IPD team selection process. Participants also cited any unique elements used by their team. From this, 32 benefits of IPD workshops are identified. Among these perceived benefits, subject matter encompasses workshop format, information sharing and team building:

1. Workshop format: Time expenditure (i.e. agenda), activities, tools, unique elements
2. Information sharing: Learning, inquiring, understanding
3. Team building: Relationships, participation, interactive exercises

Despite that the original questions emphasized “team selection process”, numerous respondents expressed workshop benefits outside of the team selection process. These beliefs are presented in two categories, A and B. In category A, the workshop is believed to be a preliminary exercise in demonstrating the performance and processes expected for the actual project. In category B, the workshop is seen as a precursor to the development of a tactical concept design proposal.

These two categories are summarized and reiterated below:

- Category A: IPD workshops benefit project performance.
- Category B: IPD workshops benefit advancement in the team selection process, particularly with respect to the next document submission.

Some outcomes may benefit both categories. For example, “team chemistry” as an outcome of the IPD workshop. This can mean that early demonstrations of team chemistry count toward project performance goals (i.e. IPD goals). This may also mean that team chemistry benefits the fulfilment of criteria to win the selection. Therefore team chemistry is able to benefit both categories, project performance *and* IPD team selection. The data analysis that justifies this distinction is explained next.

5.3.2. Influential Aspects of IPD Workshops

In an open-response, workshop participants responded to the question “How did the workshop influence your perspective on the project owner’s goals and team approach?” The following categories summarize comments:

Commitment of project owner to IPD: About 20 unique phrases are directed at the commitment of the project owner to the delivery method. These are assigned to two subcategories: “example of expectations” and “communication of values.”

Example of Expectations. One comment directly states that the workshop elevated understanding of the project owner’s commitment to IPD. The majority of responses describe a realization of the project owner’s commitment to IPD, based on the workshop as an early example that “...indicates potential for [a] collaborative process.” To one commentator, the IPD workshop exemplifies a “real project experience.” The project owner is largely described as “willing to be highly participatory” and pushing toward the team approach. The project owner is repeatedly perceived as open to the new delivery method.

A couple responses feel that the project owner indicates a lower level of commitment to IPD than expected; citing that the discussion was not of the delivery process and more feedback was expected from the project owner being a member of the IPD team. Another response believes

that the project owner was “95% on board” but feels the project owner found no benefit in some workshop sessions.

Communication of Values. The workshop is also seen as a “snapshot” of the project owner’s perspective. The project owner is seen to value equal participation among voting parties. Solely based on communication, one response states that the project owner proved to be committed to IPD.

Project outlook: Two comments express hopefulness toward the project owner’s success with IPD—one particularly noting it was too soon to measure IPD success. Another comment states “no change [of perception] based only on the workshop.”

Status as pioneer of IPD: Six phrases suggest that the project owner is seen as leading the industry and shaping the future of project delivery. Within these responses, it is remarked that the project owner is ahead of other project owners and likely to lead the industry in best practices. Another two expressions believe that the project owner goals and priorities include exploring IPD as a new delivery method.

Owner input for deliverables: Comments describe gaining a better understanding of the project priorities based on screening committee input during the workshops. There is one feeling of greater ability to tailor the team’s proposal based on end user input. Workshops were seen to enable teamwork in advance of the project and the gathering of critical information. One participant notes that their team’s large attendance was matched by the project owner’s attendance. There is a single expression of confusion over how to handle conflict in the IPD process.

IPD benefits: There are a couple reports of increased awareness on benefits that are associated with an IPD approach; including a remark that the IPD workshop was a positive experience. A commentator feels that teamwork/communication is optimized by IPD workshops.

Team selection: Comments describe increased knowledge of the screening committee members’ expectations at a key moment for selection. There are perceptions that the workshop

is a good method for partnering. The workshop is also perceived as part of the interview process.

The aforementioned categories represent responses on how IPD workshops influenced the perspectives of workshop participants. Each category is titled and populated according to the opinions of the questionnaire sample. Questions were developed based on previous evidence that case study project goals included project vision, renovation goals, IPD approach, IPD team structure and IPD outcomes.

Content analysis finds that general project goals (i.e. project vision and renovation goals) were received by IPD workshop participants. IPD workshop participants reported gaining information about the end-user's vision and a better understanding of client's (i.e. project owner) priorities. It is also apparent that the IPD specific goals (i.e. IPD approach, IPD team structure, IPD outcomes) were absorbed by IPD workshop participants. Findings strongly suggest that commitment to IPD ideals and building great partnering relationships were understood as project owner values. Other sub-goals, such as engagement of all levels and increasing efficiency, are not directly spelled out in the data.

In the analysis, new discoveries (i.e. emergent categories not previously mentioned in the conceptual framework) were incorporated as needed. For example, team questionnaire II has a high content of subject matter describing the project owner as a pioneer of IPD. Lastly for uncategorized answers (i.e. outliers), critiques include: IPD workshop is too short; price structure is too dominant in selection; feels like a design competition; more contact with project owner is desired; more end users in audience are desired; IPD workshop venue is too small.

5.4. Findings and Analysis: Expert Interviews

Expert interview data contains practices for IPD team selection previously used in the United States. As mentioned in the methodology, experts were defined as industry members having at least one direct experience with an IPD project. Data collection on IPD team selection practices includes information on both IPD team selection criteria and the IPD team selection process. Analysis of the qualitative data catalogues the defining elements of IPD selection, based on how expert interviewees reported and described previous project experiences.

5.4.1. Practices for IPD Team Selection

Expert interview data encompasses the collective experiences of ten industry members in IPD team selection. The sample of interview participants represents the following professions: project owner (4), construction manager (2), architect/architectural engineer (2), structural engineer (1) and mechanical contractor (1). In semi-structured interviews, participants recalled defining elements of previous IPD team selections, in which they had direct involvement. Also addressed was teaming arrangement, particularly noting the time of involvement for risk/reward group members. Data collection recorded what was perceived to work well along with difficulties for IPD team selection. Interviewees also made recommendations for future team selection processes.

According to expert interview data, the practices available for IPD team selection are distinguishable by selection method. In an IPD project, conventional procurement methods are typically replaced by qualifications-based selection, for at least the architect and construction manager. Evidence suggests that the qualifications for an ideal team are based on technical credentials as well as ability to perform and collaborate in an IPD environment. Although expert interviewees expressed similar and shared ideologies, reported approaches to IPD selection all differed. It is found that support means for selection ranged from open solicitation methods to closed solicitation of pre-listed, qualified teams. Also, the views regarding architect and construction manager cost information ranged from complete non-disclosure to use of ancillary cost information. Differences in approach seemed to be driven by the unique needs of project owners as well as level of experience with IPD.

Expert interview data is useful to inferring the degree of commonalities the case study shares with other IPD projects. In the research steps, case study field research terminated prior to expert interviews therefore expert interview data collection was targeted based on the scope of case study findings. Interestingly, there were no reports of pre-selection IPD workshops and design concept proposals, as found in the case study. Also, there were no reports of self-selected teams to the extent of multidisciplinary representation requested in the case study. However, similarities can still be drawn between expert interviewee reporting and case study data, especially through the consideration of team selection criteria. The qualitative analysis of expert interviews highlights all relevant discoveries. Further interpretation is reserved for the discussion. The primary purpose of this section is to report expert interview findings for IPD selection practices; including solicitation method, selection method, teaming arrangement and criteria.

Teaming arrangement: Experts reported a mixture of self-selected teams and separately selected teams. A common approach was to begin with a “core team”; the core team included the architect, contractor and project owner. In itself the core team can be self-selecting or separately selected by the project owner. The remainder of the team is then selected using team input or solely based on the project owner’s discretion. In instances of team input, the remainder of the team is selected through nomination, group consensus and/or voting rights. For example, one expert interviewee reported the following progression based on team input: first selected architect, then selected contractor and then nominated three MEP firms. In a contrary process, another expert interviewee described selecting the general contractor first and then the architect second. Another alternative sequence was first selection of trade contractors, followed by partnering with the general contractor. Sequence may first prioritize the involvement of entities responsible for designing and coordinating the most complex building systems. Regardless of order, it is found that team entities picked earliest may have input/voting rights on the next entities that are selected. In one project, in addition to selection, first picks also had say on the level of inclusion of future risk/reward group members. In another case, the solicitation method required that proposal submissions be addressed to the core team. As many as eleven risk/reward group signatories were reported in expert interviews.

Unlike the case study, expert interviewees did not seem to express strong feelings of favorability toward self-selected teams. A belief was that self-selection is not always genuine, and may be used as payback between firms for assistance and nominations on other unrelated projects. Still a contrary opinion believed that it was beneficial for the core team to recommend the invitation of certain firms, based on previous experience and pure qualifications. One of the documented IPD practices negotiated the core team based on existing relationships and a previous shared project experience. Although separate selection was the predominate method in expert interviews, it is not without disadvantages. One expert interviewee noted that it was “a little lucky” to have success partnering with new people. Lastly, the decision for separate selection is sometimes driven by state laws/processes.

Also notable is how teams perceived their selection status based on timing of involvement and risk/reward group membership. Trade involvement does not necessarily need to translate into risk/reward group involvement. An expert interviewee recalled resistance from an entity that was not a risk/reward group member during the IPD project, supposedly due to disappointment regarding status. In effect, collaboration was less effective. Therefore it is important to consider the impact of future risk/reward group membership within the IPD team. It was recommended, for the sake of management, to balance trade involvement in the risk/reward group.

Solicitation method: Open and closed solicitation methods were described. One expert interviewee mentioned that the decision to send an RFP is determined by threshold construction costs. An example of a closed solicitation method was the use of structured prequalified lists that nest the abilities of partners and firms (i.e. high, low, none). It seems that conventional solicitation methods (e.g. RFP/RFQ) are most often used for IPD selection, however the approach to submission content and format may appear modified. For example, in one scenario using a RFP, team responses were limited to an A3 and supporting resumes. In addition to submission requirements, another notable aspect of solicitation methods was how project owners were perceived to communicate of expectations. For example, one project owner was believed to transparently explain uncertainties and internally held IPD learning requirements upfront in the RFP stage. Unique aspect of IPD selection are perceived to include submission requirements as well as consideration of IPD-specific objectives.

Selection method: A key defining aspect of IPD team assembly is that qualifications-based selection may occur before consideration and/or any discussion of cost, fees and profit structure. However, IPD projects are also stated to use cost information for best-value selection and competitive bidding of trade partners. In cases that cost information is requested, price is not necessarily a large factor in selection. An expert interviewee noted that the highest price may be selected granted the business case justifies the cost differential, which tends to be between 1-2%. Therefore the selection methods that request cost information may still prioritize qualifications. Another case cited that the project owner only asked the general contractor for billing rates, rather than typical requests for cost breakdown. However, according to one expert interviewee, certain legislature forbids discussion of fees prior to contract negotiation in a qualifications-based selection.

Selection method is tied to teaming arrangement therefore separate selection of trade partners and subcontractors often followed different procurement methods from the core team. In one case, subcontractors were brought upstream for design-assist by evaluating qualifications (e.g. experience, unit pricing, labor pricing). In another case, the majority of trade partners were procured through competitive bidding. However, a common message was that the selection pool for trade partners is reduced in an IPD project. Expert interviewees perceived that fewer subcontractors were eligible for serious consideration in an IPD project. Lastly, as stated before, team input may be used in the selection of trade partners. The approach to selection method for trade partners ranges from conventional methods to pluralistic approaches to qualifications-based selection.

Criteria: According to expert interviews, cost is not a driver in IPD selection therefore team qualifications are judged more heavily. One expert interviewee described team selection criteria as “almost purely on chemistry.” Accordingly, one belief was that the desire to participate in an IPD project should be rated higher than portfolio. It follows that one project owner heavily weighed team willingness to learn together and stumble together in the process of becoming knowledgeable about IPD. Using the same clusters determined in the case study, the following qualifications were identified for IPD team selection criteria in expert interview data:

- **Experience:** Competency, expertise, design qualifications, proficiency, LEED certification, reputation and previous work.
- **Due-diligence:** Cost predictability, schedule predictability, low risk, value and design concepts.
- **Collaborative performance:** Willingness to collaborate, willingness to learn, target value design capability, trust, team chemistry, leadership capability and teamwork.
- **Other:** Uniqueness, innovation, use of Lean-based methodologies and business terms.

Collaborative performance was particularly expanded on in expert interviews. One expert interviewee explained that proposals needed to display a capability for collaboration. Therefore the need to showcase indicators for collaborative performance influenced a different approach to the team selection process and submission requirements. It was believed that indicators for collaboration included the ability to participate in large group meetings and have knowledge of other trades. Also, resumes were expected to focus on the integrated team and collaboration. Forgoing adequate vetting for collaborative performance is perceived to negatively impact the IPD project. This opinion was explained by a cited instance in which a project owner handpicked each team member, supposedly without emphasis on IPD performance. As a result, a change-out was required because one team member did not have the skillset to collaborate and contribute to the IPD team. Multiple expert interviews affirmed that issues related to collaborative performance, such as buy-in, can be persistent throughout an IPD project if not established upfront.

A final factor that seems to influence application of IPD selection criteria is the use of qualified lists, particularly in closed solicitation methods. Use of prequalification appears to more greatly shift focus on team dynamics, due to the fact that baseline competencies and financial requirements are already established within the qualified lists. For instance, it is believed that all team members invited in a closed solicitation possess good technical qualifications and ability to perform the project. The deciding factor for selection is then described as solely based on the “feel” for the team. Qualified lists and/or closed solicitation methods are seen to select based on differences in qualifications that are solely related to intangible traits that support potential for IPD behavior.

5.4.2. Recommendations for IPD Team Selection

The overarching belief is that there are no specific rules and selection differs for each project. The most structured requirements seem to be for public projects. Some expert interviews described IPD selection with little reference to relational concepts such as collaboration: Although still discussing qualifications-based selection, the perspective of these expert interviewees tended to emphasize the mechanical aspects of IPD team assembly, such as timing of involvement, proprietary specifications, scope of work and contract agreement. However, the opinions of most expert interviewees were centric around using IPD team selection to capture IPD behavioral ideologies, especially collaboration. It is concluded that some viewpoints are process oriented while others are criteria oriented. Compiling all data, important takeaways on the approaches to IPD team selection are:

- Expectations for centralized decisions in IPD projects (i.e. jointly developed goals) may be brought upstream by incorporating team input into separate selections and progressive growth of the IPD team.
- IPD selection is a critical moment in which the project owner decides on team structure pertaining to the future risk/reward group.

5.5. Conclusion: Findings and Analysis

Findings on IPD team selection criteria and team selection processes are based on the perspectives of case study screening committee members, case study prospective team members and expert interviewees at-large. This chapter established new knowledge regarding unconventional approaches to IPD team selection. Notably, it was discovered that IPD team selection criteria pertains to experience, due-diligence, collaborative performance and unique qualifications. Also realized were the many approaches and opinions associated with IPD team selection processes. It appears that the inclusion of an IPD workshop in the case study selection was novel and can be described as a pioneering approach to IPD team selection. The self-selected teams in the case study also represent new ideas in IPD team assembly, as opposed to separate selection of team entities. Despite these differences, qualifications-based selection appears to be a major underlying support mechanism of team selection for an IPD project. The interpretation of major findings are discussed collectively in the next chapter.

6. Discussion

The two previous chapters present case study data and expert interviews. Chapter 6 synthesizes evidence from these data sources. The purpose of chapter 6 is to address the thesis proposition, based on the collected data, in order to develop a refined framework. Table 6-1 outlines the strategy for addressing each research question. The discussion interprets evidence on the following subjects within IPD team selection: team selection criteria, team selection process and team selection practices.

Table 6-1: Research strategy outcomes.

Research Question	Findings	Contribution
How can team selection criteria align with IPD goals?	<p>Distinguish IPD goals for the case study</p> <p>Describe the relationship between team evaluation and IPD specific goals</p> <p>Align selection criteria with IPD specific goals</p> <p>Describe project performance predictors which are perceived to influence IPD success</p>	<p>Describe how and why the case study evaluation criteria are used in the selection of IPD teams</p> <p>Capture a list of team selection criteria that are believed to have a supporting role in attaining IPD goals</p>
How can unconventional approaches to the team selection process contribute to IPD team assembly?	<p>Describe unique attributes belonging to the IPD team selection process</p> <p>Capture and classify opinions regarding the assessment of intangible elements during the team selection process</p>	<p>Explain the contribution of each milestone in the IPD team selection process</p> <p>Describe the perceived value of the IPD workshop and how that justifies unconventional procurement activities in some cases</p>
What are the options for IPD team selection?	<p>Identify practices that have been used to attain project goals related to IPD</p> <p>Compare and contrast the perceived benefits and recommendations for implementing IPD team selection</p>	<p>Describe the challenges of IPD selection</p> <p>Propose future recommendations for IPD team selection</p>

6.1. Discussion: IPD Team Selection Criteria

Research question one focuses on the relationship between team selection criteria and project goals. To initiate this discussion, this section first establishes how and why the case study project owner adopted IPD criteria into team selection. This begins by confirming the initial proposition that IPD team selection will result in new team selection criteria for the case study project owner. Established first is a chain of evidence for the differentiation of IPD team selection criteria. After defining IPD team selection criteria, the motivators for IPD team selection criteria are explained, further addressing initial assumptions on the relationship between IPD and goals for project success. According to these findings, a procedure for the alignment of IPD team selection criteria with project goals is presented; thus responding to research question one. This is substantiated by internal guidelines for first time project owners seeking to develop IPD team selection criteria. The discussion considers previous literature along with case data (i.e. direct observation, document review and screening committee interviews) in order to suggest techniques for the administrative handling of IPD team selection criteria.

6.1.1. Differentiation of IPD Team Selection Criteria

The case study project owner perceived IPD team selection criteria to require new measures of evaluation that were supplemental to the owner's historical uses of conventional team criteria (e.g. technical credentials, construction experience, and design experience). This was evident from how team selection criteria was communicated in solicitation documents. In addition to qualifications and project approach, two IPD-driven qualifications were introduced: team structure and IPD approach. A comparative check against previous design-build solicitation documents further verified that the introduced categories for IPD team qualifications were indeed unique to the case study project.

In addition to the document review, screening committee interviews also identified distinct criteria for the IPD team selection. Screening committee interviews especially revealed IPD criteria and indicators. This was coupled with the observation that screening committee members tended to view IPD team selection as an experimental endeavor. Moreover, descriptions of the IPD project as a "pilot project with unknown outcomes" further confirmed

that the approach to IPD team selection and IPD team criteria was unprecedented at the project owner's organization. When compiled, the new team selection criteria all link to the project owner's stated ideology: implementation of a productive and collaborative teamwork environment is an essential input to attaining the most efficient and cost effective project outcomes. Case study team selection criteria for evaluating IPD teams were thus distinct from the criteria used for other delivery methods.

6.1.2. IPD Team Selection Criteria

Now that IPD team selection criteria are established as different, the motivators behind these specific measures are studied. Evidence from the screening committee discussions indicates that IPD was selected to deliver a better facility. The literature suggests that characteristics of an IPD project help overcome dysfunctional project team behaviors. Essentially, a new project-based organization forms in which IPD team member's original firm-based allegiances should be indistinguishable for the purpose of the project. Rather than traditional silo mentality, actions of all parties are redirected to uphold the best interest of the project. By eliminating competing interests, the project is suggested to be more efficient in terms of reducing rework and removing layers of contingency. Evidence of this expectation was apparent in the case study solicitation documents as well as through direct observation. This relationship shows that IPD team selection criteria are translated measures of IPD goals to support expectations for project implementation as a coherent multidisciplinary organization. It follows that project goals should be clearly communicated to all key project stakeholders, including the screening committee and solicited teams.

In reaction to this motivation, the project owner decided how to implement important performance measures for IPD teams. According to the actions of the project owner, contractual incentives are not enough to dissuade divisive silo behaviors. One case study project owner representative stated that IPD collaboration is more than coordination. Team cooperation for transactions and coordination is seen as a standard; the spirit of IPD, however, is a greater commitment to collaboration. This explains why the case study project owner felt a need to develop new criteria in order to select the best team. The case study need for new criteria was based on the project owner's defined measures of importance; confirming the recommendations of Esmaeli et al. (2013) on planning for project success. The impact is that the introduction of

6.1.3. The Impact of IPD Team Selection Criteria

IPD team selection criteria may redistribute the factors and weighting of conventional evaluation. As found in the literature, integrated construction teams require a migration of entire systems of thinking. This is needed to overcome dysfunctional behavior caused by misaligned “sub-goals,” as defined by Love et al. (1998). According to the case study and expert interview evidence, project owner want to attract prospective teams that truly understand IPD and believe in the potential of an IPD project. The IPD mindset must acknowledge that (1) IPD is more than a payment arrangement and (2) IPD is more than an incentive for team performance.

Beyond a contract model, IPD is a business model that attributes its potential for success to lessening competing priorities. IPD aligns project teams to operate in an integrated manner. For example, based on jointly developed goals and collaborative decision-making, project management teams make decisions for an IPD project by consensus. Having administered countless projects, the project owner felt that not all teams would be prepared for this type of operational shift. As an experienced project owner, there is knowledge of the surrounding market and parties that have previously contracted with the owner. Therefore the adoption of IPD team selection criteria implies that the project owner perceived differences in the level of collaborative performance among construction industry teams.

Even qualified teams, in a conventional sense, may not possess willingness or the correct personalities for a collaborative team. The effects of poor and underdeveloped collaborative performance are mentioned in the literature review: If transactions remain fragmented, an integrated team will still have dysfunctional behaviors (Forgues and Koskela, 2009). Therefore not fully committing to IPD likely diminishes chances for success for IPD project goals. However, in the case study, a full commitment to IPD appeared nonnegotiable. Reportedly, the project owner wanted to reap the full benefits of shared risks/reward. This seemed to prompt the need to redevelop and increase screening in order to select a short list of teams predisposed to this manner of thinking; thus bringing forth IPD team selection criteria.

A final modification for IPD projects is that selection criteria must be weighted to support the nature of the project requirements (Rahman and Kumaraswamy, 2005). In addition to promoting IPD goals, project owners must also prioritize between technical credentials and

relational qualifications. IPD criteria is seen as supplementary to standard prequalification criteria: Only after prequalifying IPD teams, should intangible criteria, that reflects collaborative goals, be prioritized over costs, fees and design preferences. Later in the discussion a range of options regarding qualified teams and qualifications-based selection are presented. This shift in evaluation leads back to the main point that selection criteria should first serve project requirements.

6.1.4. How IPD Team Selection Criteria Aligns IPD Goals

The first research question expected to find links relating IPD team selection criteria with IPD goals. In response, this section synthesizes observational evidence, document review and screening committee interviews in order to understand how the case study aligned IPD team selection criteria with IPD goals in the RFQ/RFP. As shown before, the case study project IPD goals are categorized as IPD approach, IPD team structure and IPD Outcomes. IPD goals were suggested to resonate with some of the indicators previously defined for IPD team selection criteria. Concept maps confirm these connections. Essentially IPD project goals are reflected in team selection criteria, then further by related performance indicators.

An example of how the project owner aligned the goal of “IPD Team Structure” with team selection criteria is displayed in Figure 6-1. Figure 6-1 pulls from multiple data sources to diagram recurrent themes then confirm aspects of alignment within the IPD team selection process.

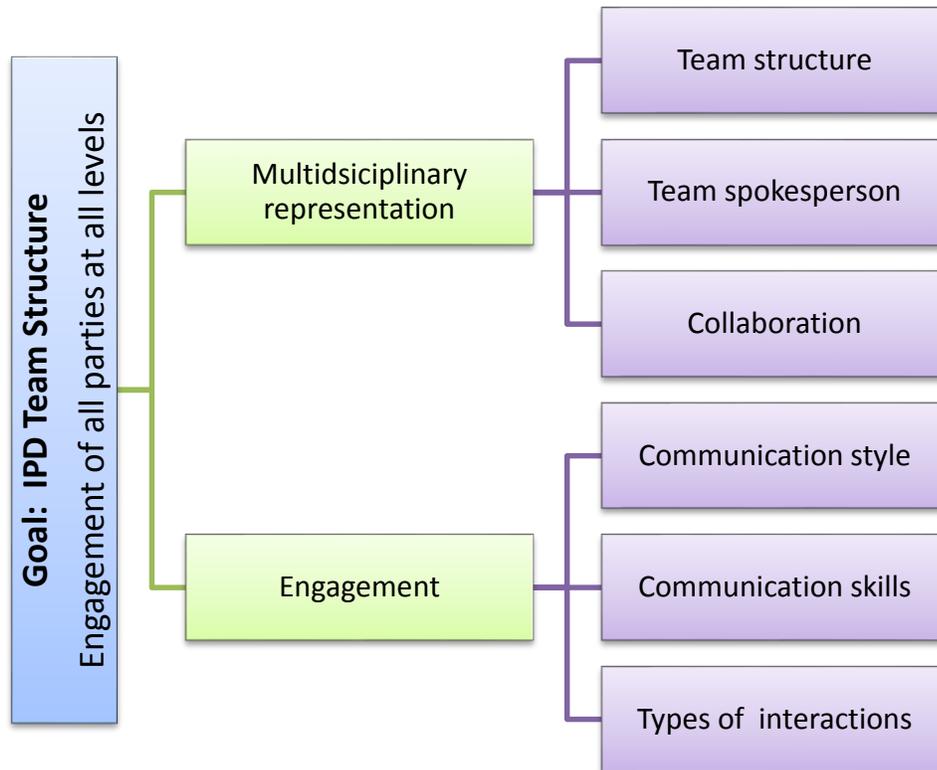


Figure 6-1: Concept map of how the project owner aligned the IPD team structure goal “engagement of all parties at all levels” with team selection criteria.

The furthest left column in Figure 6-1 displays the IPD specific goal for team structure, previously defined as “engagement of all parties at all levels” in Table 4-1. Multidisciplinary representation and engagement are directly linked criteria which branch out from the team structure goal. According to screening committee interviews, multidisciplinary representation and engagement were criteria helpful to selecting the team that best demonstrated “engagement of all parties.” Then the furthest right column expands on the indicators associated with each criterion. The system of organization used in this concept map represents how IPD team selection criteria and indicators are described as supportive of IPD specific goals.

To reiterate, the goal for IPD team structure is directly supported by multidisciplinary representation and engagement criteria. This is a triangulation of evidence because goals and criteria were defined from two different sources (i.e. document review, screening committee

interviews), yet arrive at the same concepts. Interestingly, goal alignment is also inclusive of sometimes overlapping criteria and indicators.

Various criteria may support more than one IPD goals because multiple ideas can converge within a single IPD specific goal. For example, the goal of IPD team approach (i.e. IPD commitment and integrated design process) is also supported by which multiple indicators, including: team attitude, transparency, team accountability and collaboration. Lastly, indicators for IPD outcome goals (i.e. efficiency, savings, partnering) are at least: teamwork, productivity, new processes/tools/designs, productivity and again, collaboration. According to these findings and concept mapping, a process for alignment of IPD team selection criteria with IPD project goals is inferred. Steps are as follows:

1. **Identify behavior change requirements.** Identify dysfunctional behaviors in past projects that IPD is believed to correct. Realize how collaboration is a driver for choosing IPD.
2. **Define IPD goals.** Identify performance outcomes to be obtained from choosing IPD then base IPD goals on these desired performance outcomes. Base goals on project needs, as well as the project vision, as defined by end-users and other key internal stakeholders. For example, the case study IPD goals sought a team environment which effectively collaborates and produces innovative project solutions.
3. **Develop criteria.** Clear articulation of criteria is seen to increase the likeness that proposing teams absorb objectives and effectively address project goals. The development of indicators may also serve as a fruitful discussion for refining or revising evaluation techniques. Requirements should be based on indicators that can be reasonably gathered in the solicitation method.
4. **Set action plan.** Finally, the use of selection criteria needs to be incorporated into the team selection process. Overall the action plan should fully realize the motivators that drive the delivery method. This is an opportunity to satisfy otherwise difficult to assess areas of collaborative performance, such as team chemistry. To solve these issues, the action plan should bring forth an unconventional approach to assessment, such as IPD workshops. The action plan design assists in reaching project goals.

6.1.5. Benefits and Outcomes of Goal Alignment

Goal alignment benefits early communication and strategy for project performance. Logically, the most competitive team for an IPD project displays IPD-like behaviors in past projects *and* embraces IPD ideals in current practices.

Criteria that are consistent with IPD goals potentially affect how teams perceive the project and strategize their performance in the selection process. It seems that high performing teams, which exude collaboration, respond well to IPD team selection criteria. Although IPD team selection criteria supports internal goals, communication of criteria should be directed at the external audience. Communication of clear objectives and criteria may attract competitive teams. For example, the case study project owner encountered several proposals from teams not previously contracted. Unfamiliar candidates can strengthen the selection pool if the project posting is coveted as a beneficial opportunity. This was seen in the case study, particularly when a screening committee member remarked that the solicitation method brought forth some of the best firms that the project owner had not previously worked with for a project. A logical set of IPD selection criteria can be advantageous to the start of an IPD project.

One thing to avoid is an unwieldy set of IPD team selection criteria. While a diverse screening committee membership results in a range of perspectives, it is essential to maintain a common purpose for IPD selection criteria. If there lacks a common purpose, views may be too divergent to allow IPD team selection criteria to effectively support project goals. Overall, by adhering to a concise set of qualifications, priorities will be more visible and comprehensible. The next section on internal guidelines for IPD team selection will further discuss this point.

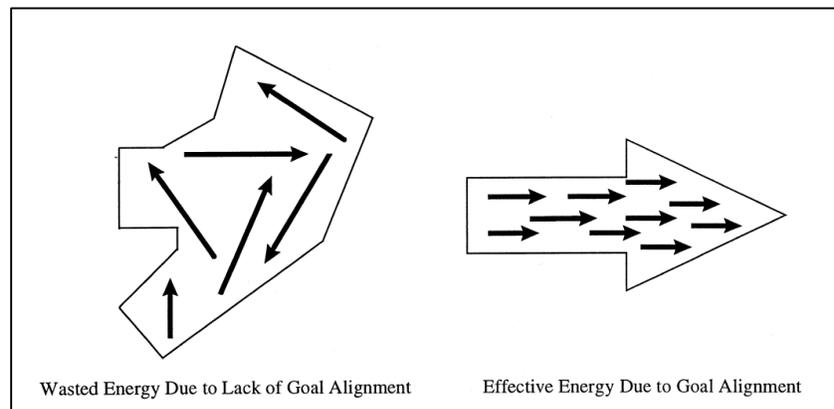


Figure 6-2: Goal alignment and cohesiveness. Source: Love et al., 1998.

The case study supports previous findings of Love et al. (1998) that link organizational communication to task orientation. As displayed in Figure 6-2, team effectiveness is increased when motivations are directionally in line with project goals (Love et al., 1998). **Above all, the purpose of goal alignment with selection criteria is to effectively communicate team expectations seen as vital to project goals.** The case study IPD goals for team structure, project approach and project outcomes are all targeted at creating a productive team environment and collaboration to reach project solutions. Alignment of IPD team selection criteria transports these goals upstream and into the team selection process. To the benefit of the case study, the relationships between IPD specific goals and team selection criteria were consistent (as captured through concept maps and screening committee interviews.) As a result, aware prospective teams were believed to better understand project values with greater certainty. This approach to project goals and team selection criteria can be an early stride toward project success.

6.1.6. Internal Guidelines for IPD Team Selection Criteria

In the case of a project owner being inexperienced with IPD, mobilization for IPD team selection requires proactivity. Internally, the case study project owner used meetings and a consultant to ensure that adequate information and resources were available to support screening committee knowledge about IPD. Prior to initiating a selection process, project owners should realize the needs of internal project participants, such as the case study screening committee.

The project delivery transition strategy for the case study appeared to include selection of a high performance team to form a purposeful organizational merge. Evidence indicates that the screening committee desired the future IPD team to lead a new path. The value of receiving assistance in learning IPD concepts was further confirmed by the inclusion of an external consultant on the screening committee. Consultation was seen as helpful to reaching informed decisions and therefore easing the transition to IPD team selection. Interestingly, the disadvantages associated with IPD inexperience may be less than expected. For instance, uncertainty seemed to encourage screening committee members to adopt an awareness toward IPD characteristics. The screening committee was attentive to the success of the pilot project. This high level of screening committee attentiveness may be attributable to perceptions of a

groundbreaking project approach. An IPD transition strategy that deviates from business as ordinary can be an opportunity for growth.

6.2. Discussion: IPD Team Selection Process

Developed in hand with effective IPD team selection criteria is the establishment of a team selection process to assist in distinguishing ideal IPD teams. Considered next are screening procedures for IPD team selection. As evidenced by the literature review, alternate approaches to procurement systems can facilitate a multidisciplinary team that utilizes early involvement in the design process (Walker, 2007). Using literature review and case data, the purpose of this section is to discuss how a project owner can implement an effective procedure for IPD team selection and successfully streamline an integrated team. In response to research question two, emphasis particularly highlights the impact of an unconventional approach to the team selection process in the case study.

While exploring the usefulness of unconventional approaches to team selection, the real-life rivals defined in the methodology are revisited. In particular, the following confrontations are embedded in the discussion: “Is the project owner conducting the IPD selection in the correct way?” and “Are the revisions to the selection process representative of nontraditional criteria?” Consequently there are five considerations to be addressed based on the case study team selection process. First, the influential aspects of a self-selected teaming arrangement are evaluated. The discussion then transitions into the rollout of IPD team selection criteria and the use of IPD workshops. Taking into account all perspectives, suggestions are made on the team selection process and documenting lessons learned.

6.2.1. How to Accommodate a Self-Selected Teaming Arrangement

Early involvement of a multidisciplinary team is an underlying tenet of utilizing an IPD approach. In a traditional procurement system, the project team is joined by separate contracts. However, in alternative delivery methods, such as IPD, solicitation methods may request either separate or joint proposals based on the project owner’s preferred approach. Teaming arrangement is an early decision that affects the timing of participant involvement for IPD team assembly.

Self-selecting teams are suggested to benefit project goals for multidisciplinary representation and collaborative performance. In the case study, prospective IPD teams were composed of self-selecting multidisciplinary entities. Based on these partnerships, participation in the team selection process was a joint endeavor and the winning IPD team would eventually sign a multiparty contract. According to findings, this approach to partnering was seen as favorable to IPD teams. Screening committee interviews stated for reasons such as strategic partnerships, synergy, team potential and team relationships. Team questionnaire I stated for reasons such team empowerment, trust, partnering, team chemistry and familiarity. This suggests that integrated teams adopt functional behaviors through self-selection. Although these reasons are generally accepted, the corresponding literature implies that there is no single solution to build a multidisciplinary team. To maximize the benefits of self-selection, time of involvement should be based on need and project goals.

Engaging with Prospective IPD Teams

Interactions between prospective IPD teams and the screening committee are part of the evaluation process for realizing interpersonal strengths and other indicators regarding team behavior. The case study screening committee dedicated a considerable amount of time to engage with prospective IPD teams in an integrated approach to project delivery. For example, the decision to invite prospective IPD teams to site visits was accompanied by the expectation of an organized hosting with screening committee input. Case study teams reportedly brought sizable multidisciplinary groups to site visits. One team even requested a second site visit, due to a need to bring additional team members. This approach to early involvement highlights the bilateral nature of interactions that coincide with team engagement and team evaluation.

In addition to site visits, IPD workshops also required a heavy involvement from both the screening committee and prospective teams. The screening committee was expected to coordinate the logistics of these unique procurement activities. Unlike previous selections where archival evidence shows that the project owner capped prospective team attendance, all IPD participation was at the discretion of each prospective team. Participation limits for IPD workshops were only driven by the size of the room. A range of 11 to 18 prospective IPD team members participated in workshops with the screening committee. Prospective teams expected the IPD workshop to emulate a big room venue. In questionnaire data, a team member requested

a larger venue for IPD workshops. Teams continued to arrive in large numbers at the case study final interviews, almost mirroring the representation seen at workshops. Overall IPD team selection is seen to benefit from participation. Expectations for an integrated approach to self-selected multidisciplinary teams seemed to encourage large numbers of participants in the team selection process. It should be noted that in closed discussions, the screening committee considered attendance decisions along with the level of engagement shown by attendees. For future processes, project owners should be aware of the aforementioned special requirements for participation and engaging teams during unique team selection process activities.

6.2.2. How to Utilize an IPD Workshop

Outside of a project environment, it is difficult to screen for certain IPD team characteristics which require collaboration, such as jointly developed goals. From the perspective of the case study project owner, standard procurement mechanisms (e.g. RFQ and RFP) were insufficient for IPD team selection. Realizing this, IPD workshops established face-time with prospective teams in what teams interpreted as a mock project environment. IPD workshops were considered valuable to predicting team performance.

The screening committee believed it was preferential to select an integrated team already cultured to the IPD-mindset, therefore the scoring of IPD workshops rewarded such types of indicators. Teams with and without direct IPD experience were able to actively demonstrate values and practices that were consistent with IPD principles. Notable indicators which were perceivable in IPD workshops supported due-diligence and collaborative performance criteria. Furthermore, requesting that IPD teams lead workshop agendas was believed to indicate how an IPD team would run an actual project meeting. Rather than relying on submission documents and resumes, IPD workshops were an interactive and first hand approach for screening committee members to evaluate team qualifications for scoring.

Based on screening committee findings, some of the strongest indicators for how teams collaborate were ingrained in IPD workshop performance. Interestingly, these broad case study outcomes were based on the project owner's simple, original request that teams use the workshop to learn project goals and program requirements. Described next are two tips for project owners to maximize the effectiveness of IPD workshops:

- Initiate synergy by adopting an integrated approach to workshops and,
- Seek out indicators for the performance of the integrated team.

Synergistic outcomes: Unlike pre-bid meetings and selection interviews, IPD workshops welcome a two-way flow of information and exchange of ideas. Based on communication with the project owner, evidence indicates that prospective teams formed strong opinions regarding screening committee members' commitment to IPD. Prospective team members tended to applaud how concepts of integration and openness (i.e. transparency) were ingrained in the team selection process. In an integrated approach to team selection, workshops may serve as an early catalyst to orient all stakeholders around serving the best interest of the project and collaboration for synergistic outcomes.

Performance indicators: To reiterate main points in the literature review, Baiden et al. (2006) and Cicmil et al. (2006) found that a greater emphasis on team compatibility, communication and social interaction promotes integration in the actuality of projects. In the case study, IPD workshops were a demonstration of this needed focus on “practical action” and “lived experience” to improve the project team environment (Cicmil et. al., 2006).

IPD workshops intended to help the screening committee better understand indicators and predictors for team performance. For example, collaboration and the use of the whole team during workshops were thought to be telling of a team's IPD potential. Face-to-face interactions allowed the screening committee to assess communication style, communication skills and personal interactions; which are indicators for engagement within collaborative performance criteria. Other indicators served by workshops were team attitude, transparency and team accountability, which support qualifications for buy-in.

Although some case study participants interpreted IPD workshops as a mock project experience, the authenticity of workshop performance could not be verified until actual project performance metrics became available. Therefore it is possible that behaviors presented in IPD workshops may not be a true representation of the overall project dynamic. Seeing that the “preview” of team dynamics was limited, team reputation and first impressions may be some of the most

viable substantiations to workshop performance. Another issue with authenticity was that, according to one response in team questionnaire II, conflict resolution strategies seemed unaddressed in workshops. The literature review confirms that mitigation of conflict is important in integrated teams, however, based on the case study, conflict resolution techniques may not be apparent in team selection. Despite the potential for divergence in behaviors between selection and actual appointment, there is still believed to be value in early signs of demeanor. Overall, the decision to incorporate IPD workshops to displace typical procedures (e.g. pre-bid meeting) was based on perceptions that workshops were helpful to reveal indicators for IPD team selection criteria.

Sequence of IPD Workshop in Team Selection Process

According to the case study, when IPD workshops precede interviews, interviews are a presentation of jointly developed solutions in design concept proposals. Design proposals showed how teams used the information gained in workshops. The screening committee gauged how well they were *heard* during IPD workshops based on how the team used their combined expertise to produce a solution. Final interviews then gave teams an opportunity to further present their design proposals and sell the team. Therefore interviews were considered final opportunities to explain thoughts and opinions.

Even with scheduling IPD workshops months before final interviews, an observation was that first impressions of team behavior in IPD workshops remained consistent with how the team was preconceived in interviews. This suggests that preliminary IPD workshops were highly influential at creating an impression of the team behaviors that followed teams throughout the selection process. Therefore IPD workshop performance was absolutely critical.

In concluding this section, workshops were an unconventional opportunity to evaluate teams for intangible IPD team selection criteria, such as buy-in, team chemistry and engagement. Beyond the typical assessment of proposal submissions and final interviews, the approach to IPD selection included new interactive opportunities for prospective project teams to showcase innovative design ideas and illustrate the unique competencies of team members.

6.2.3. How to Maintain the Quality of the Overall Team Selection Process

The case study solicitation method was utilized to communicate a serious commitment to IPD. IPD workshop exit questionnaire data revealed that IPD team members were highly concerned with a project owner's contributions and commitment to the integrated team. Likewise, expectations for prospective IPD teams were also evaluated for their commitment level to IPD (i.e. buy-in, team chemistry, engagement). To confront uncertainty and perceptions of "cold feet" regarding IPD, the following stakeholder responsibilities are recommended for the IPD team selection process:

Owner responsibilities: Incentivize team participation; clearly define project goals and performance expectations; transparently communicate objectives for each gateway in the team selection process.

Team responsibilities: Willingness to agree to the terms of an IPD contract; due-diligence for document submissions and overall participation in the team selection process; acknowledge the project owner *and* end user as full members of the IPD team.

Mutual responsibilities: Embody IPD; act in good faith; learn *with* each other during IPD training (i.e. knowledge sharing.)

6.2.4. How to Document the Selection Process for Continuous Improvement

A contribution of this study is to qualitatively describe the perceived value of unconventional approaches to team selection. To close the discussion on the IPD team selection process, this section summarizes observations for how to measure value added. The influence of procurement activities should be measured in order to inform future decisions in other unconventional approaches to team selection. Due to the findings that all case study stakeholders perceived the IPD selection as a new experience, lessons learned are especially valuable to future projects. This section advises project owners on how to proceed with documenting their process for future benefit.

It is seen that pioneering efforts lack an established baseline and therefore bring forth uncertainty. Prospective IPD teams and screening committee members both sometimes

expressed the sentiment “too soon to tell.” Although uncertainty appears to be inherent to a first-time IPD project, data collection should focus on gathering reasonably attainable feedback, such as expectations influenced by the IPD team selection process. Several findings in the case study illuminate valuable subject matter that project owners will benefit from measuring and documenting. Findings also reveal constructive commentary that was provided by prospective team members. For example, in team questionnaire I, long listed team members were concerned about the size of the selection pool. Also, in team questionnaire II, short listed team members suggested improvements to the overall process for IPD team selection, particularly regarding: IPD workshops, end user interactions and qualifications-based selection. There are many opportunities for feedback in an IPD team selection process. Capturing and analyzing lessons learned is a solution to addressing uncertainty and other issues.

Lastly, lessons learned should also consider operational issues in the team selection process. The case study project owner had several active construction projects and selections happening concurrent to the IPD project. The adoption of IPD is demanding, however time requirements are believed to payoff. It seems to be generally accepted that a commitment to IPD inherently requires an early deployment of resources.

6.3. Discussion: Options for Using an IPD Approach to Team Selection

The transformational change required to form cooperative, integrated team partnerships is not easy (Seed, 2014). This research study hopes to contribute potential solutions to overcome the challenges perceived in IPD team selection. This final section discusses alternative approaches to team selection that are viable for IPD team assembly. Expert interview data sheds light on IPD team selection practices outside of the case study. According to these findings, important factors in choosing a solicitation method are presented first. Then, for practicality, the discussion highlights general considerations regarding the greater upfront investment perceived in an IPD team selection process. Overall options for IPD team selection are explained based on industry-wide perceptions, including underlying beliefs on effectiveness. The hope is that adoption of a tailored, goal-driven approach to team selection will streamline any transition to IPD teams.

6.3.1. Important Factors in Choosing a Solicitation Method

This next section uses case study and expert interview data to explain the important factors in choosing a solicitation method. As established earlier, there are believed to be fewer ideal teams for IPD than in predominate project delivery methods. Due to the effect of fragmentation and silos, IPD-like behaviors are not encouraged by traditional project delivery in the construction industry. In agreement, an expert interviewee stated that “Very few people are actually collaborative and are open; [those behaviors are] counterculture to how our industry is.” Therefore screening for capability to perform in a collaborative environment was strongly emphasized in expert interviews. It follows that a contribution of this research is to discuss the approaches to IPD solicitation methods, with respect to the perceived industry-based challenges such as dysfunctional project teams.

Previously in this chapter, the roles of team selection criteria and the team selection process in IPD selection were explained separately. Next these two concepts are joined together, as practices, in the discussion for choosing a solicitation method. Important factors in choosing a solicitation method are based on the collective motivators that influence decisions on how to implement criteria and a selection processes. Below, findings from the case study and expert interviews are comparatively discussed with respect to practices for IPD selection.

Comparing and Contrasting Approaches to Team Selection Criteria

Expert interview data fit into the same clusters used to group case study team selection criteria: experience, due-diligence, collaborative performance and other. Expert interview findings confirmed the importance of screening for the following qualifications: experience, expertise, reputation, buy-in, team chemistry and unique qualifications. However, expert interview data does not support case study findings on multidisciplinary representation qualifications. This is because the practices defined in expert interviews did not use self-selected teams to the extent of the case study. At most, expert interviews cited self-selection of a core team and then separate selection of other team entities. Despite this difference, the overwhelming majority of IPD team selection criteria are held in common between multiple IPD projects. However, expert interviews suggest that prevailing indicators can be interpreted as integrated with criteria. Although expert interview evidence shows IPD team selection criteria in line with the case study, in practice, indicators such as teamwork (for team chemistry) and willingness to collaborate (for

buy-in), may not be as clear-cut as the boundaries that were determined in the case study screening committee data analysis.

In expert interview and case study data, team selection criteria is motivated by the perception that dysfunctional behavior is an outcome of predominant approaches to assembling competitive project teams. Due to the prevalence of silo behavior in the construction industry, expert interviewees believed that proposing team members, especially trade contractors, often need to adjust fragmented mindsets in order to overcome lack of exposure to IPD projects. From a trade perspective, lack of experience working collaboratively with other trade partners is perceived to be a challenge in IPD team assembly. Perceptions of dysfunctional behaviors and inability to collaborate explain the rationale for teamwork being a qualification and indicator for collaborative performance in data collection for both expert interviews and case study screening committee interviews.

Along with understanding expectations for collaboration in IPD projects, expert interviewees perceived another challenge to be verifying the authenticity of IPD buy-in. Although more teams are becoming versed in IPD and Lean terminology, expert interviewees explained there is a need to gather an authentic feel for team dynamics beyond tactfully written submission documents. For experienced project owners, this is often accomplished through references, reputation and/or interview performance. This is slightly different from the case study, which additionally used IPD workshops to weigh willingness to collaborate and authenticity of IPD buy-in.

Comparing and Contrasting Approaches to the Team Selection Process

Evidence from expert interviews suggests that there is no single expectation for a team selection process. Like in predominant procurement methods, the team selection process for IPD often consists of multiple, separate selections to build out the team. Although the case study attempted a highly involved self-selected teaming arrangement, some IPD candidate teams thought it better to modify their proposed team structure to initially include fewer entities than requested. Findings in team questionnaire I suggest that although self-selected teams are generally viewed as favorable, drawbacks include simplification of complex relationships and lack of owner input. Expert interviews further confirmed the concern that self-selected teams are not always produced

for authentic reasons. In addition to affecting the timing of involvement for multidisciplinary teams, the approach to team partnerships is believed to influence trust, team chemistry and collaboration in IPD team selection.

Experienced owners may leverage knowledge of the selection pool, from past projects, into their decisions for solicitation method. An expert interviewee reported a project owner that maintained qualified lists for closed IPD solicitations. This approach is notably different from the case study, which held an open solicitation and evaluated minimum qualifications on the basis for the project. While expert interviews revealed techniques believed to streamline IPD selection, such as the request of A3 proposals, there was no mention of IPD workshops prior to selection. Team selection interviews were the predominant approach to team interaction in expert interviews. This further differentiates the case study, and makes the case study selection process particularly unique.

A final difference, not addressed in expert interview data collection, was the use of design concept proposals. It was found that IPD team selection may not require design concept proposals, cost estimates or target value design processes until after the winning team is appointed. Despite differences in approach to team selection processes, expert interviewees and case study participants typically reported satisfaction. It follows that the main purpose of a team selection process, whether conventional or unique, should be to effectively select the best team for the project.

6.3.2. Challenges of Greater Upfront Investment

In comparison to other selection methods, IPD team selection is perceived as a heavier frontend project expenditure. The case study leveraged the early involvement characteristic of IPD as a means to require prospective IPD teams to develop project solutions before selection. This was seen in the conceptualization phase of the team selection process, encompassing IPD workshops and design concept proposals. In effect, prospective team members remarked that the case study IPD team selection process required a notable investment of resources. Likewise, on behalf of the project owner, the time commitment required of screening committee members was perceived to be greater than usual. This section discusses the challenges associated with upfront costs in IPD team selection.

Although the inherent cost of the selection process was a concern to some prospective IPD team members, the cost did not deter participation in the case study. Moreover the majority of prospective team members found the IPD team selection process to be favorable. Submission requirements and workshops do not appear to dissuade the level of interest displayed by case study firms. Similarly, on the project owner side, the advantages of the unconventional approach to the team selection process are seen to outweigh the challenges. Outside of the case study, an expert interviewee stated that the primary concern is delivery cost rather than bid day cost. Team selection is seen as consequential to project cost performance, therefore IPD teams are relatively comfortable with increasing initial spending of resources believed to improve opportunities for success.

6.4. Conclusion: Discussion

Choice of delivery method is a crucial decision for project owners (Al Khalil, 2002; Shah and Coleman, 2013). As previously stated, adoption of integrated project teams for IPD is still uncommon (Fleming and Koppelman, 1996). Essentially, an IPD team assembles a temporary organization based on shared accountability. After committing to IPD as a delivery method, team selection is subsequently one of the most important decisions. It is possible for standard team selection processes to be modified to serve the purpose of evaluating qualifications for self-selected multidisciplinary teams. IPD specific implementations of team selection criteria and team selection processes are filled with upstream opportunities to support project goals.

Although the methods for evaluating collaborative performance are still new and relatively undefined in practice, workshop-like approaches allow interaction in a simulated project setting for the improved assessment of teams. Evidence suggests that requesting teams to convey collaboration through IPD workshops may instill early expectations regarding level of commitment to IPD. In effect, proposing teams may also have expectations for the actions of the project owner to likewise uphold IPD ideologies. Based on the case study and expert interviews, leading practices value selection of an ideal team that meets qualifications in the areas of experience, due-diligence and collaborative performance.

7. Conclusion

By building upon established categories for effective integrated teams, the prevailing effort is to shed light on what factors and preconceptions appear to influence how IPD team selection is practiced. The premise of this study is that IPD team selection will result in modifying approaches to the team selection process and criteria. This presumption was developed based on new team requirements for collaborative performance that target the shared success of jointly developed goals and team-based decision-making. This research explains how and why a project owner instituted team selection on a first-time IPD project. The key findings are as follows:

- Team selection criteria communicate expectations seen as vital to project goals.
- In addition to technical qualifications, advantages in qualifications for collaborative performance (i.e. effort and multidisciplinary representation) and due-diligence (i.e. buy-in, team chemistry and engagement) are seen as critical to the success of both general project goals and IPD specific goals.
- Inclusion of simulated team interactions, such as IPD workshops, in conjunction with proposals, serve as a means to better understand commitment to integrated design processes and potential for collaboration among multidisciplinary team members

7.1. Conclusion: Alignment of IPD Team Selection Criteria

There is believed to be a continuum between team selection criteria and team performance outcomes. Therefore team selection criteria communicate expectations seen as vital to project goals. IPD team selection criteria that align with project goals are an early enactment of expectations for collaborative performance and ideal team attributes. This is especially important in new adoptions of IPD, in which the project owner is viewed as a pioneer, leading the industry in delivery methods for the facility type. Team selection criteria is believed to transport project goals upstream and into the team selection process.

In the case study, IPD specific project goals included commitment to IPD ideals, engagement throughout the team structure and great partnering relationships for efficient project solutions. These goals were in line with the expectations for integrated teams that are related to collaborative performance. The case study suggests that criteria for collaborative performance

should include buy-in, team chemistry and engagement. From the goal alignment study, these are seen as supportive of predicting *sincerity* of involvement, engagement of composite teams and strength of partnerships.

Despite new adoptions of relational criteria, conventional team selection criteria used in predominant delivery methods remain relevant for IPD selection. However, after qualifying for experience, qualifications for an ideal team are expanded to identify traits such as IPD-mindset, team chemistry and potential for innovation. In the case study, this shift toward integration required teams to convey expertise and demonstrate a genuine passion for working in IPD and IPD-like environments. These qualities were seen as difficult to observe through submission documents alone, therefore indicators for team selection criteria were extracted from interactions in IPD workshops. The choice of an IPD workshop is just one potential example for simulating team interaction in support of the case study owner's process. In conclusion, team selection criteria can be used to directly contribute to the communication of project goals and early expectations for team performance specific to IPD.

7.2. Conclusion: IPD Team Selection Process

Conclusions for the IPD team selection process address the relationship between the team selection process and factors related to the collaborative performance of multidisciplinary IPD teams. There are special considerations for the IPD team selection process because unlike traditional teams, integrated teams are expected to amend traditional adversaries through collaborative processes and a "new spirit of cooperation" (AIA, 2007; Fleming and Koppelman, 1996). The case study revealed that performance indicators for these concepts rely on the screening committee's ability to perceive team behaviors. Therefore the case study selection process was meant to support the selection of a collaborative team with great potential for project success. According to the case study, decisions for an IPD team selection process should consider the benefits of self-selected teams, interactions in IPD workshops and the overall approach to IPD team selection.

Teaming arrangement influences the sequence of an IPD team selection process and may benefit opportunities for multidisciplinary team engagement. It was seen that self-selected teams were

beneficial for the case study process, wherein proposing teams were given autonomy to determine the extent of inclusion of multidisciplinary entities. Based on the case study, primary benefits of self-selected teams are shared vision and higher commitment through team volition. However, although a minority contrary opinion, some proposing team members showed strong beliefs that separate selection for team building is more effective and preferred over self-selected teaming arrangements. Disadvantages are further highlighted by instances when the project owner perceived weakness and/or incomprehensible reasoning in certain partnerships. Teaming arrangement is an important discussion because it influences selection criteria (i.e. multidisciplinary representation) and timing of project participant involvement. Therefore based on project goals and requirements, IPD project owners should carefully approach teaming arrangement with respect to the desire for multidisciplinary team engagement in the team selection process.

It was found that inclusion of personal interactions between the screening committee and prospective teams appeared to increase confidence in the assessment of indicators which support IPD specific goals. For instance, IPD workshops are useful to the assessment of IPD team selection criteria that is otherwise difficult to observe. Therefore the case study used IPD workshops to predict performance through social interactions that were representative of the actuality of the IPD project. Solicitation documents communicated that IPD workshops screened for leadership potential, team chemistry and collaboration. Screening committee interviews confirmed that these points and more were used for evaluating team qualifications. Furthermore, team behavior in IPD workshops seemed to be critical to realizing team conduct associated with effort, due-diligence and collaborative performance. Face-to-face interactions between project stakeholders were seen as critical to realizing the authenticity of language and ideas communicated in proposals. Therefore including interactive opportunities, such as IPD workshops, in the team selection process may be crucial to selecting a team that indicates an IPD-mindset and is able to attain IPD specific goals.

Lastly, the team selection process is a way for a project owner to actively demonstrate the priorities being communicated to prospective teams. A well communicated solicitation method appears to attract high performing teams. Therefore throughout an IPD solicitation method, in addition to aligning project goals with team selection criteria, a project owner is also obliged to

exhibit a commitment to IPD via a high level of engagement during all pre-selection interactions with prospective teams. Particularly in IPD workshops, prospective IPD teams were seen to gain strong impressions of the potential for collaborative processes *with* the project owner. Therefore, during the team selection process, a project owner's approach to communication with prospective teams potentially channels the amount of project owner commitment to the ideologies desired in the IPD project.

7.3. Conclusion: Options for IPD Team Selection

There are many options for an experienced owner to select an IPD team using a qualifications-based or best-value selection. Although there is no single best approach to IPD team selection, findings suggest that all project owners are entitled to "feeling confident" about their final decisions for IPD team assembly. The practices for IPD team selection, discovered in expert interviews, were all aligned to meet the needs of the project and project owner. It was found that typical submission requirements, such as resumes, were often tailored to an IPD approach; usually shifting the direction of emphasis from competition to collaboration. Similar to the case study, expert interviewees identified IPD team selection criteria within the major categories of experience, due-diligence, collaborative performance and other (e.g. innovation, business terms). However, major decisions that are seen to influence differences between expert-provided selection practices include approach to solicitation method, selection method and teaming arrangement. In concluding, although there are many variables within IPD team selection, the overall measure of selection effectiveness is based on ability to satisfy project goals and program requirements.

7.4. Limitations

7.4.1. Limitations of Case Study Research

Although no method is without limit, case studies constraints are specific to research bias and lack of exactness. However, the case study project is a valuable representation of IPD that will increase the current understanding of IPD team selection. Limitations for the case study address methodology, data collection, data analysis and misuse.

Methodology: In this instance of a single case analysis, no cross-case patterns can be determined. Possible improvements to methodology include documenting additional case studies for variation and multiple case analysis. Also, the case study can be improved by introducing multiple field investigators for variation and to mitigate bias (Eisenhard, 1989).

Reliable communication of objectives: Data collection relied on the capability of case study participants and expert interviewees to honestly express their thoughts and opinions throughout the team selection process. Miscommunication or accidental misrepresentation of information is possible when using qualitative data collection techniques such as interviews and open-ended questionnaires.

Sensitive information and fear of negative portrayals: The concern for anonymity may not be sufficient to encourage survey and interview participants to accurately self-report their experience during the team selection processes. Public and private procurement systems both encompass sensitive information and provisions for contract acquisition. Certain data related to team selection may be electively withheld due to privacy concerns and unavailability.

Misuse: Barkley (2006) warns that “best practice” case studies can be misused as justification for support or opposition in a situation lacking the assets and relevance of the particular case study. In this research, the case study project owner possessed considerable resources in terms of expertise and experience—all of which would be critically absent in a scenario with a one-time project owner. To discourage misuse, this research is not intended for generalizations and follows the recommendation of Barkely (2006) to mitigate short comings of a “special case.”

7.4.2. Limitations within Study

An original statement supporting the case study proposition was discarded due to insufficient data. This key assumption was: “The impact of integrated *project management* teams needs to be distinguished from traditional methods and traditional teams, with particular evidence of how the selection process translates into successful team formation and the resulting project success.” This assumption was based on the need to eliminate firms incapable of reconciling hierarchal, dysfunctional and/or fragmented behaviors. However, not enough evidence was found to discuss the relationship between the project management teams and the team selection process. A

number of reasons likely contributed to the unavailability of this data. First, the behavioral expectations for project management teams were difficult to isolate from desirable team dynamics among the entire project team. This is perhaps because an IPD project aims to distribute commensurate authority and accountability to all project team members. The case study data collection techniques did not provide enough access to address all key assumptions in the original conceptual framework.

7.5. Recommendations for Future Research

At the conclusion of this research study, 2 years remained in the case study project schedule. Therefore performance outcomes are not yet available. Comparison of front-end decisions against actual performance are an ample area of future research. Perceived outcomes may be useful for developing performance metrics for future statistical testing. The case study performance outcomes may be particularly of value to future studies that seek a definitive relationship between IPD team selection processes and project performance.

Another area of future research, is to expand the data collection on IPD team selection into the qualifications required for project management team members. In existing knowledge, the construction project manager is often regarded as a principal authority of the project team. However, the functional requirements for project management teams are less clear than the existing knowledge for individual project managers. Even fewer studies identify the project management competencies critical to successfully streamline an integrated project team. Although integrated approaches encourage the relaxation of hierarchal organizational constructs, there is no indication of the obsolescence of the construction project manager. Potentially IPD will increase the demand for alternative project management styles; such as the implementation of integrated project management teams. Therefore it may be of value for future studies to address the composition of integrated project management teams.

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