FACTORS INFLUENCING EFFECTIVE IMPLEMENTATION OF INTEGRATED PROJECT DELIVERY IN PROJECT TEAM ORGANIZATIONS AS AN INNOVATION IN THE AEC INDUSTRY

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ABSTRACT

FACTORS INFLUENCING EFFECTIVE IMPLEMENTATION OF INTEGRATED PROJECT DELIVERY IN PROJECT TEAM ORGANIZATIONS AS AN INNOVATION IN THE AEC INDUSTRY

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In the Architecture, Engineering, and Construction (AEC) industry, integration among parties with different skills who are working on an interorganizational team can improve project performance. Integrated Project Delivery (IPD) as an innovative project delivery method enhances the integration of AEC project teams with a series of strategies that improves team collaboration, creates trust, and shares risks. However, it is not easy to promote an innovative approach that challenges the traditional way. Klein and Sorra (1996) identify the function of team climate and values fit in effective innovation implementation. The literature also highlights the significance of communication in the innovation implementation process. To foster the IPD implementation process so that AEC projects can benefit from such an innovation, this study tests Klein and Sorra's (1996) model and investigates the role of communication in innovation implementation. By employing qualitative content analysis and a case study approach, this research establishes an innovation implementation evaluation system, identifies seven principal factors and five secondary factors influencing IPD implementation, and proposes that a team climate and a communication mechanism can influence facilitation of successful IPD implementation.

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CHAPTER 1 INTRODUCTION

1.1 Overview

The success of built environment projects in the Architecture, Engineering, and Construction (AEC) industry is highly dependent on the coordination of different project parties. An AEC project team consists of multiple organizations with different skills and interests besides their common interests for project success (Taylor & Levitt, 2007). This interorganizational structure naturally contains gaps between the project parties. In addition, traditional contract systems produce obstacles for collaboration and at times even lead to a hostile relationship between different project parties. Although some technology innovations, such as building information modeling—BIM (Azhar, Nadeem, Mok, & Leung, 2008), provide better tools for collaboration, organizational and contractual innovations to improve the process of delivering built environment projects have long been needed.

Integrated Project Delivery (*IPD*), defined as "a relational contracting approach that aligns project objectives with the interests of key participants" (Matthews & Howell, 2005), is a project delivery method recently introduced in the United States to the AEC industry in response to this need. IPD is initiated to address the issues of fragmental and hostile relationships within interorganizational teams and to integrate all participants as a whole team. As in any innovation adoption and implementation, however, IPD has been challenging to many AEC teams in successfully integrating it.

Rogers (1995) posits the idea that the application of innovation includes initiation, adoption, and implementation. Of those, implementation is the critical procedure because many organizations that fail in the implementation process never achieve benefits from the innovation (Klein & Sorra, 1996). Thus, how to implement the innovation effectively is crucial in terms of how much it can contribute to the success of an AEC project.

Klein and Sorra (1996) develop an innovation adoption model and believe that climate/structure for innovation implementation and innovation-values fit contribute to the implementation effectiveness. Additionally, collaboration and communication aspects among teams are highly significant to innovation implementation. Previous research manifests the belief that multiple skills, information sharing, and disagreement resolution mechanisms are critical attributes for a team working on complicated tasks (Kozlowski & Bell 2003; Lafasto & Larson 2001). To perform well on those attributes, team communication is very essential.

The researcher of this study belongs to a research group from Michigan State University (MSU) that is focusing on the topic of innovation implementation in project based industries. The preliminary findings of a previous study by this group indicate that Klein and Sorra's theory about innovation implementation is reliable, although the researchers realize the need for improvement in the model in such areas as coordination mechanism and innovation cultural fit. Specifically in the AEC industry, research findings related to team integration (Korkmaz, Swarup, & Riley, 2011; Pocock et al., 1997; Swarup, Korkmaz, & Riley, 2011) and industry reports (7 Group, 2009; American Institute of Architects [AIA], 2010) identify some influential attributes for the success of a construction project. The MSU research group's preliminary

findings from a case study indicate that IPD's innovative features can improve team collaboration. The group identifies certain influencing factors (e.g., climate, innovation-values fit) in IPD implementation based on Klein and Sorra's (1996) model (Nofera, Korkmaz, & Miller, 2011). Communication aspects (e.g., monitoring, managing, challenging, negotiating) are also believed to be important in effective implementation of innovation in AEC projects (Nofera et al., 2011), according to the MSU group's results. Yet the group finds a gap in this field because there are only a few studies in the literature focusing on the influence of communication on innovation from a theoretical and systematic standpoint. Generally, the MSU group believes it is appropriate to use Klein and Sorra's theory as the starting point to investigate the factors influencing IPD implementation as an innovation in the AEC industry—the subtopic of the whole research on which this study will focus.

1.2 Research Goals and Objectives

Based on the existing literature and the gaps stated above, the goals of this research are (1) to investigate how communication aspects—including managing, monitoring, challenging, and negotiating—contribute to innovation implementation, and (2) to determine how this factor, along with the implementation climate/structure and innovation-values fit, influence IPD implementation as an innovation in the AEC industry. The specific objectives of this research are as follows:

1. Test the revised Klein and Sorra's (1996) innovation implementation model (as shown in Figure 1) via content analysis and describe metrics for its constructs in the context of IPD implementation in AEC teams;

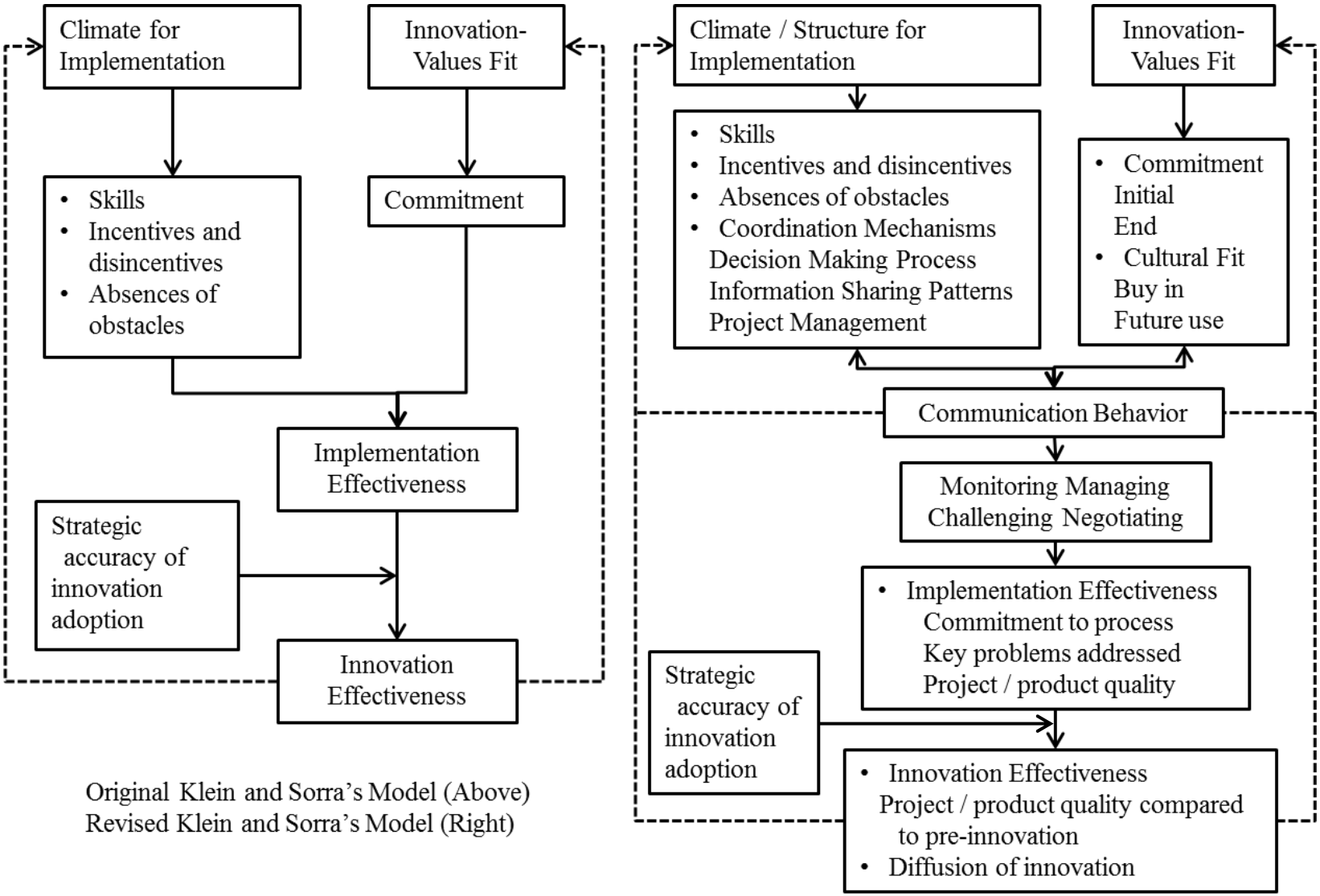


Figure 1 Original and Revised Klein and Sorra's (1996) Model

2. Explore the communication mechanisms in IPD teams and their links to the Klein and Sorra model (1996).
3. Develop propositions to define links among innovation implementation model constructs and communication mechanisms.

1.3 Methods

In general, the researcher employs a qualitative research strategy by conducting a content analysis and a case study. First, an evaluation system is established based on Klein and Sorra's (1996) innovation implementation model and the communication mechanisms proposed by Miller and Korkmaz (2012). A series of metrics is developed to measure the degree of influence for each influencing factor. For each metric, the definition and assessing standards are created. Table 1 Master Metrics for Innovation Implementation Evaluationlists the master metrics used to evaluate the innovation implementation performance of projects. The chapter on methodology presents a more detailed interpretation of the submetrics used in this study.

Table 1 Master Metrics for Innovation Implementation Evaluation

Constructs	Metrics	Description
1. Climate	1.1 Team member skill levels	Select participants with high skill levels or develop participants' skill levels (e.g., previous experience, training, sufficient time for learning and using innovation) (Klein & Sorra, 1996)
	1.2 Rewards	Project team's motivators for pursuing IPD and reward structures adopted (AIA & AIA California Council, 2007)

Table 1 (cont'd)

1. Climate	1.3 Absence of obstacles	Organizations (1) respond to complaints, (2) remove obstacles, or (3) exhibit no obstacles to IPD implementation and function (e.g., clear doubts of participants who are using IPD, provide a good physical climate for team collaboration) (Klein & Sorra, 1996)
	1.4 Coordination mechanisms	Facilitate interdependencies between interorganizational groups (Parmigiani & Rivera-Santos, 2011)
	1.5 Trust	Project team members believe each other (AIA, AIA Minnesota, & School of Architecture—University of Minnesota, 2012)
2. Values Fit	2.1 Commitment	Project participants' willingness to devote time, resources, and energy to IPD process (Klein & Sorra, 1996).
	2.2 Culture fit	How host organization's throughput or organizing processes will match IPD's interactive and integrative principles (Korkmaz, Miller & Sun, 2012).
3. Communication	3.1 Monitor	Project team members vigilantly scan " internal and external environments for information or events that might influence the project" (Korkmaz et al., 2012) and point out problems (Morgeson, DeRue, & Karam, 2010)
	3.2 Manage	Project team members at management level act cooperatively to resolve differences, communicate with other groups, and seek to buffer project from external forces (Druskat & Wheeler, 2003; Morgeson et al., 2010)
	3.3 Challenge	Project team members suggest new ways of completing work and contribute to new ideas (Morgeson et al., 2010)
	3.4 Negotiate	Members spend time discussing issues and use tradeoffs/concessions to devise workable solutions(Meiners & Miller, 2004)
4. Implementation Effectiveness	4.1 Commitment to IPD process	Project participants' willingness to devote time, resources, and energy to IPD projects in future (Reichers, Wanous, & Austin, 1997)
	4.2 Problem addressed	Problems addressed in project by implementing IPD (Tjosvold, Wedley & Field, 1986)
	4.3 Adequate progress	Project is on or ahead of schedule during construction process (i.e., milestone activity is finished on time) (Korkmaz et al., 2012)

Table 1 (cont'd)

5. Innovation Effectiveness	5.1 Project quality	"owner's level of satisfaction with the project characteristics" (Korkmaz, Riley, & Horman, 2010)
	5.2 Cost	Cost performance of project (Korkmaz et al., 2010)
	5.3 Schedule	Schedule performance of project
5. Innovation Effectiveness	5.4 Change order	Number of change orders
	5.5 Safety	Safety issues (i.e., accident, labor injury) occurred on job site
	5.6 Participants' satisfaction	Positive response from major project participants in terms of IPD implementation
	5.7 Sustainability	Sustainable features and/or goals of LEED green building rating system (Brundtland Commission, 1987; USGBC, 2012)

Then content analysis is conducted based on the "IPD Case Study" report (AIA et al., 2012) including 12 successful IPD projects. Each case study is reviewed and the project performance is assessed by employing the evaluation system. Common patterns of those projects related to model constructs and communication mechanisms are identified via the cross-case synthesis approach.

Meanwhile a case study called Project B, in which the project team fails to implement IPD, is conducted. The researcher has access to formal and informal communication records, including face-to-face meetings, conference calls, and email exchanges during the project delivery process to collect longitudinal data for this case study. Longitudinally collected ethnographic case study data and structured interviews with team members enable an in-depth analysis of study constructs via comparisons to the content analysis results.

To ensure quality in the case study, four tests are applied: construct validity, internal validity, external validity, and reliability (Yin,2003). The researcher collects data via multiple paths (i.e.,

various project team member interviews and longitudinal project data) and has informants review their own interview transcripts to establish construct validity. The study uses pattern-matching strategy and cross-case synthesis to ensure internal validity. For external validity, a well-formulated model (Klein & Sorra, 1996) is adopted, mainly to design study metrics and analyze the case study. To guarantee reliability in the data collection process, a case study database is established to make sure the study process is repeatable and also reliable (Yin, 2003). In addition, another researcher is involved to conduct the reliability check during the data analysis process to strengthen data reliability.

Three questions investigated in this study are listed below:

1. Is Klein and Sorra's innovation implementation model (1996) applicable to understanding of AEC team processes of IPD implementation?
2. Which factors foster IPD implementation as an innovation in AEC project teams?
3. What role does communication play in innovation implementation and how does it fit Klein and Sorra's model (1996) in relation to constructs of climate and innovation-values fit?

Finally, the researcher will compare case study results of the failed IPD project with content analysis of successful IPD projects to identify factors influencing IPD implementation. The propositions will provide insights about relations between climate/structure, innovation-values fit, communication constructs, and effective innovation implementation in interorganizational project teams.

1.4 Findings and Deliverables

The deliverables of this study are:

1. An evaluation system to assess the effectiveness of IPD implementation as an innovation,
2. Survey questions to collect data through structured interviews,
3. Detailed quotations and examples that support the assessment of IPD implementation, and
4. Propositions to be tested further in follow up studies.

CHAPTER 2 LITERATURE REVIEW

2.1 Need for Team Integration in the AEC Industry

In the AEC industry, multiple parties with different levels of skills and various interests, in addition to their common goal of success, form a project team (Taylor & Levitt, 2007). Those dissimilarities make it difficult for the project's partners to work closely with each other without conflict of interest. Due to the adversarial nature of the traditional construction contract system, everyone focuses only on one's own job rather than collaborates with other team members due to language restrictions of the contract and a lack of incentive for team integration (Forbes & Ahmed, 2011). Matthews and Howell (2005) point to four systemic problems in traditional construction contracts:

1. Construction parties have less input into design ideas,
2. Innovative and integrative practices are impeded,
3. Lack of coordination in the construction planning system, and
4. Subcontractor's self-preservation mind set.

These problems expose not only the lack of collaboration on AEC teams but also the fact that it hinders construction project success. Pocock (1997) posits that a high degree of interaction on AEC teams as a result of integration could improve project performances, considering the factors of cost growth, schedule growth, contract modifications, and modifications caused by design deficiency. Korkmaz, Riley and Horman (2010) points out that design integration can improve project performance in terms of cost, time, quality, and sustainability. Chinowsky, Diekmann, and Gallotti (2008) emphasize the significance of social collaboration on construction project

teams to achieve high project performance. Swarup (2010) further highlights the influence of communication method, collaboration, and involvement time on a project's level of integration.

2.2 IPD as an Innovation to Address Need for Integration

Bossink (2004) points out four drivers of innovation in the construction industry: environmental pressure, technological capability, knowledge exchange, and boundary spanning. Of those, boundary spanning in particular represents the need for innovation to bridge the gap on interorganizational teams and improve collaboration. So an innovation in project delivery method, imbedded with a new contract system, is urgently needed to build a helpful environment for team integration. Integrated project delivery (IPD) as both a project delivery method and type of relational contract, ties the interests of major project parties together contractually with the project's success, which enhance collaboration of project interorganizational teams and optimize the entire project's performance (Forbes & Ahmed, 2011). Sive (2009) suggests there are five drivers for IPD adoption in construction industry: (a) market demands of predictable project outcomes relying on reliable delivery practices, (b) industry desires of effective coordination (c) technology drivers (e.g., BIM) that improve information sharing, (d) sustainability pressure that need interdisciplinary collaboration, and (e) collaborative working culture as a social trend. In addition, IPD has six innovative features (AIA California Council, 2007):

1. The project team is managed by a group of major stakeholders based on open book management. The major project participants are involved as early as the design phase, and select the trade partners collectively. These strategies improve transparency of project management and enhance trust among interorganizational teams, which in turn provide a good environment for close collaboration.

2. During the design process, certain innovative strategies such as design charrettes, target value design, and set-based design are adopted to allow major project participants to work together on improving constructability of the design and promoting efficiency and reliability in the design process. In this phase, the contractor is involved earlier and integrates with the designer's team to control costs and eliminate the extra procedure of checking constructability.
3. A risk pool is established to release each party from liability and reduce both their individual risk as well as that of the whole project. The risk pool ties the profits of major project participants together and links it to the project success, which encourages all project participants to interact actively and collaborate with each other to reach their common goals.
4. Performance compensation and behavior compensation are used to encourage participants to commit to the project. When project participants are willing to devote time, resources, and energy to the IPD project, obstacles for collaboration and integration are reduced.
5. A good environment for application of information sharing technologies such as Building Information Modeling (BIM) and project documentation management software is provided to enhance the communication process.
6. Relational contracts are employed to improve reliability of the integration.

In applying this innovative approach so that it will contribute to an individual project's success, it is critical to understand how to apply innovation in organizations overall.

2.3 Innovation Implementation in Interorganizational Project Teams

In this section, the literature related to innovation concepts, innovation implementation models, and other contributive factors related to innovation implementation are summarized.

Innovation broadly refers to ideas, processes, or products perceived to be new by individuals or organizations (Rogers 1995; Slaughter 1998). It is significant in the technology, organization, and economic development of many industries. Process-type innovations not only enhance existing workflow practices (Vakola & Rezgui 2000), but also lead to novel and even breakthrough products, so it is particularly valuable for organizations. In a world of rapid commoditization, fast pacing, and fierce international competition, innovation is the only sustainable source of growth, competitive advantage, and new wealth that can keep an organization vibrant (Harris 2003). In the AEC industry, technology innovations such as BIM improve team collaboration by providing advanced tools (Azhar, Nadeem, Mok & Leung, 2008). Organizational and contractual innovations can also foster team collaboration by diminishing personal social obstacles such as cultural boundaries (Davis & Songer, 2009) and owner-driven natures (Arditi, Kale, & Tangkar, 1997). Because every participant of the construction project contributes different skills to the whole team, it is essential to motivate them to adapt, integrate, learn, and accept innovative ideas (Chinowsky & Taylor, 2007).

According to Rogers (1995), there are three general phases in the process of innovation diffusion into organizations: initiation, adoption, and implementation. During the initiation process, an organization realizes the problem, looks for solutions, finds existing innovations, identifies the fit ones, and further chooses to adopt some particular ones. In the adoption phase, the senior

management level decides to adopt one innovation proposed in the initiation phase, and then assigns it to lower level team members (Klein & Sorra, 1996). During the implementation phase, the innovation is appropriately applied in the organization after members have committed to it. Christensen & Overdorf (2000) point out that leadership's perceptions of organizational resource and values, along with the viability of existing mechanisms and products, are the main drivers of the innovation application process. Klein & Sorra (1996) speculate that in organizations applying innovation, failure during the innovation implementation process is the main reason for failure to achieve benefits from the innovative processes or equipment. They identify the main factors influencing innovation implementation effectiveness and develop a model to illustrate the process.

Klein and Sorra (1996) point out that proper organizational climate for innovation implementation and the fit between innovation and organization value are necessary for the effective implementation of innovation. Figure 2 illustrates how, in a good climate for implementation, team members have essential skills to manage and participate in the innovation, identify the incentives to promote and disincentives to remove, and eliminate the structural and procedural obstacles to innovation implementation. Furthermore, a high innovation-values fit will motivate team members to be more committed to the implementation of innovation. These two factors address the problem in implementation effectiveness and further optimize the benefits of bringing innovation to the project.

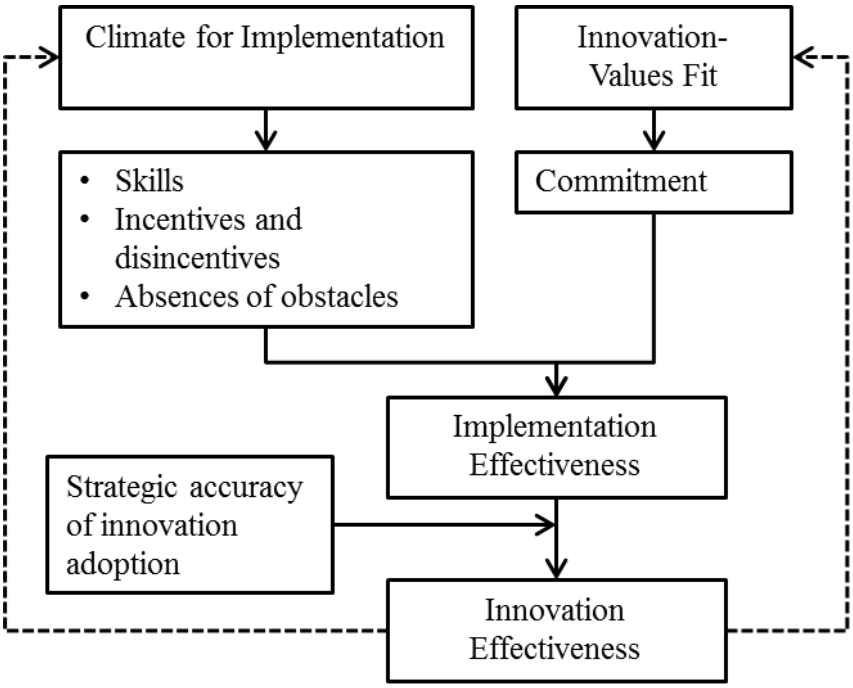


Figure 2 Innovation Implementation Model (Klein and Sorra, 1996)

2.4 Role of Communication in Innovation Implementation and Team Integration

The two factors proposed by Klein and Sorra (1996) are essential but not sufficient to ensure the successful implementation of innovation and the benefits it can add. In an analysis of successful and failed design/manufacturing relationship innovations, Adler (1995) finds it necessary to have intensive coordination among interorganizational team members to develop effective alternative plans and to solve unforeseen problems and disputes. Adler also emphasizes that more coordination is needed as the processes or product results become more complicated. Furthermore, Lewis (2007) highlights the idea that a true "buy-in" of stakeholders requires the communication skills of change agents, who have to tailor messages they send to each stakeholder to ensure their effectiveness. To achieve the buy-in of stakeholders in innovation application, a consensus among the parties of the interorganizational team is needed, which can

be achieved through low efficiency meetings that emphasis equal participation (Lewis, Hamel & Richardson, 2001). They also point out that imposing the idea on stakeholders through a sales blitz is not an effective way to achieve true consensus. Similarly, Higgs and Rowland (2011) observe that message framing behaviors and evidence of supportiveness by organization leaders are necessary to promote the interorganizational teams expect to collaborate but who hesitate to do so. During the collaboration process, team performance is not satisfactory when it relates to coalitions, informal status displays, respect by representatives for each other's goals and processes, holding others accountable for failure to meet deadlines or quality expectations, or obfuscation during decision making (Lewis, Isbell, & Koschmann, 2010). Despite the necessity of structure/climate and values fit, these tools cannot lead to collaboration within or between organizations. Collaboration is therefore an independent factor influencing the effectiveness of innovation implementation.

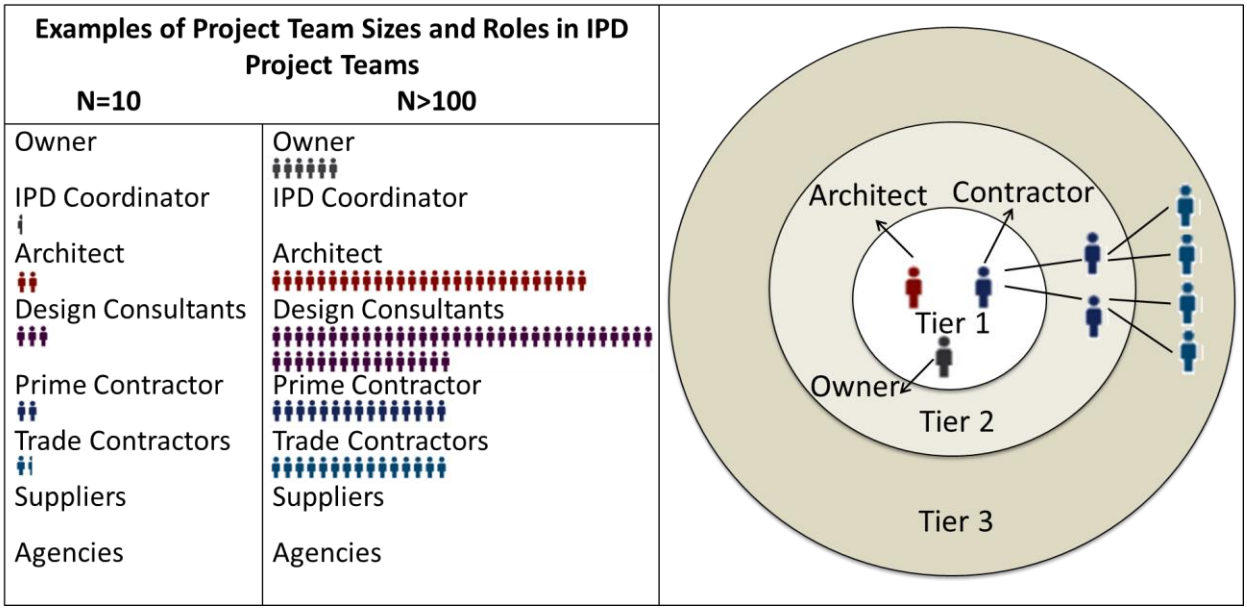
Collaboration is also very important in the AEC industry because project participants rarely have previous connections and it is challenging to get to know one another and cooperate closely in a short period of time. Chinowsky, Diekmann, and Gallotti (2008) argue that project success requires both management of technical components (e.g., schedule, task, resource) and effective collaboration among project participants. Particularly in the AEC industry, the integration and communication of owners, designers, contractors, and suppliers at the interorganization level are as important as for those at the intraorganization level (Pekericli, Akinci, & Karaesmen, 2003).

The interaction manners between members within an organization or among different organizations of a team can impact the success or failure of a project (Di Marco et al., 2010;

Druskat & Wheeler, 2003; Morgeson, DeReu, & Karam 2010). Nofera, Korkmaz, & Miller (2011) show evidence that communication mechanisms relating to conflict management and information flow monitoring play an important role in IPD implementation. The preliminary results of *IPD Case Studies* (AIA et al., 2012) indicate that both a good climate due to the execution of a series of strategies and a high level of collaboration brought about by close team interaction and communication facilitate IPD implementation. Dossick and Neff (2011) comment that innovative communication tools such as BIM can promote team integration, communication effectiveness, and innovation implementation.

In the AEC industry, project team sizes vary depending on project scales. As project scale increases, information exchange among team members can become difficult and complicated due to communication problems related to missing information, misunderstanding the message, and confusion in responsibility distribution (Redding, 1972).

Another problem impeding communication in construction teams is the Tier boundary existing between different levels of members (Nofera et. al., 2011). As shown in Figure 3, members on project teams from different organizations can be categorized into three Tiers. Tier 1 members (including owner, designer, and contractor) form the lead tier with support members who report to them in their home organizations. For example, in a contractor's branch, the project manager of a general contractor (GC), as a Tier 1 member, manages the Tier 2 members who might be the project engineers of the GC or managers of subcontractors. These people are responsible for contacting and managing Tier 3 members, such as suppliers and subcontractors.



For interpretation of the references to color in this and all other figures, the reader is referred to the electronic version of this thesis.

Figure 3 Project Team Roles, Sizes, and Tiers in Construction Projects (Korkmaz et al., 2012)

Three issues come to light when examining boundaries between tiers. First, varying interpretations of *tier* from different members belonging to different tiers increase the difficulty of understanding each other. Meanwhile, time and geographic differences between different tier members complicate coordination (Poole, 2011) and communication. Second, Tier 1-3 members become project stakeholders due to the values they create for the project (Lewis, 2007). In this case, all stakeholders need to have their goals aligned and commit to them to make the project a success. Finally, a coordinator is needed to keep members from different tiers on the same page (Di Marco, Taylor, & Alin, 2010; Likert, 1961; Singh, Verbeke, & Rhoads, 1996). Furthermore, Likert mentions that sometimes a professional coordinator is not enough; coordinators are needed from Tier 2 and Tier 3 members. Consequently, close coordination and communication

are essential across organizational boundaries to implement IPD and any other innovation effectively in such project team organizations.

Thus communication plays a significant role in improving the integration of interorganizational teams, especially in a large scale construction project where team interaction is complicated. The integration will further promote the innovation implementation.

2.5 Innovation Implementation Model

Based on the preliminary findings of an MSU research group regarding the climate for implementation, the structured coordination mechanism related to the decision making process, information sharing mechanisms, and project management plays a role in improving innovation implementation effectiveness (Nofera, et al., 2011). As to innovation-values fit, a good cultural fusion—including the buy-in of stakeholders and their willingness to use the innovation in the future—has a positive influence on innovation implementation (Nofera et al., 2011). In addition, some metrics are provided to assess the implementation effectiveness. These preliminary findings will be further tested in this research.

Meanwhile, several metrics used in *IPD Case Studies* report (AIA et al., 2012) is also valuable for this study. The report identifies five motivators—market advantage, cost predictability, schedule predictability, risk management, and technical complexity—to evaluate the project teams' motivation to pursue IPD. A liability waiver and insurance for IPD, included in the report, act as different forms of rewards and are potential factors influencing the collaborative climate of IPD implementation. In terms of information sharing mechanisms, the following principles,

tools, and strategies are also highlighted in the report: financial transparency, BIM, Lean Construction related tools, early involvement, and colocation. All of these metrics are included and categorized under different submetrics in this study. Based on the literature review, Figure 4 shows the proposed model the researcher will use to start investigation in this study. The bolded elements are the factors proposed by Miller and Korkmaz (2012).

The evaluation system includes five constructs—Climate/Structure, Innovation-Values Fit, Communication Mechanisms, Innovation Implementation Effectiveness, and Innovation Effectiveness—of which three are innovation implementation influencing factors and two are the results of innovation implementation. The definitions of those five constructs follow.

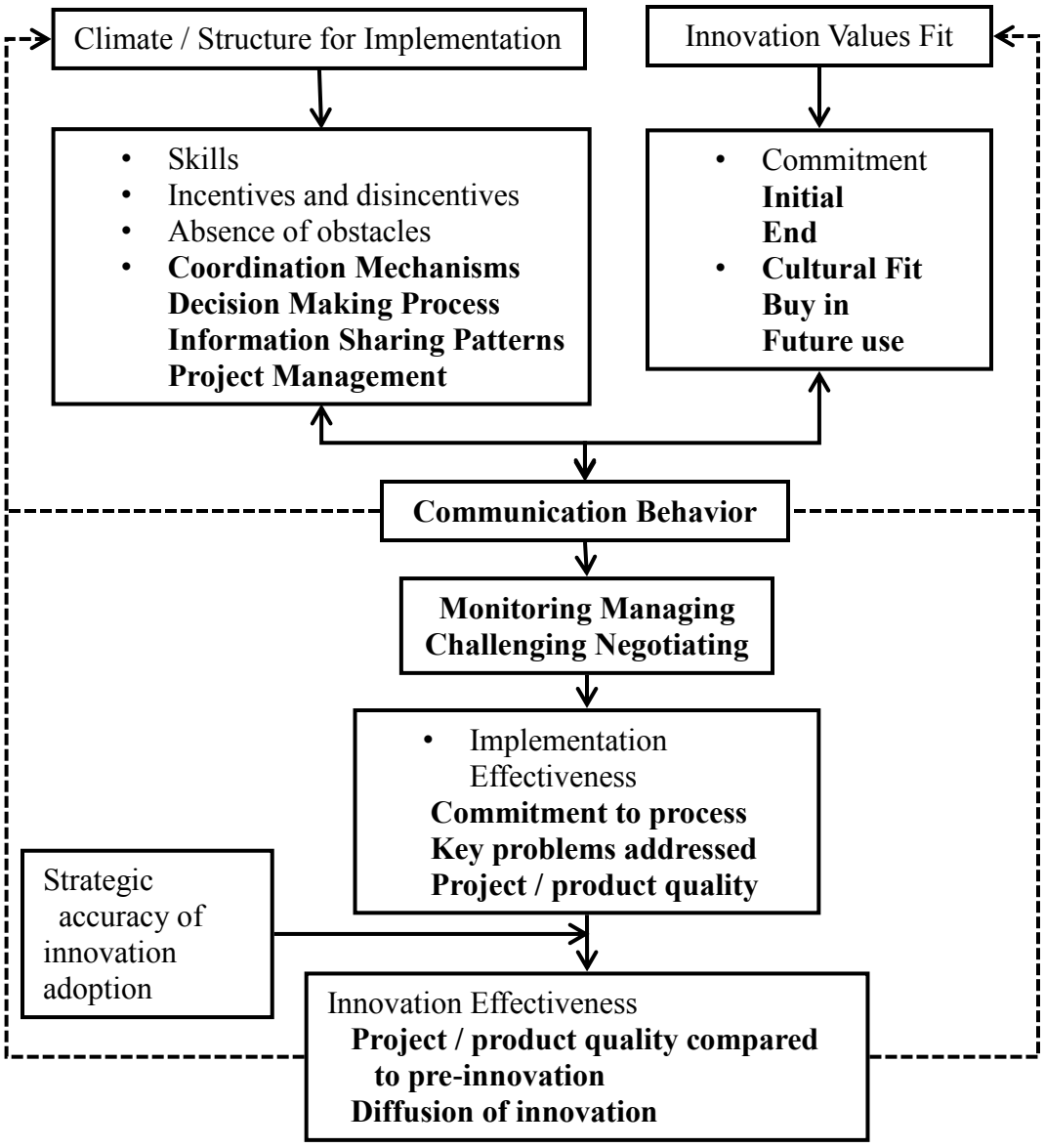


Figure 4 Proposed Innovation Implementation Model (Miller & Korkmaz, 2012) adapted from Klein & Sorra's (1996) model.

2.5.1 Climate

Climate, specifically indicating the innovation implementation climate of an organization, refers to "targeted employees' shared summary perceptions of the extent to which their use of a specific innovation is rewarded, supported, and expected within their organization" (Klein &

Sorra, 1996). *Structure* refers to strategies and policies the organization is making to enhance the climate of innovation implementation. The metrics for Climate are created based on three resources. First, Klein and Sorra (1996) provide three major metrics: Team Member Skill Levels, Rewards, and Absence of Obstacles. Second, the MSU research group emphasizes Coordination Mechanism as also critical in forming a positive innovation implementation climate in the AEC industry. Third, *IPD Case Studies* (AIA et al., 2012) highlights the idea that Trust among interorganizational teams is important for IPD implementation. In addition, the report provides a series of valuable metrics related to IPD. The inclusion of those metrics in the evaluation system makes the system more effective in terms of assessing the IPD implementation as an innovation. All metrics used under Climate are listed in Table 2, along with the description.

2.5.2 Innovation-Values Fit

Innovation-Values Fit refers to "the extent to which targeted users perceive that use of the innovation will foster (or, conversely, inhibit) the fulfillment of their values" (Klein & Sorra, 1996). Klein and Sorra posit that team members' commitment to innovation can reflect whether the innovation fits the organization's values shared by each member. In addition, Nofera, Korkmaz, and Miller find that a good *Culture Fit* also indicates a good innovation-values fit (Nofera et al., 2011). So Commitment and Culture Fit are used as metrics to assess Innovation-Values Fit.

2.5.3 Communication

Communication refers to interaction among members within or between organizations to solve

problems, resolve disputation, and reach consensus collaboratively as a team. Effective communication is significant to innovation implementation based on the literature review, so it is proposed as another influencing factor in innovation implementation. Four communication aspects demonstrated to be critical (Nofera et al., 2011) are used in this study to measure Communication Mechanisms in IPD projects: *Monitoring, Managing, Challenging, and Negotiating.*

2.5.4 Innovation Implementation Effectiveness

Innovation implementation effectiveness emphasizes "behavioral phenomenon" changes caused by the implementation of innovation (Klein & Sorra, 1996). This construct is assessed by *Commitment to IPD process, Problem addressed,* and *Adequate Progress* (Korkmaz et al., 2012).

2.5.5 Innovation Effectiveness

Innovation effectiveness emphasizes the benefits achieved by implementing an innovation successfully. The construct is evaluated by a series of metrics related to the project performance: *project quality, cost, schedule, change order, safety, participants' satisfaction,* and *sustainability* (Korkmaz et al., 2010). Table 2 lists all metrics used in this study, along with their descriptions.

Table 2 Innovation Implementation Metrics

Metrics	Description
1.Climate	
1.1 Team member skill levels	Select participants with high skill levels or develop participants' skill levels (e.g., previous experience, training, sufficient time for learning and using innovation) (Klein & Sorra, 1996)
1.1.1 Major project participants' IPD experience	Previous experience of working on IPD project (AIA et al., 2012).
1.1.1.1 Owner's IPD experience	Owner's experience of working on IPD project
1.1.1.2 Architect's IPD experience	Architect's previous experience of working on IPD project
1.1.1.3 General contractor's IPD experience	General contractor's previous experience of working on IPD project
1.1.1.4 Other major organizations' IPD experience	Other participants' previous experience of working on IPD project
1.1.2 Training	Educational sessions (e.g., IPD orientation, team building activities) provided to improve project participants' skill in using innovation (Klein & Sorra, 1996)
1.1.3 Previous cooperation experience	Previous working experience with participating organizations (owners, architects, engineers, general contractors, subcontractors) on other projects. (AIA et al., 2012)
1.2Rewards	Motivations, financial incentives, or other beneficial that encourage IPD implementation (AIA & AIA California Council, 2007)
1.2.1 Motivators	Motivators that drive project participants to pursue IPD project (AIA et al., 2012)
1.2.1.1 Market advantage	Project participants would like to market themselves as industry leader based on their IPD experience (AIA et al., 2012)
1.2.1.2 Cost predictability	Project has a tight budget and might be difficult to be delivered on or under budget by using traditional delivery method (AIA et al., 2012)
1.2.1.3 Schedule predictability	Project has tight schedule and might be difficult to be delivered on or ahead of schedule by using traditional delivery method (AIA et al., 2012)
1.2.1.4 Risk management	Project has transactional risk because of specific project conditions (i.e., project type, site) that make risk management a critical factor (AIA et al., 2012)

Table 2 (cont'd)

1.2.1.5 Technical complexity	Complicated project that needs a high level of collaboration on expertise by multiple project parties (AIA et al., 2012)
1.2.1.6 Strong motivator	Any of the five motivators above, but initiator feels IPD is only way to deliver project successfully, in terms of difficulties encountered (AIA et al., 2012)
1.2.2 Reward structure	Incentives provided for innovation use and disincentives adopted to avoid adverse factors for innovation use (Klein & Sorra, 1996)
1.2.2.1 Incentives	Incentives provided by owner to motivate project participants to finish project ahead of schedule and/or under budget and/or meeting quality requirement of owner (AIA & AIA California Council, 2007)
1.2.2.2 Risk pool	Potential profits pooled from all contracting parties except owner, who shares project risk (AIA & AIA California Council, 2009)
1.2.2.3 Liability waiver	Contract clauses waive claims and liability between all contracting parties, or "no sue" clause applied to all contracting parties (AIA & AIA California Council, 2007)
1.2.2.4 Insurance for IPD	Insurance products that is designed specifically for IPD project (AIA & AIA California Council, 2007)
1.3 Absence of obstacles	Organizations (1) respond to complaints, (2) remove obstacles, or (3) exhibit no obstacles to IPD implementation and function (e.g., clear doubts of participants using IPD, provide good physical climate for team collaboration) (Klein & Sorra, 1996)
1.3.1 Respond to complaints	Organizations respond to participants' complaints actively (Klein & Sorra, 1996)
1.3.2 Remove obstacles	Obstacles that might hint IPD implementation are removed to make team members participate in IPD implementation easily (Klein & Sorra, 1996)
1.3.3 Exhibits no obstacles	There are no obstacles in the IPD implementation process (Klein & Sorra, 1996)
1.4 Coordination mechanisms	They facilitate interdependencies between interorganizational groups (Parmigiani & Rivera-Santos, 2011)
1.4.1 Decision making system	The existence of interactive procedures that the project team follows to make major decisions (i.e., whether a regular, patterned decision making mechanism is followed and whether decisions are made collaboratively) (Van de Van, Delbecq, & Koenig,1976)

Table 2 (cont'd)

1.4.1.1 Aligned project goals	Project goals that are mutually decided upon and agreed to by all project participants (AIA et al., 2012)
1.4.2 Information sharing mechanisms	Tools that inform participants of project task checklist completion and quality, and routine information sharing behavior (Miller, Johnson, & Grau, 1994)
1.4.2.1 Financial transparency	Open book accounting that allows members at management level to have access to information on estimating and cost (AIA & AIA California Council, 2007)
1.4.2.2 Building Information Modeling (BIM)	Implementation of Building Information Modeling, including process management and software use (Eastman, Teicholz, Sacks, & Liston, 2008)
1.4.2.3 Lean Construction Related Tools	Tools and strategies from Lean Construction principles, which help eliminate waste and improve reliability of the construction process (AIA et al., 2012)
1.4.2.3.1 Last Planner System	Last Planner System (LPS), a strategy used to improve workflow reliability (Forbes & Ahmed, 2011).
1.4.2.3.2 Target Value Design	Target Value Design (TVD), a design strategy that performs the design based on a certain estimate to control project cost and meet owner's requirements for design (Forbes & Ahmed, 2011)
1.4.2.3.3 A3	A3 report: a document fits on a sheet of A3 paper with fixed format to identify problems and provide possible solutions, which helps with efficient decision making (Forbes & Ahmed, 2011)
1.4.2.3.4 A4	A4 report, a standard form used in BIM implementation to help identify issues, root out causes, and find solutions to issues (AIA et al., 2012).
1.4.2.3.5 Choosing by Advantage	Choosing by Advantage (CBA), a system that helps with complex decision making by evaluating the advantage and importance of different alternatives (Suhr, 1999)
1.4.2.3.6 Visual management	A management strategy that uses visual display to improve team communication (Forbes & Ahmed, 2011).
1.4.2.3.7 Daily huddle	A daily short meeting of the project team to align the day's goals (AIA et al., 2012).
1.4.2.3.8 Other tools	Other tools that follow Lean Construction Principles
1.4.3 Confidence in project management	Project team members' confidence about success of project and tolerance of controversy (Tjosvold et al., 1986)

Table 2 (cont'd)

1.4.4 Strategies	Strategies used to improve general climate of innovation implementation
1.4.4.1 Early involvement	Involve contractor and major subcontractors in design phase (no later than design development phase) to perform ongoing estimating and improve design accuracy and constructability (AIA & AIA California Council, 2007).
1.4.4.1.1 Phase of involvement	Phase when general contractors and subcontractors are involved
1.4.4.1.2 Early involvement effectiveness	Function and effectiveness of early involvement
1.4.4.2 Colocation	All major project participants (owner, architect, engineers, major subcontractors) work in large open office to improve collaboration (Ashcraft, 2011)
1.5 Trust	Project team members believe each other (AIA et al., 2012)
2. Values Fit	
2.1 Commitment	Project participants' willingness to devote time, resources, and energy to IPD process (Klein & Sorra, 1996).
2.2 Culture fit	How will host organization's throughput or organizing processes match IPD's interactive and integrative principles? (Korkmaz, et al., 2012)
3. Communication	
3.1 Monitor	Project team members vigilantly scan "internal and external environments for information or events that might influence the project" (Korkmaz, et al., 2012) and point out problems (Morgeson et al., 2010)
3.2 Manage	Project team members at management level act cooperatively to resolve differences, communicate with other groups, and seek to buffer project from external forces (Druskat & Wheeler, 2003; Morgeson et al., 2010)
3.3 Challenge	Project team members suggest new ways of completing work and contribute to new ideas (Morgeson et al., 2010)
3.4 Negotiate	Members spend time discussing issues and use tradeoffs / concessions to devise workable solutions (Meiners & Miller, 2004)
4. Implementation Effectiveness	
4.1 Commitment to IPD process	Project participants' willingness to devote time, resources, and energy to IPD projects in the future (Reichers et al., 1997)

Table 2 (cont'd)

4.2 Problem addressed	Problems addressed in project by implementing IPD (Tjosvold et al., 1986)
4.3 Adequate progress	Project on or ahead of schedule during construction process (i.e., milestone activity finished on time) (Korkmaz et al., 2012)
5. Innovation Effectiveness	
5.1 Project quality	The owner's degree of satisfaction with the project characteristics (Korkmaz et al, 2010)
5.1.1 Turnover quality	Difficulty of project's turnover to owner (Konchar & Sanvido, 1998)
5.1.2 System quality	Quality of building system (Konchar & Sanvido, 1998)
5.1.3 Overall quality	The degree of project team's satisfaction with the project outcomes (Korkmaz et al., 2010)
5.1.4 Owner's satisfaction with cost	Owner's degree of satisfaction with cost performance of project (Korkmaz et al., 2010)
5.2 Cost	Cost performance of project
5.2.1 Perceived cost performance	Participants' perception of cost performance (Konchar and Sanvido, 1998)
5.2.2 Actual cost growth	Project's actual cost performance (Konchar and Sanvido, 1998)
5.3 Schedule	Schedule performance of project
5.3.1 Perceived schedule performance	Participants' perception of schedule performance (Konchar and Sanvido, 1998)
5.3.2 Actual schedule growth	Project's actual schedule performance (Konchar and Sanvido, 1998)
5.4 Change order	The exercise of a contractual power to unilaterally direct changes in the work (AIA, 1987)
5.5 Safety	Safety issues (i.e., accident, labor injury) occurring on job site (Korkmaz et al., 2010)
5.6 Participants' satisfaction	Positive response from major project participants in terms of IPD implementation
5.7 Sustainability	Sustainable features and/or goals of LEED green building rating system (Brundtland Commission, 1987; USGBC, 2012)

The literature review above highlights the function of communication in team coordination. How it contributes to effective innovation implementation, though, and what the relationship is between it and implementation structure/climate and innovation-values fit will be investigated more deeply in this study.

CHAPTER 3 METHODOLOGY

3.1 Introduction

The literature review reveals that IPD has the innovative features that can foster team collaboration, which is urgently needed in the current AEC industry. In addition, one study indicates that effective innovation implementation, as the critical point of innovation success, is related to implementation structure/climate and innovation-values fit (Klein & Sorra, 1996). The literature indicates that collaboration and communication also play an important role in innovation implementation, especially in complicated projects involving a variety of organizational tiers. However, the literature is lacking in two main areas: (1) There is insufficient evidence to assist in understanding the mechanisms of innovation implementation in the AEC industry, and (2) Communication's role in innovation implementation is largely unexplored. This study will act as a stepping stone to fill that gap by responding to the following research questions:

1. Is Klein and Sorra's innovation implementation model (1996) applicable for understanding the AEC teams' processes of IPD implementation?
2. Which factors foster IPD implementation as an innovation in AEC project teams?
3. What role does communication play in innovation implementation and how does it fit Klein and Sorra's model (1996) in relation to climate and innovation-values fit constructs?

To answer these questions, this study performs a content analysis of *IPD Case Studies* (AIA et al., 2012) and an in-depth case study analysis. Figure 5 demonstrates the process map followed in this study.

3.2 Research Objectives

The specific objectives of this research are:

1. Test Klein and Sorra's (1996) innovation implementation model via content analysis and describe the metrics for its constructs in the context of IPD implementation on AEC teams;
2. Explore communication mechanisms in IPD teams and their links to the Klein and Sorra model (1996); and
3. Develop propositions to define links among innovation implementation model constructs and communication mechanisms.

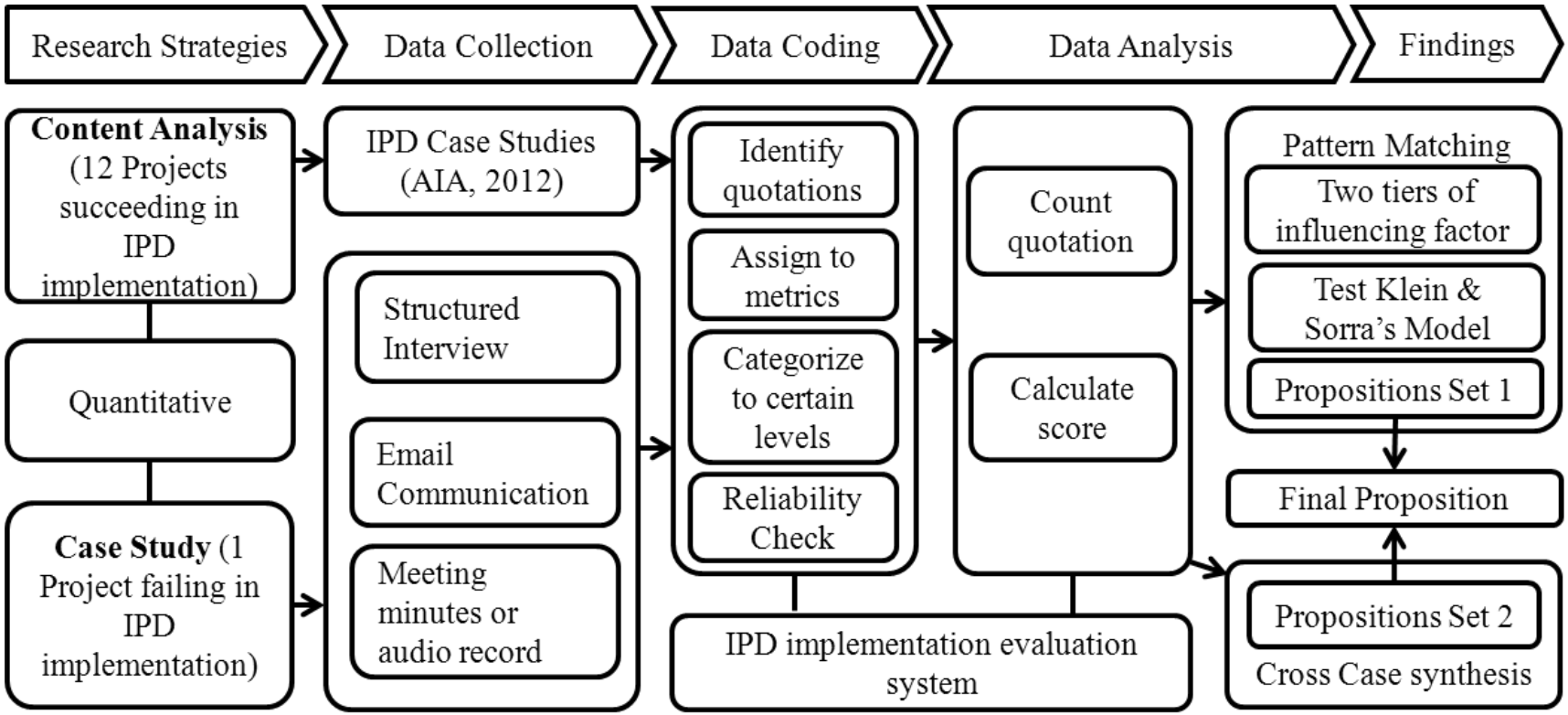


Figure 5 Research Process Map

3.3 Research Approach

There are five research approaches used in social science: experiment, survey, archival analysis, history, and case study (Yin, 2003). Different approaches can be used to investigate different types of research questions. Survey and archival analysis approaches can be used to examine the research question "what." The experiment, history, or case study approach can be used to investigate the research question "how." The survey approach usually needs a large sample for statistical analysis, yet it is difficult to gain access to a large amount of IPD projects, considering their limited number and the limited research time for this study. The researcher realizes some IPD case studies has already been conducted by other organizations, which can provide good material for archival analysis to identify factors influencing IPD implementation as an innovation. Content analysis as a method of archival analysis is an appropriate and effective way to analyze archived data. As an example, Jordan and Javernick-Will (2012) present a content analysis of journal articles from the last 10 years focusing on disaster journals and successfully identify the indicators of disaster recovery and resilience from the perspectives of "engineers, social scientists, practitioners and economists." Similarly, it is feasible for this project to perform a content analysis of an IPD case study report to identify the factors influencing IPD implementation via climate, innovation-values fit, and communication mechanisms.

Among the three approaches that can be used to identify the question "how," the experiment approach is not appropriate here because the research objects are construction projects over which the researcher does not have control. Additionally, since the researcher can collect more information by observing the project delivery process and interviewing project participants instead of using historical documents, a case study is a better approach for this research.

Furthermore, findings from the case study can be compared with findings from content analysis. Any common patterns will make the conclusion stronger. Taylor, Dossic, and Garvin (2011) point out that in the construction engineering and management field, case study is an effective approach when it provides appropriate research questions, analysis details, and validity and reliability, all of which is explained in the data quality section. In summary, this study will use content analysis and case study approaches to explore the answers to the research questions.

3.3.1 Choice of Research Strategy

Quantitative method relies on mathematical technique to analyze data collected through a large number of surveys or questionnaires; qualitative method uses an approach such as interview or ethnographic means to investigate the behavior, attitude, and experiences of participants (Dabbs, 1982). Although the quantitative method is more popular because it has a number based nature, is easy to set up clear goals, and is less time consuming, qualitative method has its own advantages as another valid research approach. Qualitative method can deeply interpret, analyze, and test data to reveal a potential relationship and principles, some of which cannot be achieved by using quantitative method (Patton, 2002).

The aim of this study is to analyze how certain attributes (e.g., structure/climate, innovation value fit, and communication aspects) influence innovation implementation and the reasons causing this to happen. The qualitative analysis method is helpful for discovering specific patterns by conducting case study and content analysis. Through qualitative data analysis, the structured interviews conducted for the case study project provide details about the performance of the interorganizational team and problems arising during the IPD process from the

perspectives of the owner, the architect, and the contractor. When performing quotation analysis, qualitative analysis enables the researcher to investigate either best practices or lessons learned, reflected by each single quotation, and to make the number of quotations under each metric more meaningful. This approach provides a deeper understanding of the projects that succeed or fail in IPD implementation. Furthermore, the comparison between the features of successful IPD projects in the content analysis and the failed project in the case study can reveal factors that influence effective implementation of IPD, which is an advantage when applying both content analysis and a case study approach at the same time.

3.3.2 Data Quality

To ensure the quality of the case study, four tests are employed in the design of the case study (Yin, 2003): construct validity, internal validity, external validity, and reliability (shown in Table 3).

As to construct validity, research data are collected from multiple project participants via different paths (e.g., emails, meetings, interviews). The interview transcripts are sent back to the interviewees for confirmation. Several constructs—such as the climate/structure of organization, innovation-values fit (Klein and Sorra, 1996), and communication mechanisms—are used to investigate the innovation implementation effectiveness in AEC project teams. Pattern matching and cross-case synthesis are used to ensure internal validity. More specifically, cross-case synthesis is used in the content analysis cases to identify common features of the cases; pattern matching is used to compare content analysis results and case study results to identify the factors that influence IPD implementation.

Table 3 Case Study Design Tests

Tests	Case Study Tactic	Action in This Study	Research Phase
Construct Validity	Use multiple sources of evidence	Interview with multiple project participants	Data Collection
	Have key informants review draft of case study report	Have interviewees review the transcripts	Composition
Internal Validity	Pattern matching	Match patterns of case study with content analysis	Data Analysis
	Cross case synthesis	Identify common features shown in different cases in content analysis	Data Analysis
External Validity	Use theory in single case studies	Use one critical case to test and extend well-formulated model	Research Design
Reliability	Develop case study database	Establish a case study documentation storing system	Data Collection

(Adapted from Yin, 2003)

As to external validity, one critical case study and twelve case study content analysis are conducted to test Klein and Sorra's (1996) innovation implementation model and explore a new role of communication aspects in the model. In terms of reliability, a case study database is developed to organize the case study documents. All raw data and coded data are saved under certain categories (e.g., interview audio records, email communication). Furthermore, another researcher performs a reliability check to ensure data are coded accurately without bias. To measure reliability, the percentage of agreement is calculated. In addition, Cohen's Kappa (Cohen, 1960) is also used as a pilot indicator on two metrics as an example. Cohen's Kappa (Cohen, 1960) is an interrater reliability index used to assess level of agreement in a qualitative study. It is considered more robust than the percentage-of-agreement method because chance agreement is measured. Here is the formula used to calculate Cohen's Kappa (Cohen, 1960):

$$\kappa = \frac{\Pr(a) - \Pr(e)}{1 - \Pr(a)}$$

Where Pr (a) is the observed agreement among raters, and Pr(e) is the hypothetical probability of chance agreement. κ equal to 1 means a complete agreement and κ equal to 0 mean there is no agreement except for agreement by chance. In research, κ equal to 0.6 or 0.7 represents a good reliability on agreement (Wood, 2007).

3.4 Data Collection Procedure

This section summarizes the data collection procedure in this study. Steps for establishing an evaluating system, and data collection tools and processes are explained.

3.4.1 Metrics for Data Collection

To reach the research goal, an innovation implementation evaluation system is developed for the IPD project content analysis and case study. The five constructs in the evaluation system are Climate/Structure, Innovation-Values Fit, Communication Mechanisms, Innovation Implementation Effectiveness, and Innovation Effectiveness. There are 59 submetrics developed under those 5 constructs, based on a variety of literature. The literature review chapter has a detailed explanation about how the five constructs are selected and how all metrics are defined. In addition to metrics, general project information is also collected based on the following categories if they are available: project name, type, size, project cost, location, contract type, project start time, initiation party, LEED certification intended, LEED certification achieved. This information enables the cross-case synthesis to be conducted based on different characteristics of IPD projects.

After all metrics are created, the next step is to identify a way to measure each metric: First, a measuring standard is established for each of the metrics.

Then, based on that standard, three levels are created for each metric: positive, neutral, and negative. Each level meets the standard to a different extent, with positive being the highest, neutral in the middle, and negative the least. In other words, the positive level quotations meet the standards strictly with the support of detailed description or examples; the neutral level quotations either do not fully comply with the standard or have only very brief descriptions without supporting descriptions or examples; and the negative level quotations do not meet the standard. This evaluation system is used to categorize quotations from content analysis cases and the case study for further analysis.

For example, the established standard for one of the metrics, "commitment," is: to what extent project participants are willing to devote time, resources, and energy to the IPD process. The evaluation requirement for this metric at a "positive" level is: very willing to devote time, resources, and energy to the IPD process. Additionally, the case needs to be supported by description and/or examples. For a "neutral" evaluation, the researcher needs to detect: very willing to devote time, resources, and energy to the IPD process, but without description and/or example, or somewhat willing. For a "negative" evaluation: the researcher needs to detect unwillingness to devote time, resources, and energy to the IPD process. If no information is provided, the case will be put in the "not given" category under the metric of "commitment." The metrics description and measuring criteria table is attached in Appendix A.

3.4.2 Selection of Content Analysis and Case Study

Content analysis focuses on IPD project case study reports published by other organizations. Thus, data to be collected are previous IPD case study reports. The researchers use the Internet to search for detailed and authoritative case studies from industry or academic organizations. Among the three case study reports located, *IPD Case Studies* (AIA et al., 2012) is the latest, published in March 2012. It is developed by AIA, AIA Minnesota, School of Architecture, University of Minnesota, and includes 12 IPD projects—the most found in all three reports—with wide project size and geographic range. This report updates information in the five case study report done by the same organizations in 2011, creates one more case study and includes six case studies developed by the AIA California Council. The case studies from different authors help to avoid subjective bias by any single author. At the same time, the case study format is consistent, which will provide better analysis. Therefore, *IPD Case Studies* (AIA et al., 2012) is used for content analysis in this study.

Regarding selection of case study, the criteria are that it should be an IPD project by contract on which the researcher can interview project participants and collect longitudinal data for analysis. Based on these criteria, a small scale sustainable demonstration office building project located in a Midwest state of the United States is selected. The project team agrees to share all communication data, including audio records and minutes of face-to-face meetings, conference calls, and emails with the researcher, who is also able to interview four major participants of the project. The project team decides to give up IPD, however, and use Construction Management (CM) at risk during the detailed design phase. Four interviews are conducted right after IPD is abandoned. In this case, findings from the case study will investigate reasons for the failure of

IPD implementation and further identify influencing factors in IPD implementation and any relationships between them by comparing with the successful implementation in content analysis.

3.4.3 Data Collection Tools

For the case study, a database is established to store and organize all data collected from the IPD project. In the database, the researcher creates separated folders for email communication files, meeting minute files, meeting audio record files, and interview audio record and transcript files.

For the structured interview, after collecting general information on the project (e.g., size, type, and location) and the interviewee (e.g., position, contact information), interview questions are developed aimed at the five constructs, based on similar metrics in the innovation implementation evaluation system. Because the structured interview questions are developed before the content analysis is started, metrics derived from the case study report are not included in the questions.

For the Climate/Structure section, questions are asked about team member skill levels, reward structures, participant obstacles, and coordination mechanisms, which include decision making system, information sharing patterns, and confidence in project management. For the Innovation-Values Fit section, questions are asked about project participants' commitment to the project and cultural fit (Klein & Sorra, 1996). For the Communication Mechanisms section, questions are asked about team performance in terms of managing, monitoring, challenging, negotiating, and integrating. For the Innovation Implementation Effectiveness section, questions are asked about

innovation implementation and project success (Innovation Effectiveness). Innovation implementation includes team members' commitment to IPD process, and the problems addressed and progress achieved because of IPD application. Project success is assessed by factors of project quality, cost, schedule, change order, safety, participant satisfaction, and project sustainability. Because the case study project had not been completed, very limited feedback is provided in terms of Innovation Effectiveness. Consequently, Implementation Effectiveness and Innovation Effectiveness are both put under the same section, but can be separated into independent sections for future research. The structured interview questions are attached in Appendix B.

3.4.4 Data Collection Process

Once the researcher decides to use *IPD Case Studies* (AIA et al., 2012) for content analysis, the data are in hand and ready for analysis. For the case study, data are collected via structured interviews and ethnographic communication records. The research is approved by Institutional Review Board (IRB) of Michigan State University before the data collection process starts. Two types of consent forms are submitted to IRB for interview data and ethnographic data. The interview data consent form informs the participants they will be involved in a structured interview, lists the types of questions they will be asked, and requests permission to make an audio recording of the interview. The ethnographic data consent form asks project participants for permission to use communication records that might include information such as their names and project related actions. The researcher obtains consent from participants for the entire data collection process. These two consent forms are attached in Appendix C and Appendix D respectively.

For the structured interview, the researcher schedules a time with the major project contacts (i.e., owner, designer, general contractor and design supplier) for face-to-face or phone interviews. Each interview takes about one hour, during which participants answer questions about innovation climate/structure, innovations-values fit, communication mechanisms, and implementation effectiveness. The interviews are audio recorded, with participant consent. Then the researcher transcribes the data from the audio record to written documents, which are emailed to participants to ensure the transcripts do not change their original meaning. The analysis does not start until participant confirmations are received.

For communication records, the researcher collects longitudinal data on one IPD project. After receiving consent from major project participants, the researcher is copied on all email communications among project participants and can attend and audio record all meetings and conference calls to collect data. The researcher also has access to any meeting minutes for data collection purposes.

3.5 Data Coding Procedure

Structured interview data and communication records data for the case study, along with content analysis data, are coded for further data analysis. The aim of the data coding process is to quote the contents (e.g., comments, descriptions from project participants, facts and conclusion from case study report) of the collected data and assign them to the correct category (i.e., positive, neutral, negative, and not given) of the metrics to which they belong.

The researcher uses ATLAS ti.—a qualitative data analysis software— to code data collected from interviews and emails in the case study, and from the report for content analysis. This procedure makes data coding and literature quoting easier and the analysis process more efficient and accurate (ATLAS ti., 2012).

In Atlas ti., the researcher creates two families in which to save content analysis data and case study data, establishes a coding system based on the evaluation system developed earlier, quotes the data under each code, and assigns the level to which they belong. Figure 6 shows the interface of Atlas ti. during the quoting process. Paragraphs on the left side are parts of the primary document needing to be coded. The contents on the right side are codes. The vertical bars indicate the range of the quotation that belongs to a certain code. The color of code font and the bar are matched with each other. The researcher selects the sentences, "By feeding information into an interactive design process, design ideas can be tested against costs. Besides controlling costs, the TVD provided an important benefit by placing control of design and its cost with the architect; this ensured design ideas were not unreasonably diluted or compromised." They are coded under the "Target Value Design" metric. Furthermore, the researcher can mark the level to which the quote belongs in the comment area of the quotation.

3.6 Data Analysis Methods and Process

After coding, the coded quotations are exported into a Word file for a reliability check. Percentage of agreement for all collected data is calculated, and Cohen's Kappa (Cohen, 1960) for two metrics are calculated as an example.

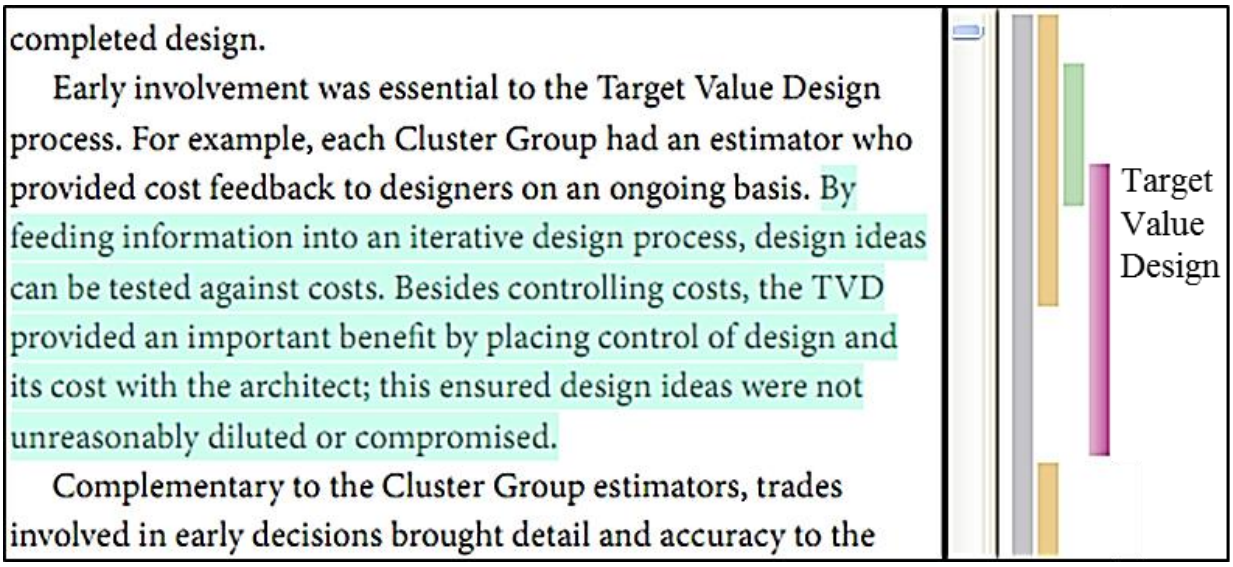


Figure 6 Screenshot of Atlas ti illustrating the process of coding quotations.

Quotations going through the reliability check are transformed into an Innovation Implementation Evaluation Table in an Excel spreadsheet to calculate the scores based on the number of quotations for each case under a certain level of certain metrics. Pattern matching and cross-case synthesis are used to analyze the scores. First, the researcher uses pattern matching to identify: (a) the factors influencing IPD implementation based on the score values, (b) the score difference between the content analysis projects (i.e., the ones that successfully implemented IPD) and the case study project (i.e., that dropped the IPD method). Based on the findings, the researcher tests the revised Klein and Sorra (1996) model and proposes relationships between the model constructs. Findings from an analysis of email communication records are used to support the principal factors. Second, by using a cross-case synthesis approach, the researcher compares the scores of those 12 successful IPD projects and highlights their common features. Propositions are developed based on the findings from both pattern matching and cross-case synthesis.

3.7 Summary

Chapter 3 emphasizes the goals and objectives of this research and introduces the methodology used—content analysis and case study. In the data collection process, project participants' views of IPD implementation as innovation are collected via structured interviews, and team communication records are received. Quantitative analysis is used in for data analysis. Meanwhile, strategies of pattern matching and cross-case synthesis are applied to ensure quality in the research data analysis.

CHAPTER 4 DATA COLLECTION, CODING, AND ANALYSIS

This chapter introduces the detailed data collection, coding, and analysis process for the content analysis and case study. Data quality measures and the reliability check process and results are presented.

4.1 Data Collection

4.1.1 Content Analysis

The raw data for the content analysis are *IPD Case Studies* developed by AIA, AIA Minnesota, School of Architecture—University of Minnesota (AIA et al., 2012). The public case study report, which can be downloaded from the AIA website, is the latest one available, with the largest amount of case studies published by authoritative organizations in the AEC industry. The report includes 12 IPD projects, among which five cases are updated from 2011 by the same organizations, one new case is added, and six cases are from the "Integrated Project Delivery: Case Studies" report published by AIA and AIA California Council in 2010 (AIA et al., 2012). For the five updated cases, the report includes survey results based on responses of 127 participants (AIA et al., 2012). The relatively large number of cases from different sources increases the study's quality. At the same time, however, it brings challenges to the analysis process. The amount of information varies from case to case, ranging from 4 to 13 pages for each case. This situation increases the difficulty of using the cross-case synthesis process for data analysis. The researcher uses a formula to standardize the data to make it comparable. For data coding purposes, the report is separated into 12 independent PDF files for convenient analysis.

4.1.2 Case Study

4.1.2.1 Background of the Case Study Project

The researcher interviews four participants of the construction project used as a case study in this research. Following is a brief introduction to the project. Coded as Project B, the project is a small scale (5400 sf.) office building located in City A in a Midwest state (State A). The owner wants the building to be a sustainable high performance office that demonstrates the sustainable material and technology used. The building provides space for the owner's organization, other tenants, and a summer university class.

The project is designed by an Architecture firm from City C in State A, which has worked with the owner for a long time and maintains a good relationship. The contractor is a middle sized construction company from City B in another Midwest state. The interior design supplier is a large company in City D of State A. Among these four major participants, only the owner and architect have previous cooperation experience. In terms of IPD experience, three participants do not have IPD experience before this project, while the design supplier had done several IPD project.

The architect is on board first. To reduce the project cost, the owner would like to look for corporate contributions from suppliers. The design supplier promises to donate a large amount of materials on condition of implementing IPD in this project. Although the owner is not familiar with IPD, after considering the material support and the potential benefits of IPD on marketing and project delivery, the owner agrees to use IPD in this project. Then the owner, the architect,

and the design supplier have a meeting and select the contractor for this project based on qualification.

Following the design supplier's suggestion, the owner hires an external IPD consultant and then the team holds a two-day kick-off meeting in City B to give an IPD orientation and plan the project delivery process as well. By the time of the kick-off meeting, however, the conceptual design is almost completed. As an IPD project, the contractor is not involved early enough. After the meeting, the team members are excited and want to commit to the IPD process. Now that the project is going, however, several issues emerge and are not resolved appropriately. Around three months after the kick-off meeting, the owner decides to quit IPD, change the contractor, and use the construction management (CM) at risk delivery method to finish the project.

Although it does not implement IPD successfully, the project is still very valuable for investigating the factors that influence IPD implementation and achieving the research objectives of this study. The following sections introduce the data collection process for both the case study and the content analysis.

4.1.2.2 Institutional Review Board (IRB) Approval

This study involves human subjects in structured interviews and other data collection processes (e.g., collecting emails, audio recording of meetings), so the researcher submits an IRB application and achieves the approval of Michigan State University's IRB. Before the researcher conducts the structured interview and observes and/or records the group meeting, the human

subjects participating in this research are asked to sign the consent form giving their permission for collecting and using the data.

4.1.2.3 Conducting Structured Interviews

Right after the owner decides to give up IPD, the researcher schedules interviews with the four project participants—owner, architect, contractor and design supplier. Before starting the interview, the researcher asks for permission to audio record the interview. During each interview, which lasts about one hour, the researcher first collects basic information about the project and the interviewee, and then asks questions related to those five constructs—Climate, Innovation-Values Fit, Communication Mechanisms, Innovation Implementation Effectiveness, and Innovation Effectiveness. The methodology chapter describes how the interview questions are developed and what questions are asked under each category. The interview with the owner is conducted face to face and the others are done via telephone. All four interview records are manually transcribed into text and saved as a Microsoft Word file. The files are sent back to the interviewees to confirm that the transcripts have not changed their original meaning. All audio and test data are stored in the case study database.

4.1.2.4 Collecting Longitudinal Data

For research purposes, the researcher also collects longitudinal data—including email copies, records, or minutes of face-to-face meetings and conference calls—during the three-month period when the project team implements IPD. With permission of the project team, the

researcher receives copies of email communications on a daily basis. By the end of the IPD period, the researcher receives 138 emails sent among project team members. To save the record for further data coding and analysis, the emails are organized in a Microsoft Excel spreadsheet and then transferred to Microsoft Word and Adobe PDF documents.

4.2 Data Coding for Content Analysis and Case Study

After the researcher finishes collecting the data for content analysis and the case study, the data coding process starts. The objectives of data coding in this study are (1) quoting the information found in the collected data, which is related to the metrics developed for innovation implementation assessment, (2) link them to the relevant metrics, and (3) categorize them to the performance level (i.e., Positive, Neutral, Negative, and Not Given).

To achieve the objectives efficiently, the researcher uses Atlas ti.—a qualitative data analysis software—to code the data. In Atlas ti., all information about one project is stored in a project file called Hermeneutic Unit (HU). Under each HU, there are six subunits with different functions: families, primary documents, codes, network, quotes, and memos. Figure 7 illustrates this study's data coding process in Atlas ti. *Families* allows the user to group the documents or codes of the same category. Two document families are established for this study: Content Analysis and Case Study. *Primary documents* is the space to store all data documents for a project. The researcher adds 12 case documents under the Content Analysis family, and 4 interview transcripts documents and the email communication record under the Case Study family. Under the *Code* function, a series of metrics is created to categorize quotations. To help understand the hierarchical levels of the metric system, the researcher establishes a metric

network to clearly identify the level and position a particular metric belongs to. In total, there are 59 metrics achieving quotations directly without any submetrics under them. *Quotes* is where quotations are saved. The researcher reads the content, selects sentences or paragraphs, and assigns them to the metrics to which they are related. Then those sections are saved as quotations under Quotes. For each quotation, the researcher adds category level information as comments based on predefined standards. The *Memo* function, in which users can take notes as reminders, is not actively used in this study. If one quotation is related to several metrics at the same time, it will be quoted under all those quotations. After finishing the entire quoting and categorizing process, the data coding under Atlas ti. is complete. The researcher exports the quotations to text files for reliability check and data analysis.

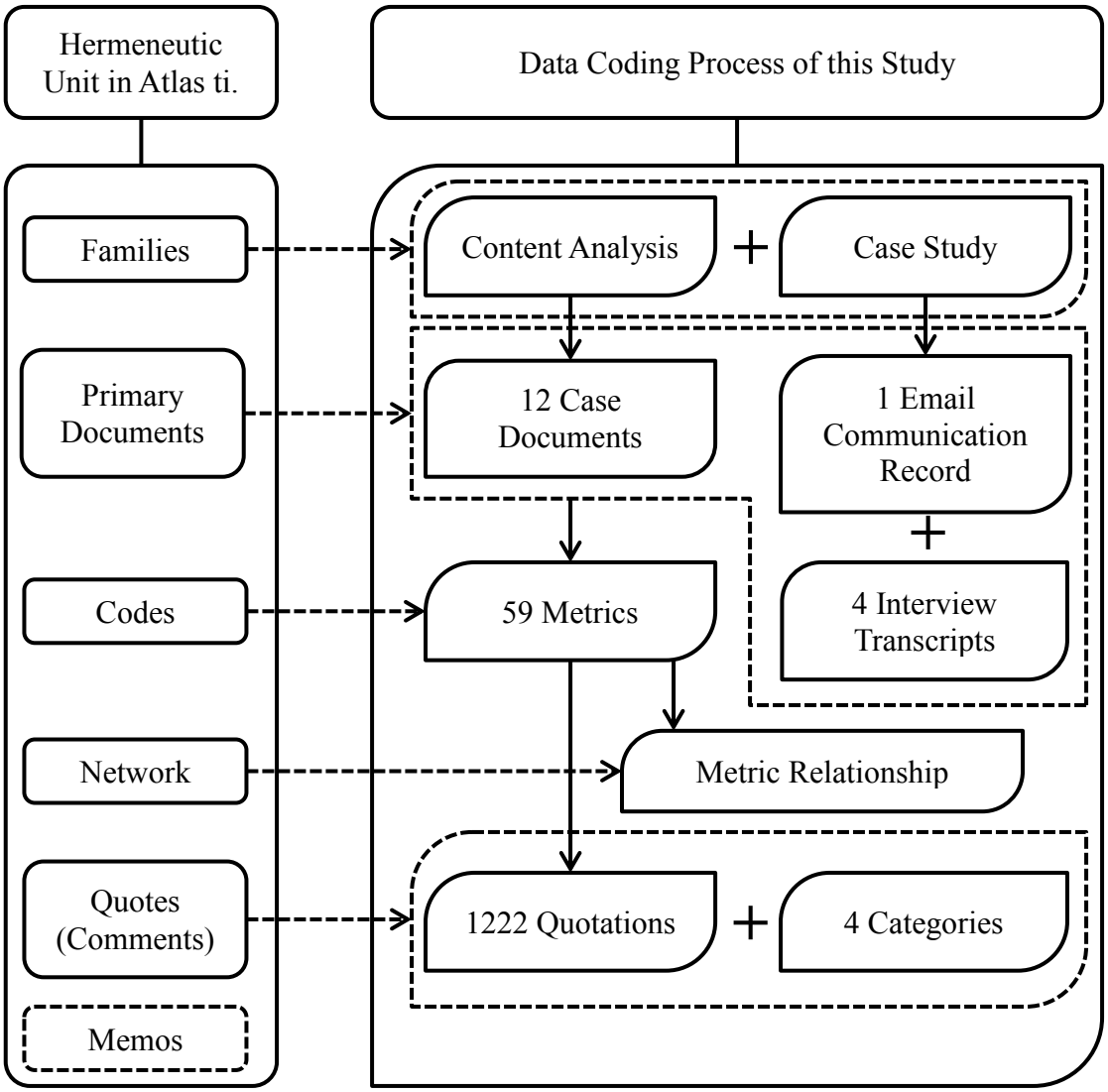


Figure 7 Data Coding Process in Atlas ti.

In the exported document, Atlas ti. provides document, quotation numbers, and a location code for each quotation so the researcher can easily track the source of the data with or without Atlas ti. To maintain data confidentiality, all personal and sensitive information (e.g., people's name, company name, location, etc.) in the case study export documents is coded.

The following example demonstrates the procedure described above.

1. The researcher reads the transcript document from the interview, with the general contractor added under Case Study Family and finds the following sentence talking about good trust existing in the project team:

"There was absolutely no lack of trust among the team members. (Name of owner's project manager) does extremely well. I wouldn't say that I trust anyone any more or any less."

2. The researcher selects it, codes it as "Trust," and puts "G" in the comment area representing the "Positive" level. The level name is modified from "Good" to "Positive" after the data coding process. Similarly, "Poor" is modified to "Negative," while "Neutral" is kept the same. After exporting the document and coding the sensitive information, the quotation is presented as following:

"P16: Structured interview with Contractor .pdf - 16:21 [There was absolutely no lack o..] (7:2481-7:2624) (Super)

Codes: [Trust]

No memos

There was absolutely no lack of trust among the team member. OPM1 does extremely well. I wouldn't say that I trust anyone any more or any less.

Comment:

G"

The quotation means that the author “Super” (default name) codes the sentence as a “Positive” level under the metric “trust” and it is Quotation #21 located on the seventh page of Primary Document 16 “Structured interview with Contractor,” a PDF file. As can be seen, the name is coded as “OPM1” (owner’s project manager #1).

4.3 Data Quality

These sections describe several methods the researcher uses to reduce error, avoid bias, and increase data coding reliability.

4.3.1 Reducing Sampling Error

This study uses cases with large diversity in both content analysis and case study in an effort to reduce the bias caused by sampling. The 12 IPD projects included in the report for content analysis are located in 11 cities of 9 states distributed evenly across the United States. The project sizes range from 878,000 square feet to 7,000 square feet. The cases also cover different building types—including healthcare facility, office building, higher education building, and government project—within the scope of new construction, building extension, and interior renovation. The location of the case study project is also different from those of the cases above. The high diversity of the cases builds the foundation of a convincible conclusion.

4.3.2 Avoiding Respondent Bias

To avoid respondent bias, the researcher collects data from various sources. For content analysis, the 12 cases are written by two different organizations; for case study, the researcher interviews

4 project participants and collects email communication among 30 individuals. Multiple data sources provide more comprehensive data and avoid the bias caused by using a single data source.

4.3.3 Performing Reliability Check

After completing the data coding process in Atlas ti., another researcher (Researcher 2) helps the first researcher (Researcher 1) to perform the reliability check. Researcher 1 is a graduate student in construction management, who is knowledgeable about construction management strategies and the IPD implementation process; Researcher 2 is a graduate student studying organizational communication, who is familiar with communication and interaction mechanisms of organizations.

Because of time limitations, Researcher 2 reviews the coded documents finished by Researcher 1, rather than coding the quotations independently, and compares the results. Then the two researchers discuss the quotations on which they have conflicts. The basic rules followed in the disagreement resolution are to express their understanding of the quotation and explain the reasons why they want to keep or change the current coding based on the standard defined for each metric in the innovation implementation assessment system. After discussion, the researchers reach consensus on all disagreements, of which there are six types:

1. Add more content for a quotation (quotation level);
2. Delete content part or the whole quotation (quotation level);
3. Change performance level within a metric (metric level);
4. Add more metric(s) for a quotation (metric level);
5. Delete metric(s) for a quotation (metric level) and

6. Change metric category of quotation (metric level).

Quotation level disagreements focus on whether or not the contents should be quoted, while metric level disagreements focus on which metrics the quotations should be categorized under. In total, there are 24 disagreements on 1025 quotation level quotations (since every quotation is different), which means the percentage of agreement is 97.7% under the quotation level. At the metric level, there are 257 disagreements on 1226 metric level quotations. Quotations belonging to multiple metrics are counted as the number of metrics to which they belong, which means the percentage of agreement is 79.0% at this level.

As mentioned in the methodology chapter, Cohen's Kappa (Cohen, 1960) is a more robust way to measure the reliability in qualitative analysis because it considers the possibility that the agreements are reached by chance. Besides the general information categories, there are 59 basic level metrics, each of which has three levels. Theoretically, in this case, there are 177 possibilities for coding each quotation, a number so large as to be unrealistic to calculate. So the researchers decide to choose two pairs of metrics about which they have the most or moderate disagreement, and calculate Cohen's Kappa (Cohen, 1960) for that specific situation to demonstrate the application of Cohen's Kappa (Cohen, 1960) and check reliability from a different angle.

The researchers decide to choose "culture fit" for the first situation and "last planner system" for the second situation. They count the number of quotations on which they agree belong and do not belong to a certain metric, and the number of quotations on which they disagree belong and do not belong to the same metric. Then the researchers perform the same process for both the

"culture fit" metric and the "last planner system" metric. After calculation, Cohen's Kappa (Cohen, 1960) on "culture fit" is 0.91, and 1 on "last planner system." Considering the results of both percentage of agreement and Cohen's Kappa (Cohen, 1960), in general, the coding results have a high reliability.

The reliability check provides not only the measurement for data coding reliability, but also increases the reliability by using revised quotations after making the changes agreed upon by both researchers.

4.4 Data Analysis for Content Analysis and Case Study

Continuing from the reliability check descripted in the last chapter, the data analysis process aims to find out the quantity of the quotations and employ an appropriate scoring system to assess the performance of each project under the constructs. Figure 8 demonstrates the general process of data coding and data analysis.

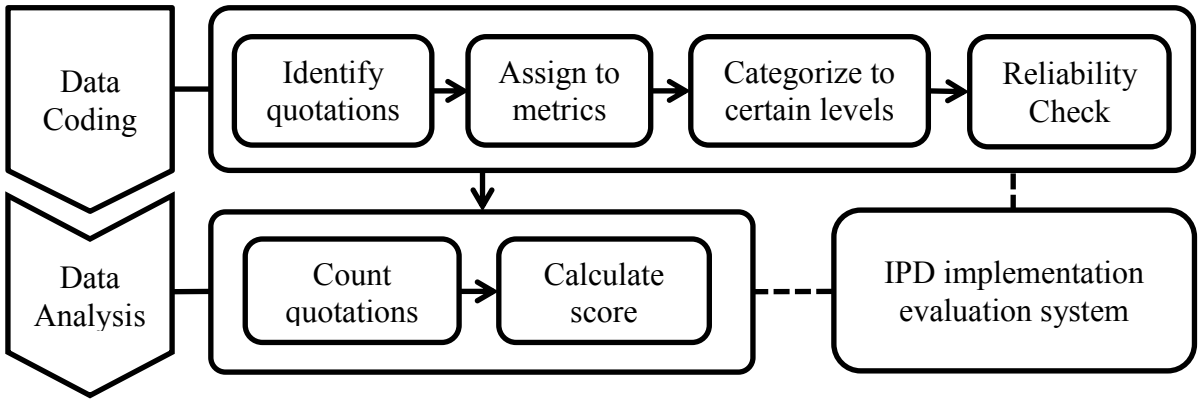


Figure 8 Data Coding and Data Analysis Process

4.4.1 Quotation Quantity Management

After the reliability check, the researcher transfers all quotations into an Excel spreadsheet, where each quotation is stored in the specific cell based on the project it comes from and the level of certain metric it belongs to. Figure 9 is a snapshot of the Excel spreadsheet. Metrics are listed vertically and projects are listed horizontally, each of which has four different categories (i.e., positive, neutral, negative, and not given) under. Each cell is coded to distinguish them from one another easily. Cells for the "positive" level are green, "neutral" are yellow, "negative" are red, and "not given" are blue.

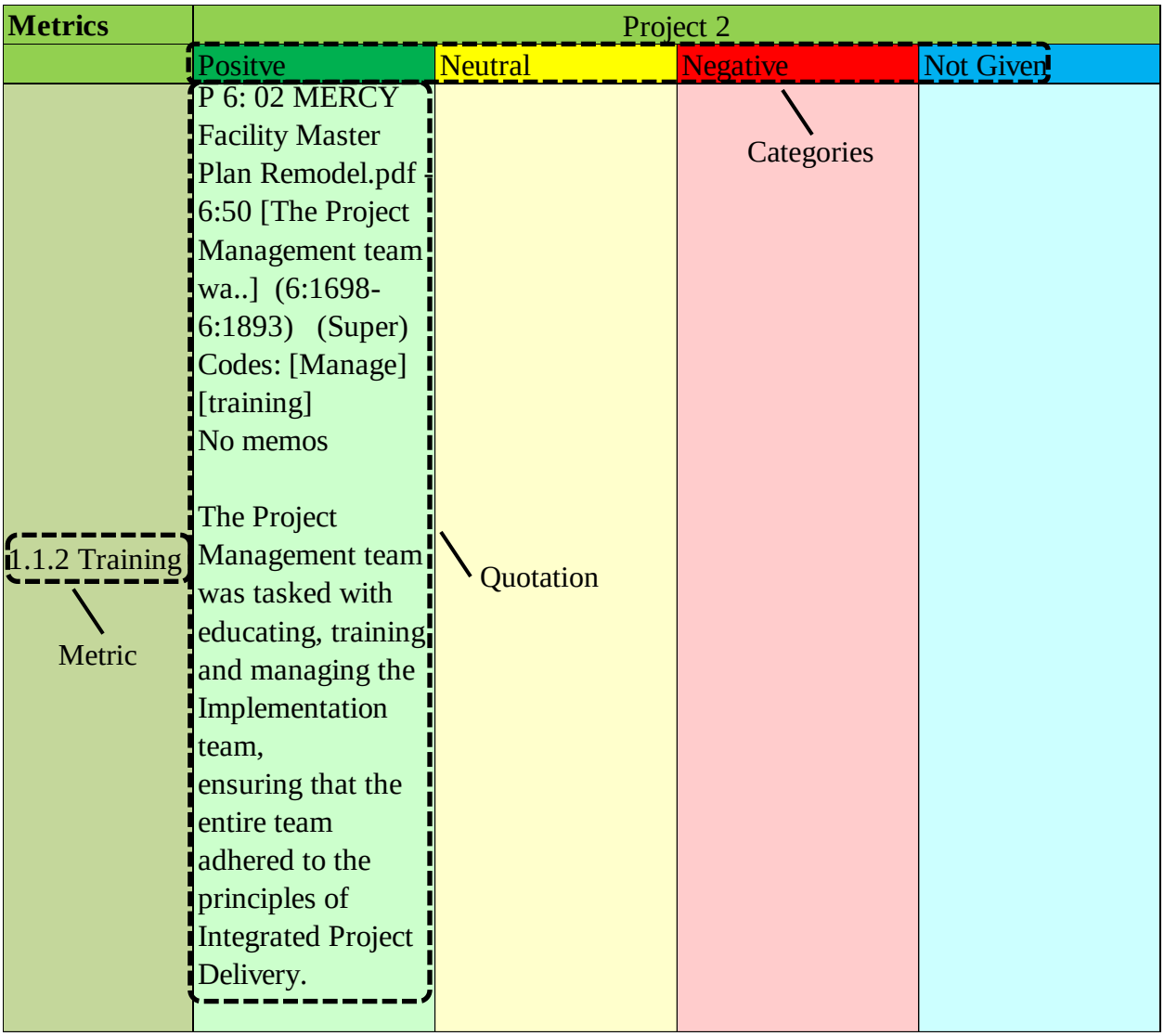


Figure 9 Snap shot of Quotation Management Excel Sheet

For instance, the researcher has a quotation below:

"*P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:50 [The Project Management team wa..]*

(6:1698-6:1893) (Super)

Codes: [Manage] [training]

No memos

The Project Management team was tasked with educating, training and managing the implementation team, ensuring that the entire team adhered to the principles of integrated Project Delivery."

Because this quotation from Project 2 of the content analysis is coded on a "positive" level under both "training" and "manage," the researcher puts it in the cell for Project 2's positive "training" quotations. The same quotation will also be placed in the corresponding cell for "manage."

After transferring all quotations for the content analysis and case study to an Excel spreadsheet, the next step is removing repetitive information. The data coding process is responsible only for identifying and categorizing quotations, so it is possible the same content is mentioned several times in different quotations. Since it is necessary to remove the repetitive data, every quotation has different meanings even though there are several quotations under the same level of metric. For content analysis, there are two situations in terms of the metrics: (1) reflecting a fact that can be answered easily by "Yes" or "No"(e.g., team member's IPD experience) and (2) reflecting the project participants' perception of the project performance, which is assessed by extent (e.g., culture fit). In the first situation, as long as there is at least one quotation under a certain level, quantity is counted as "1." For example, five quotations mention the IPD experience of the general contractor in Project 1 positively, so they count only as 1. In the second situation, every quotation is counted, as long as it does not reflect the metric from exactly the same angle as other quotations. For example, in Project 2, among all three quotations under "manage" –"neutral," two mention the three-level team structure, so the total number of quotations counts as 2. For Project B used as a case study in situation two, if quotations with repetitive information come

from different interviewees, all of them are counted because they represent the perception of different project participants. Based on the principles above, the quotations are counted and the result is shown in Appendix E.

Based on the quotation quantity of the content analysis and case study, the researcher plots a diagram (Figure 10) to illustrate the quotation quantity under each construct. The blue line with a diamond mark represents the total quotation quantity of content analysis, the red line with a square mark represents the average quotation quantity of content analysis, and the green line with a triangle mark represents the quotation quantity of Project B for the case study. The vertical axis represents the number of quotations and the horizontal axis represents the metric numbers. The metric name each number represents is listed in Table 4 (e.g., M 1 represents the metric "owner's IPD experience"). Comparing the quotation quantities of the content analysis and case study, the total number of quotations for the 12 projects in the content analysis is much larger than for Project B in the case study on most metrics. The number of quotations per project in the content analysis, however, is similar to that for Project B. On some metrics,—such as "remove obstacles" (M 18), "culture fit" (M 39), and "commitment" (M 40)—Project B has more quotations than the average number in the content analysis. In addition, Table 4 indicates that quotations are not distributed evenly among all metrics. For example, in the content analysis, metrics such as "BIM" (M 24), "commitment" (M 40), and "manage" (M 42) have more quotations. Similarly, in the case study, "remove obstacles" (M 18), "commitment" (M 40), and "manage" (M 42) have more quotations. Therefore, an evaluation system is necessary to calculate standardized scores so that project performance can be assessed without the impact of quotation distribution. The "Score Calculation" section will introduce a formula to solve this

problem. As to the quantity of quotations located in each construct, the diagram shows that for both the content analysis and the case study, the influencing constructs—climate, innovation-values fit and communication mechanism—appear in large numbers among the quotations, while the performance constructs—implementation effectiveness and innovation effectiveness—have far fewer quotations. The small quantity of the performance constructs might make it difficult to identify patterns in cross-case synthesis analysis.

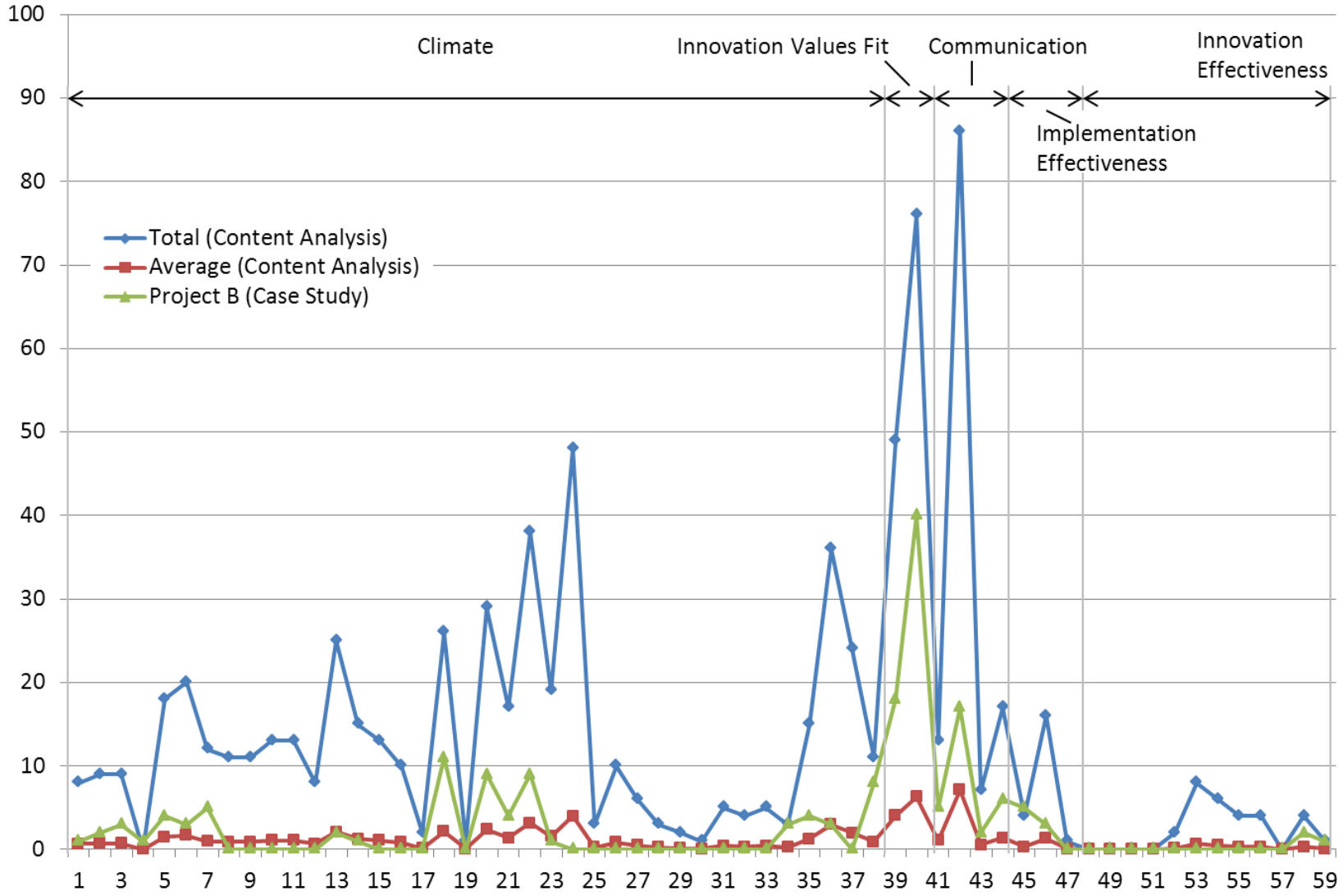


Figure 10 Quotation Distribution per Each Construct for Content Analysis and Case Study

Table 4 IPD Implementation Evaluation Metric Index

#	Metrics	#	Metrics
1	1.1.1.1 Owner's IPD experience	31	1.4.2.3.6 Visual management
2	1.1.1.2 Architect's IPD experience	32	1.4.2.3.7 Daily huddle
3	1.1.1.3 General Contractor's IPD experience	33	1.4.2.3.8 Other Tools
4	1.1.1.4 Other major organizations' IPD experience	34	1.4.3 Confidence in project management
5	1.1.2 Training	35	1.4.4.1.1 Phase of Involvement
6	1.1.3 Previous Cooperation Experience	36	1.4.4.1.2 Early Involvement Effectiveness
7	1.2.1.1 Market Advantage	37	1.4.4.2 Colocation
8	1.2.1.2 Cost Predictability	38	1.5 Trust
9	1.2.1.3 Schedule Predictability	39	2.1 Commitment
10	1.2.1.4 Risk Management	40	2.2 Culture fit
11	1.2.1.5 Technical Complexity	41	3.1 Monitor
12	1.2.1.6 Strong Motivator	42	3.2 Manage
13	1.2.2.1 Incentives	43	3.3 Challenge
14	1.2.2.2 Risk Pool	44	3.4 Negotiate
15	1.2.2.3 Liability Waiver	45	4.1 Commitment to IPD process
16	1.2.2.4 Insurance for IPD	46	4.2 Problem Addressed
17	1.3.1 Respond to complaints	47	4.3 Adequate Progress
18	1.3.2 Remove Obstacles	48	5.1.1 Turnover Quality
19	1.3.3 Exhibits no obstacles	49	5.1.2 System Quality
20	1.4.1 Decision making system	50	5.1.3 Overall Quality
21	1.4.1.1 Aligned Project Goals	51	5.1.4 Owner's satisfaction to cost
22	1.4.2 Information sharing mechanisms	52	5.2.1 Perceived Cost Performance
23	1.4.2.1 Financial Transparency	53	5.2.2 Actual Cost Growth
24	1.4.2.2 Building Information Modeling (BIM)	54	5.3.1 Perceived Schedule Performance
25	1.4.2.3 Lean Construction Related Tools	55	5.3.2 Actual Schedule Growth
26	1.4.2.3.1 Last Planner System	56	5.4 Change Order
27	1.4.2.3.2 Target Value Design	57	5.5 Safety
28	1.4.2.3.3 A3	58	5.6 Participants' Satisfaction
29	1.4.2.3.4 A4	59	5.7 Sustainability
30	1.4.2.3.5 Choosing by Advantage		

To identify the quotation quantity of different levels, another two diagrams (as shown in Figure 11 and 12) are plotted for the content analysis and the case study, respectively. Figure 11

indicates that for content analysis, most metrics appear in the largest numbers among the positive quotations, less-neutral quotations and least-negative quotations. The horizontal axis represents the metrics (metric names are listed in Table 4) and the vertical axis represents the quotation quantity based on the content analysis.

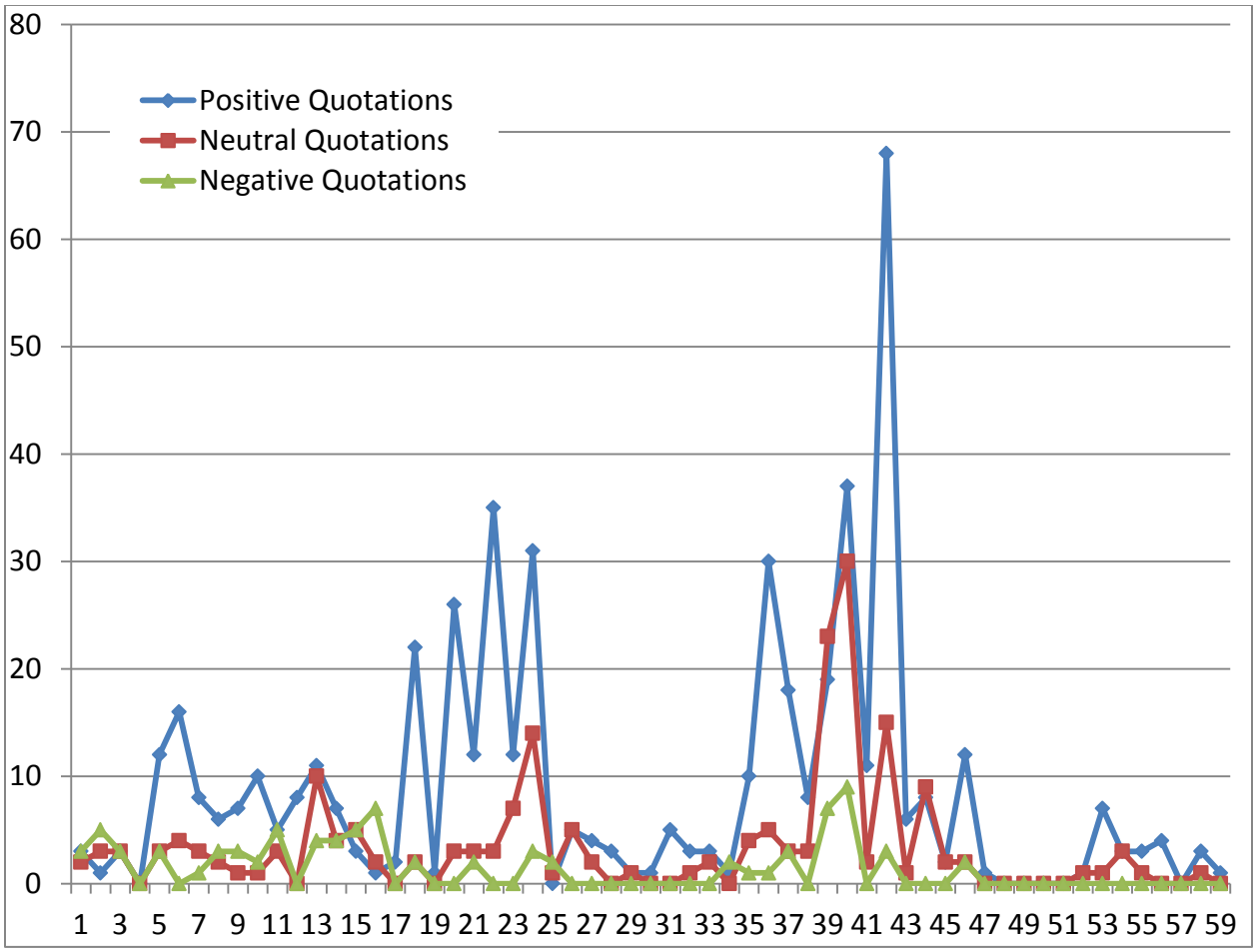


Figure 11 Quantity of Different Level Quotations in the Content Analysis

However, for the case study, as shown in Figure 12 (metric names for the horizontal axis are listed in Table 4), the number of neutral and negative quotations are higher than those of the positive quotations on many metrics. In addition, there are very limited quotations for the two

performance constructs (Metric 45-59), which indicates that Project B does not perform very well on Climate, Innovation-Values Fit, and Communication constructs composed of potential influencing factors (Metric 1-44).

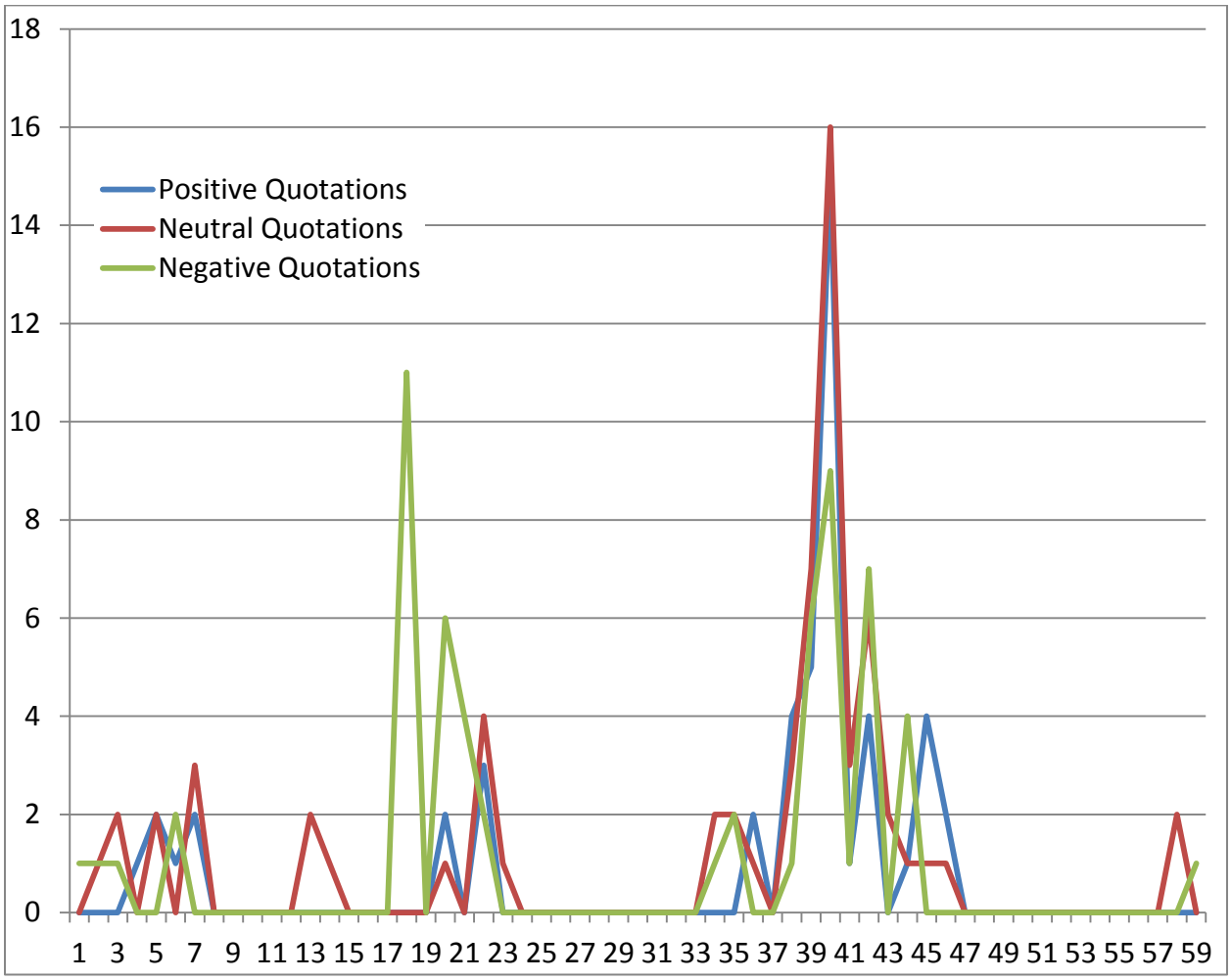


Figure 12 Quantity of Different Level Quotations in Case Study

For projects in both the content analysis and the case study, it is difficult to identify clearly the project's performance on each metric due to the quotation quantity difference among the metrics. Therefore, standardized scores are calculated and in Chapter 5, the researcher will analyze the

project performance on the metrics for the content analysis projects and the case study project more thoroughly.

4.4.2 Score Calculation

After organizing the quotation quantity, the researcher uses the formula below to standardize assessment of the IPD implementation performance:

$$S = \frac{3a + 2b + c}{2(a + b + c)}$$

Where *S* is score achieved, *a* is number of positive quotations, *b* is number of neutral quotations, and *c* is number of negative quotations.

The formula uses 2 points as baseline and assigns 3 points to positive quotations, 2 points to neutral quotations, and 1 point to negative quotations. It turns the quotation quantity under each metric into a score range from 0.5 to 1.5, which avoids the uncertain score range caused by various numbers of quotations, making the score comparable among metrics and projects. If there is no quotation for a certain metric (i.e., $a = b = c = 0$), the denominator will become zero and the formula will not be applicable. In this situation where information is missing, 1 point is assigned to the project on that specific metric, assuming that the project has a neutral performance on that metric.

Based on this score system, for a particular metric, if a project achieves 1, it means that the project performs neutral on that metric; if the score is from 1 to 1.5, it means the project performance is good on that metric; if the score is from 0.5 to 1.5, it means the project

performance is poor on that metric. In sum, the higher the score is, the better the project performs.

What makes the situation complicated is the setting of neutral quotations. When the number of positive quotations is larger than the number of negative quotations, the inclusion of neutral quotations decreases the score. When the number of positive quotations is smaller than the number of negative quotations, the inclusion of neutral quotations increases the score.

There are two different approaches to treat the neutral quotations—including neutral quotations and excluding neutral quotations. Each approach has its advantage in different situations. In the following paragraphs, two hypothetical examples are provided to demonstrate the two situations. First, it is reasonable to include neutral quotations because, when taken together with other quotations, they illustrate the comprehensive performance of a project, especially when there are decent among of quotations.

For example, as shown in Table 5, Project X has five positive quotations, three neutral quotations, and two negative quotations; Project Y has five positive quotations, zero neutral quotations, and two negative quotations. If neutral quotations are considered, Project X's score (1.15) is lower than Project Y's score (1.21) because it achieves only 50% of positive quotations compared to Project Y's 71.4%. If neutral quotations are excluded, the scores of the two projects will each be 1.21, which does not show the influence of neutral quotations on the overall project performance of a specific metric.

Table 5 Comparison of including and excluding neutral quotations (1)

Situations	Positive	Neutral	Negative	Score (Including Neutral)	Score (Excluding Neutral)
Project X	5	3	2	1.15	1.21
Project Y	5	0	2	1.21	1.21

Second, excluding neutral quotations also has value, considering the fact that some metrics have limited quantities of quotations for the calculation. For example, as shown in Table 6, Project X has three positive quotations, one neutral quotation, and zero negative quotations; Project Y has one positive quotation, zero neutral and negative quotations. Although Project X has more positive quotations than Project Y, its score (1.38) is lower than Project Y's score (1.50) due to the one neutral quotation it has. It can still be explained as Project Y has a higher percentage in terms of the positive quotation quantity, however—for this study, under some extreme situations where the quotation numbers are very low—this score cannot reflect the performance accurately. Excluding neutral will make Project X and Project Y both achieve 1.5, which can mitigate the inaccuracy of the score.

Table 6 Comparison of including and excluding neutral quotations (2)

Situations	Positive	Neutral	Negative	Score (Including Neutral)	Score (Excluding Neutral)
Project X	3	1	0	1.38	1.5
Project Y	1	0	0	1.50	1.5

Based on the example, the "including neutral quotations" approach has a larger scope of application than the "excluding neutral quotations" approach. Furthermore, if the quotation quantity for a specific metric is extremely small, the score calculated is less important and the conclusion drawn from that score is less convincing. So the research won't focus on those scores.

Therefore, the limitations of the first approach are further reduced. Consequently, in this study the researcher calculates the score under both situations but only continues in the first situation—including neutral quotations—to analyze further and to generate findings. Scores for both the content analysis and the case study are calculated and attached in Appendix F. The score calculation and analysis for the other situation is attached in Appendix G.

4.5 Summary

This chapter introduces data collection, coding and analysis processes, and methods to improve data quality. The author gives some background for the content analysis projects and the case study project. After introducing Project B as the case study, the author describes how to conduct structured interviews and gather email communication data for the case study. The data coding process presents detailed steps for coding the data for the content analysis and case study. Then the author mentions three strategies to ensure data quality. Finally, the data analysis section introduces quotation counting and score calculation. The next chapter will focus on the findings achieved based on the data analysis.

CHAPTER 5 FINDINGS

Chapter 5 presents two of the three deliverables in this study: (1) an IPD implementation evaluation system and (2) supporting quotations and examples for the system. The researcher will describe the findings obtained from the content analysis and the case study. A series of factors influencing IPD implementation is identified. Observations of email records and meeting minutes further support the findings.

5.1 Content Analysis Findings

5.1.1 Overview

The report used for content analysis focuses more on the implementation process of IPD, rather than on the results of project performance. In the report, all projects are described in terms of "legal and commercial strategies," "management strategies," "social strategies," and "workplace and technological strategies" used to improve IPD implementation. According to the report, generally among all 12 projects, these strategies enhance team collaboration and make the project delivery process more efficient than other project delivery methods. Therefore, although some projects are still under construction and there is relatively less information about the project performance in terms of such things as cost, schedule, quality, or safety for most projects, all of them are considered to have implemented IPD successfully.

As to contracts for these projects, nine out of twelve projects use a relational contract. Three projects are not able to use it because of local government regulations or the owner's restrictions. Despite the lack of legal strategies, the project teams implement IPD successfully by strengthening other strategies.

5.1.2 Score Performance of Metrics

The researcher calculates the average score of all content analysis projects to identify the average performance of successful IPD projects on each metric. The average score per metric is listed in Table 7, with metrics recorded in two categories: influencing constructs (i.e., climate, innovation-values fit, and communication mechanisms) and performance constructs (i.e., implementation effectiveness and innovation effectiveness). Metrics are ranked by ascending order of the scores. The metric numbers are given for the convenience of checking scores in Figure 13, presented in Chapter 6. In influencing constructs, the top five metrics on which the projects achieve high scores (based on at least 20 quotations for each metric) are: information sharing mechanisms, decision making system, manage, early involvement effectiveness, and previous cooperation experience. This finding means the 12 projects perform well on these five metrics on average.

Table 7 Average Score of Content Analysis Projects per Metric

Influencing Constructs		
No.	Metrics	Score*
22	1.4.2 Information sharing mechanisms	1.43
20	1.4.1 Decision making system	1.42
42	3.2 Manage	1.34
36	1.4.4.1.2 Early involvement effectiveness	1.34

Table 7 (cont'd)

6	1.1.3 Previous cooperation experience	1.32
35	1.4.4.1.1 Phase of involvement	1.29
23	1.4.2.1 Financial transparency	1.28
10	1.2.1.4 Risk management	1.27
7	1.2.1.1 Market advantage	1.25
21	1.4.1.1 Aligned project goals	1.23
24	1.4.2.2 Building Information Modeling (BIM)	1.21
12	1.2.1.6 Strong motivator	1.21
18	1.3.2 Remove obstacles	1.19
5	1.1.2 Training	1.18
38	1.5 Trust	1.17
44	3.4 Negotiate	1.17
41	3.1 Monitor	1.14
40	2.2 Culture fit	1.14
8	1.2.1.2 Cost predictability	1.13
9	1.2.1.3 Schedule predictability	1.13
13	1.2.2.1 Incentives	1.12
43	3.3 Challenge	1.11
33	1.4.2.3.8 Other tools	1.10
26	1.4.2.3.1 Last Planner System	1.09
31	1.4.2.3.6 Visual management	1.08
32	1.4.2.3.7 Daily huddle	1.08
14	1.2.2.2 Risk pool	1.07
27	1.4.2.3.2 Target Value Design	1.07
17	1.3.1 Respond to complaints	1.04
19	1.3.3 Exhibits no obstacles	1.04
28	1.4.2.3.3 A3	1.04
30	1.4.2.3.5 Choosing by Advantage	1.04
37	1.4.4.2 Collocation	1.04
29	1.4.2.3.4 A4	1.02
39	2.1 Commitment	1.01
1	1.1.1.1 Owner's IPD experience	1.00
3	1.1.1.3 General Contractor's IPD experience	1.00
4	1.1.1.4 Other major organizations' IPD experience	1.00
11	1.2.1.5 Technical complexity	0.96
34	1.4.3 Confidence in project management	0.96
15	1.2.2.3 Liability waiver	0.92
25	1.4.2.3 Lean Construction Related Tools	0.92
2	1.1.1.2 Architect's IPD experience	0.83
16	1.2.2.4 Insurance for IPD	0.75

Table 7 (cont'd)

Performance Constructs		
No.	Metrics	Score
53	5.2.2 Actual cost growth	1.21
46	4.2 Problem addressed	1.20
55	5.3.2 Actual schedule growth	1.13
56	5.4 Change order	1.13
58	5.6 Participants' satisfaction	1.10
45	4.1 Commitment to IPD process	1.08
54	5.3.1 Perceived schedule performance	1.06
47	4.3 Adequate progress	1.04
52	5.2.1 Perceived cost performance	1.04
59	5.7 Sustainability	1.04
48	5.1.1 Turnover quality	1.00
49	5.1.2 System quality	1.00
50	5.1.3 Overall quality	1.00
51	5.1.4 Owner's satisfaction with cost	1.00
57	5.5 Safety	1.00

*Score: Scores represent project performance on each metric. Score ranges from 0.5 to 1.5. 0.5, 1.0 ,and 1.5 represent worst, neutral ,and best performance, respectively.

5.1.3 Top Five Metrics with Highest Scores Based on Content Analysis

Information sharing mechanisms refer to tools that inform participants of project task checklist completion and quality, and routine information sharing behavior (Klein & Sorra, 1996). BIM as a significant approach to information sharing is listed as a separate metric, which focuses on other tools or approaches used by a project team to improve information exchange. Except for one project missing related information, all other 11 projects have positive quotations. The most commonly used approaches to information sharing are routine meetings and a web-based information sharing system. Some teams also use SMART board (an interactive whiteboard enabling live information sharing with off-site teams) or establish an advisory team for effective information sharing. High performance on information sharing mechanisms indicates an efficient information flow and can accelerate document submission and approval speed to enhance project

productivity. Meanwhile, a good information sharing system cannot be powerful without team collaboration.

The decision making system in IPD projects is a distributed process involving all related team members, who make major decisions collectively. Collaborative decision making is well implemented in almost all projects (although information is missing for one project). The collaboration enables informed and efficient decision making by considering the input from different team members and creates a sense of ownership throughout the entire project team. Based on the 12 content analysis projects, routine meetings and early involvement of contractors provide a good climate for collaborative decision making. Some project teams use tools such as A3 and Choosing by Advantages to help with decision making.

Effective management, as a significant approach to establish and maintain an integrated team, is often seen among the 12 projects. Multi-level management teams and routine meetings are widely employed in those projects. Different level teams have different meeting frequencies, varying from daily to monthly meetings, to resolve issues and make decisions as a team. In addition, some project teams assign team coordinators, hire an external facilitator, or hold informal events to enhance team interaction and build a strong relationship among the whole project team. BIM execution is more organized, with integrated team management strategies.

The early involvement of contractors and subcontractors in the design phase, along with owners' active participation, is an innovative feature of IPD and most projects perform well on it. Compared to the "phase of involvement" metric, this metric emphasizes what the project teams

do when they are involved early and how that later benefits IPD implementation. The general contractors are involved in the beginning stages to perform ongoing estimations to keep the design under budget and identify constructability issues in design to avoid the time consuming constructability check and redesign process. The early involvement of major subcontractors brings the design to a higher level of detail. Detailers from subcontractors work closely with architects and engineers to make the design more accurate, which allows the project to achieve more benefits from advanced BIM implementation.

In most projects, either part of or the whole project team has worked together before. This earlier collaboration allows the project team members to have a better understanding and fit with each other in terms of such things as company culture, approaches to project management, or team interaction. This situation in turn creates a solid foundation on which the team can join IPD, share both risks and profit, and step up to a higher level of collaboration. In IPD implementation as an innovation, the previous cooperation experience of project parties makes the shift to team integration easier, especially for project teams without IPD experience.

5.1.4 Metrics with Lowest Scores Based on Content Analysis

Although the projects in content analysis succeed in IPD implementation, the scores of some metrics are below the neutral performance score (one point), as shown in Table 7. The score on "Technical complexity" (motivator) is slightly lower than one, indicating that it is not the main motivator of the project team implementing IPD. The low score on "confidence in project management" reflects the concern of some project participants about whether they will benefit from this innovative method. However, there are only three quotations for all projects under this

metric, which weakens this finding. Among all projects, only three fully waives liabilities among project parties, which decreases their scores on the "Liability waiver" metric. This situation is caused by either the owner or the government's requirement, or else the uncomfortable result of totally giving up on the traditional method and pursuing IPD. The "Lean construction related tools" metric focuses on quotations that give an overall description of the "Lean construction tools" application. The negative performance is based on only three quotations, so this result is not very convincing. The low score on architects' IPD experience is reasonable, considering that IPD is a new method. Similarly, the score for owner and general contractor's experience is 1.00, just neutral, which indicates there are slightly more owners and general contractors with IPD experience. The score on the "Insurance for IPD" metric is the lowest among all metrics, because of ten projects with given information, only one plans to use insurance developed specifically for IPD. Although there is no negative example given on lack of insurance for IPD, an IPD specific insurance will enhance the risk sharing feature of IPD and further promote team integration.

5.1.5 Performance Constructs

Regarding performance constructs, the quotation quantity is very limited. There are 50 quotations for 18 metrics. Among these metrics, "problem addressed" (16 quotations), "actual cost growth" (8 quotations), and "perceived schedule growth" (6 quotations)—all of which have relatively more quotations—are discussed here. The "Problems addressed" metric refers to problems addressed by implementing IPD. The high score achieved on this metric indicates IPD implementation in these projects is effective. The collaboration and flexibility of IPD enable the project team to solve urgent issues efficiently and select optimal strategies with support from all related project participants. Among the six projects having quotations on "actual cost growth,"

five reduce the cost significantly because of IPD implementation, which illustrates the advantage of IPD in reducing project cost. The score on the "Perceived schedule growth" metric is 1.04, which is not outstanding. In general, there is no score below neutral for all metrics under performance constructs, which implies that IPD is implemented successfully and improves project performances, although a larger number of supporting quotations is needed to make the results more convincing. The scores on some metrics (e.g., project quality and safety) are one, due to the lack of quotations.

5.2 Case Study Findings

5.2.1 Metric Scores for Case Study

The case study, Project B, fails to implement IPD. The researcher analyzes the scores it achieves under the metrics and identifies the factors that hinder IPD implementation in this project. Table 8 lists the scores Project B achieved under each metric, which are listed by descending order of the scores.

Table 8 Score for Project B per Metric

Influencing Constructs		
No.	Metrics	Scores*
1	1.1.1.1 Owner's IPD experience	0.50
18	1.3.2 Remove obstacles	0.50
21	1.4.1.1 Aligned project goals	0.50
2	1.1.1.2 Architect's IPD experience	0.75
35	1.4.4.1.1 Phase of involvement	0.75
44	3.4 Negotiate	0.75
20	1.4.1 Decision making system	0.78
3	1.1.1.3 General Contractor's IPD experience	0.83
6	1.1.3 Previous cooperation experience	0.83

Table 8 (cont'd)

34	1.4.3 Confidence in project management	0.83
42	3.2 Manage	0.91
39	2.1 Commitment	0.97
8	1.2.1.2 Cost predictability	1.00
9	1.2.1.3 Schedule predictability	1.00
10	1.2.1.4 Risk management	1.00
11	1.2.1.5 Technical complexity	1.00
12	1.2.1.6 Strong motivator	1.00
13	1.2.2.1 Incentives	1.00
14	1.2.2.2 Risk pool	1.00
15	1.2.2.3 Liability waiver	1.00
16	1.2.2.4 Insurance for IPD	1.00
17	1.3.1 Respond to complaints	1.00
19	1.3.3 Exhibits no obstacles	1.00
23	1.4.2.1 Financial transparency	1.00
24	1.4.2.2 Building Information Modeling (BIM)	1.00
25	1.4.2.3 Lean Construction Related Tools	1.00
26	1.4.2.3.1 Last Planner System	1.00
27	1.4.2.3.2 Target Value Design	1.00
28	1.4.2.3.3 A3	1.00
29	1.4.2.3.4 A4	1.00
30	1.4.2.3.5 Choosing by Advantage	1.00
31	1.4.2.3.6 Visual management	1.00
32	1.4.2.3.7 Daily huddle	1.00
33	1.4.2.3.8 Other tools	1.00
37	1.4.4.2 Colocation	1.00
41	3.1 Monitor	1.00
43	3.3 Challenge	1.00
22	1.4.2 Information sharing mechanisms	1.06
40	2.2 Culture fit	1.08
38	1.5 Trust	1.19
7	1.2.1.1 Market advantage	1.20
5	1.1.2 Training	1.25
36	1.4.4.1.2 Early involvement effectiveness	1.33
4	1.1.1.4 Other Major Organizations' IPD experience	1.50
Performance Constructs		
No.	Metrics	Score
59	5.7 Sustainability	0.50
47	4.3 Adequate progress	1.00
48	5.1.1 Turnover quality	1.00

Table 8 (cont'd)

49	5.1.2 System quality	1.00
50	5.1.3 Overall quality	1.00
51	5.1.4 Owner's satisfaction with cost	1.00
52	5.2.1 Perceived cost performance	1.00
53	5.2.2 Actual cost growth	1.00
54	5.3.1 Perceived schedule performance	1.00
55	5.3.2 Actual schedule growth	1.00
56	5.4 Change order	1.00
57	5.5 Safety	1.00
58	5.6 Participants' satisfaction	1.00
46	4.2 Problem addressed	1.33
45	4.1 Commitment to IPD process	1.40

*Scores: Scores represent project performance on each metric. The score ranges from 0.5 to 1.5. 0.5, 1.0, and 1.5 represent worst, neutral, and best performance, respectively.

5.2.2 Special Considerations in Case Study

As can be seen in Table 8, 12 metrics have scores lower than 1.00, while for the content analysis, there are only six metrics. Project B has low scores on "Owner's IPD experience," "Architect's IPD experience," and "General contractor's IPD experience," indicating that these three parties lack IPD experience. In contrast, the design supplier is more experienced in the IPD project, which explains why the score on "other major organizations' IPD experience" is high. Based on the structured interview and email communication, the researcher identifies the following issues that might make the team give up IPD: different location of general contractor, small project scale, project budget problem, searching for corporation contributor, and unclear role of design supplier in project team tiers. These issues are also reflected in the scores of related metrics.

5.2.2.1 General Contractor's Distance to Project Location

General contractor's distance to project location leads to a higher estimated cost and brings in different operation approaches that impede team collaboration. The project team fails to realize that the different location of a general contractor will increase the cost for a small scale project. The architect comments:

"I think the GC could have been a great asset to the team. I just think distance was a huge factor."

In the preconstruction phase, in addition to providing an ongoing estimation, the owner needs the contractor to reduce project cost. But that is difficult because they don't have a strong network with the local subcontractor of State A, where the project is located. As the architect said:

"*Even though we gave them at least two to three names of each different category for bidding, with his unfamiliarity, connections, and experiences with these people, I don't feel that it was easy for them to dial down the numbers to where they could have been."*

Estimations for overhead construction cost are also higher because the contractor has to consider the travel cost and assign full time employees on site for a small scale project that could be done by part time employees of a local contractor. The project manager of the general contractor mentions:

"For a project of that size, we are probably not a good fit from the beginning to travel. The way we approached it is a little bit more expensive. It does not translate to a project of that size. It becomes a noticeable premium rather than just a minor premium when it's a bigger job."

"On a small project like this, a general contractor that can do that project in the neighborhood doesn't have to put a full time field superintendent on site because he has a superintendent doing other projects in the area."

In addition, as a middle size contractor from a large city in another state, the contractor has a different way to deliver a project from State A, where the project is located. As the architect stated:

"The GC is from the Midwest, but I think a larger firm out of City B would have done a fabulous job building the building and the quality would have been there. But I think the distance of trying to be comfortable with the climate of construction in State A [is] difficult."

"The GC is kind of…different…. City B has a different culture—the building culture. I think that was a part of the breakdown. They had a different set of standards, a different set of norms.. It just made it difficult. I think they were a very good choice, but not for this project, not this location."

This culture difference due to different location might mean the team members take a longer time to get used to each other and collaborate closely on the project, especially when they did not

work together before. Although the location issue does not specifically occur in IPD projects, it does become an obstacle for IPD implementation in Project B as it increases the cost and makes project meetings inconvenient.

5.2.2.2 Project scale

The small project scale is another issue claimed by all major project participants.

When asked about satisfaction with the skill levels of the project team, the owner responds:

"I think the team was overqualified in the project. Yes I was satisfied, but that level of sophistication gets in the way of the actual delivery of a fairly simple building. It is completely dependent on the complexity of the project. If this were a complex project, it would have a different answer."

The conversation between the researcher (UR1) and the architects (AR1 and AR2) also reflects this problem:

UR1- *"Any obstacles in the IPD process and the project itself?"*

AR2- *"The biggest obstacle was the size of the project."*

UR1- *"The size was not a good fit for IPD?"*

AR1- *"It's small."*

The contractor's quotations about location issues indicate the problem of small project scale. Additionally, he also suggests:

"With a fairly simple building like this, you can cut to the chase a little bit faster with a traditional negotiation approach. Everybody is still on board early, at the table early and transparent, but you are not necessarily following every step of the IPD process."

The design supplier comments:

"I haven't worked on the scale of the project, as some of my colleagues have. They are telling me that the larger projects are easier than the smaller projects."

It is true that IPD implementation in smaller and simpler projects might not be as cost efficient as that in larger and more complex projects when considering the higher upfront investment requirement of IPD. But there is no size limitation for IPD projects. There are small scale projects that successfully implement IPD based on both the design supplier's experience and the projects in content analysis. As mentioned in the quotations, small project scale is an obstacle for IPD implementation in Project B. However, overconcern about size issue influences project participants' commitment to IPD.

5.2.2.3 Project budget

The issue of project budget is also exposed in the interview. The general contractor's efforts on reducing estimated cost are not very effective, which make it more difficult to achieve the owner's budget goal. The owner says:

"We did everything to reduce the cost. But those were the only cost reductions we had. We reduced the scope of the buildings, we changed the materials. Nothing came from the GC."

The architect comments:

"I think the other problem with the GC [was that he] maybe knew sort of the budget but was never driving the design, the cost or the materials to that budget. I think in a true IPD, you might probably know budget more up…front and all the parties are working toward that same goal of a nice building and a budget."

The architect's comment also indicates that the budget goal is not commonly agreed upon. The owner's target budget is very low and thought to be unrealistic by the architect and the design supplier. The unaligned budget goal reduces team coherence in working toward the same objective. The general contractor is involved in criteria design. Although it's not late, they miss the chance to have more influence on the project cost in the programming phase. Together, the issues of the general contractor's location, project scale, and budget impact the team's confidence in IPD project management and the participants' commitment to the implementation process.

5.2.2.4 Searching for donors

Seeking corporate contribution to this project through donations is another factor that makes IPD implementation more complicated. The architect says:

"I am trying to get something out that I think has made this more difficult for the IPD. That has been the donation factor. It's complicated the whole effort, because it's a moving target and a moving target for a contractor is not comfortable. I don't think there is anybody that had a problem. It is more the moving target... all those factors have caused this project to be still kind of a roller coaster."

This extra process stretches the project schedule and challenges the architect's design and the general contractor's ongoing estimating, which hinder IPD implementation. Another tricky aspect is that IPD implementation is a condition of the design supplier to donate a large amount of material to the project. When asked the reason for pursuing IPD, the owner answers:

"The reason is because it was the condition of the design supplier's contribution to the project. They said 'We will do all this for Project B, provided you implement and allow us to document the study in IPD process.' So that was [an] absolute condition."

Although this is the original motivation for the owner to pursue IPD, the project team does realize the value of IPD and commits to the process. However, the score for the "commitment" metric is still below neutral, due to issues of cost and identifying the role of the design supplier,

which will be discussed in the next paragraph. In general, seeking a corporate contributor not only triggers IPD implementation but also becomes a big obstacle for it.

5.2.2.5 Design Supplier's ambiguous role in team

As mentioned in the last paragraph, the role of the design supplier in this project is not clearly identified, which causes management conflict between the owner and the design supplier. The design supplier's project manager would like to play a management role in Tier 1 of the project team to guide IPD implementation, yet the owner treats both of them as a Tier 3 supplier who sponsors the project and assists IPD implementation. The conflict limits access of the design supplier to project meetings. Consequently the design supplier does not actively participate in the negotiation and decision making processes, which causes Project B to have a low score on the metrics of "manage," "negotiation," and "decision-making system." This factor, along with other barriers, reduces the design supplier's level of commitment. As the project manager mentions:

"I think what happened, at least with myself and some of my colleagues internally, is when we started seeing some of the little cracks we started having…questions in terms of feasibility and we backed off a little bit, because we saw some of the red flags, and we started thinking, 'OK, how much do we invest in it? How much do we allocate time to a project where we think [it] is highly likely not to proceed?' I have no question that the other partners were committed. I think the design supplier at some point was committed but we started backing up, thinking that this might not go ahead."

Although, Project B does not implement IPD to the end, the project still achieves scores above neutral on the following metrics under "Influencing constructs": "Information sharing mechanisms," "Culture fit," "Trust," "Market advantage," "Training," "Early involvement effectiveness," and "Other Major Organizations' IPD experience." This finding indicates the project team has some good performance in those related aspects. The general contractor and the architect have frequent information exchanges, with involvement of the owner. The interviewees think their companies have good fits with many innovative IPD features. The project team members trust each other in general. "Marketing advantage" motivates the project team to pursue IPD. Orientation for IPD is provided by an external consultant. The involvement of a design supplier who has more IPD experience also becomes a good source from which the project team can learn IPD. Early involvement of the general contractor enables team members to work closely with the architect in ongoing estimates.

As to performance constructs, the quotation quantity is limited. The low score on the "sustainability" metric is based on only one quotation, which is not very strong. With relatively more quotation support, Project B achieved high scores on "problem addressed" and "commitment to IPD process," which means that they acknowledge the benefits of implementing IPD and are willing to use IPD in the future with a project having a better fit.

5.3 Influencing Factors—Pattern Matching Findings

The researcher uses a pattern matching approach to identify two tiers of factors that influence IPD implementation.

Based on the scores calculated in Chapter 4, if a project's score for a certain metric ranges from 1.0–1.5, the project performs well on that metric. Furthermore, if projects implementing IPD successfully have a good performance (score > 1.0) on certain metrics, those metrics have a potential positive influence on IPD implementation. Then a pattern-matching strategy is used to identify the influencing factors further by comparing the project performance on those potential metrics between projects that implement IPD successfully and projects that don't. The extent of difference will indicate the importance of the influencing factors. In this study, the researcher defines the metrics that have a positive performance (score > 1.0) on successful IPD projects but a negative performance (score < 1.0) on the failed IPD project, with a score difference larger than 0.4 as the principal influencing factors.

IPD Case Studies (AIA et al., 2012), the report used for content analysis, indicates that generally all 12 projects, either completed or already under construction, implements IPD successfully, while Project B for the case study fails to implement IPD. So for this study, the researcher uses the average score of content analysis projects and the score of Project B to identify the influencing factors. Table 9 lists all 35 metrics (potential influencing factors) for which the content analysis average score is higher than 1.0. Among those metrics, there are eight for which the case study project score is lower than 1.0. However, on "commitment", which is one of the eight metrics, the score difference between content analysis and the case study is only 0.03. This difference is too small compared to the other seven metrics, so this metric is not counted as a principal influencing factor. Consequently, seven factors influencing IPD implementation are identified: (1) previous working experience, (2) remove obstacles, (3) decision making system, (4) aligned project goals, (5) phase of involvement, (6) manage, and (7) negotiate.

Table 9 Potential Factors that Influencing IPD Implementation

Metrics	Content Analysis (CA)	Case Study (CS)	Δ (CA-CS)
1.1.2 Training	1.18	1.25	-0.07
1.1.3 Previous cooperation experience*	1.32	0.83	0.48
1.2.1.1 Market advantage	1.25	1.20	0.05
1.2.1.2 Cost predictability	1.13	1.00	0.13
1.2.1.3 Schedule predictability	1.13	1.00	0.13
1.2.1.4 Risk management**	1.27	1.00	0.27
1.2.1.6 Strong motivator**	1.21	1.00	0.21
1.2.2.1 Incentives	1.12	1.00	0.12
1.2.2.2 Risk pool	1.07	1.00	0.07
1.3.1 Respond to complaints	1.04	1.00	0.04
1.3.2 Remove obstacles*	1.19	0.50	0.69
1.3.3 Exhibits no obstacles	1.04	1.00	0.04
1.4.1 Decision making system*	1.42	0.78	0.64
1.4.1.1 Aligned project goals*	1.23	0.50	0.73
1.4.2 Information sharing mechanisms**	1.43	1.06	0.37
1.4.2.1 Financial transparency**	1.28	1.00	0.28
1.4.2.2 Building Information Modeling (BIM)**	1.21	1.00	0.21
1.4.2.3.1 Last Planner System	1.09	1.00	0.09
1.4.2.3.2 Target Value Design	1.07	1.00	0.07
1.4.2.3.3 A3	1.04	1.00	0.04
1.4.2.3.4 A4	1.02	1.00	0.02
1.4.2.3.5 Choosing by advantage	1.04	1.00	0.04
1.4.2.3.6 Visual management	1.08	1.00	0.08
1.4.2.3.7 Daily huddle	1.08	1.00	0.08
1.4.2.3.8 Other tools	1.10	1.00	0.10
1.4.4.1.1 Phase of involvement*	1.29	0.75	0.54
1.4.4.1.2 Early involvement effectiveness	1.34	1.33	0.00
1.4.4.2 Collocation	1.04	1.00	0.04
1.5 Trust	1.17	1.19	-0.01
2.1 Commitment	1.01	0.97	0.03
2.2 Culture fit	1.14	1.08	0.07
3.1 Monitor	1.14	1.00	0.14
3.2 Manage*	1.34	0.91	0.43
3.3 Challenge	1.11	1.00	0.11
3.4 Negotiate*	1.17	0.75	0.42

*Principal Factors (Shaded in light grey): $S_{CA}>1.0$, $S_{CA}<1.0$, $\Delta>0.4$

**Secondary Factors (Shaded in dark grey): $S_{CA}>1.0$, $S_{CA}>1.0$, $\Delta>0.2$

As shown in Table 9, except for the seven factors, there are still some metrics on which the differences between the average performance of content analysis projects and the performance of the case study project are large. There are five metrics belonging to this situation where the score difference is larger than 0.2: (A) Risk management motivator, (B) Strong motivator, (C) Information sharing mechanisms, (D) Financial transparency, and (E) Building information modeling (BIM). On the positive side, projects that implement IPD successfully have a higher score on these metrics, which makes the metrics critical. On the negative side, Project B, which fails in IPD implementation, achieves a neutral score on these metrics—caused either by neutral performance or lack of quotation—meaning these metrics might not have caused the failure. Therefore, these five factors are not as critical as the principal factors, based on the data of this study. So they are proposed as secondary factors that influence IPD implementation.

Figure 13 illustrates the seven principal factors and five secondary factors in the score diagram (metric names for the horizontal axis are listed in Table 4). For the principal factors, average scores of successful IPD projects are at the tops of the peak points, and scores for projects failing IPD implementation are at the bottoms of the valleys. For the secondary factors, compared to the principal factors, the difference is that the score for the project failing IPD implementation moves to the neutral line close to one.

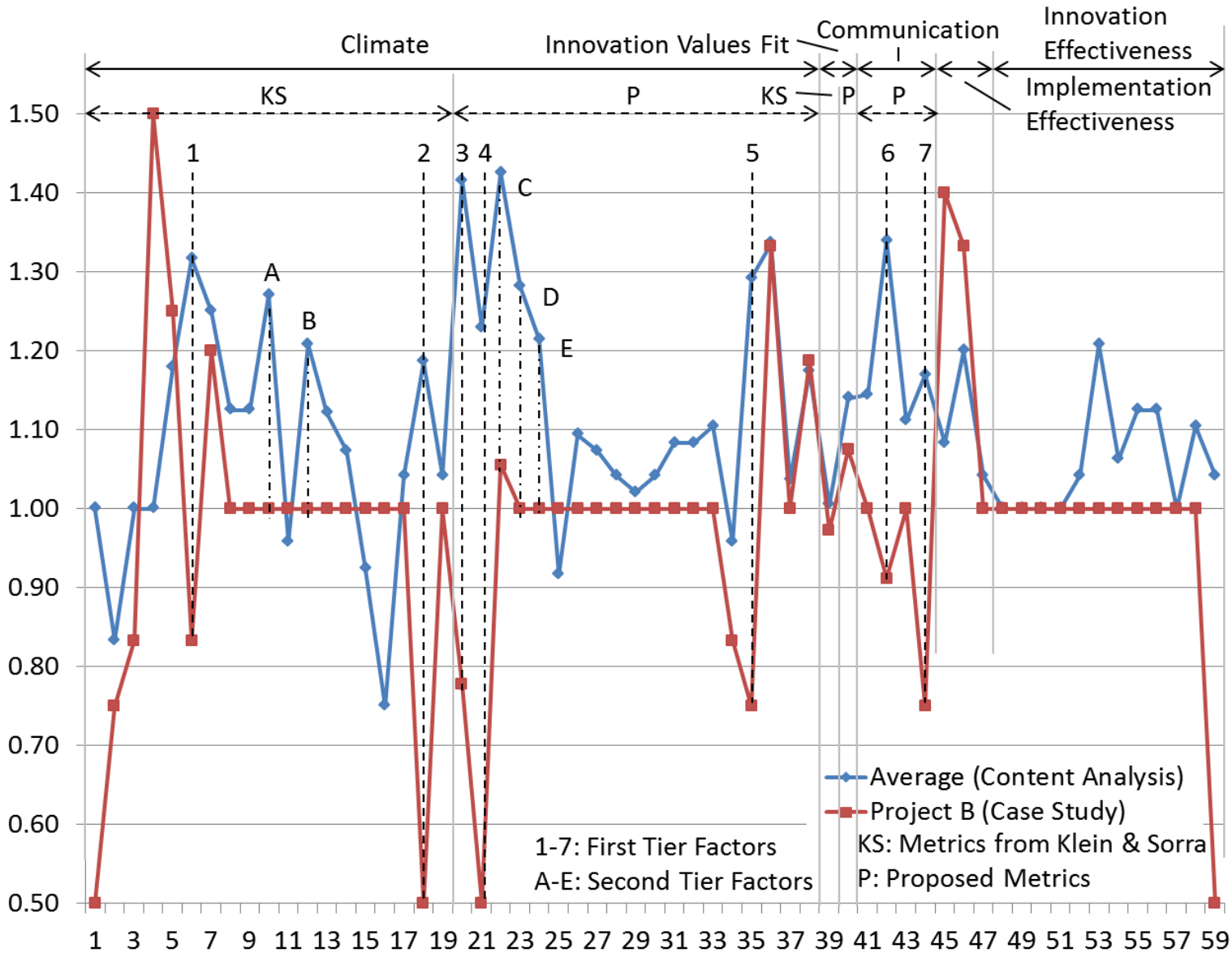


Figure 13 Score Comparison between Content Analysis and Case Study

Table 10 lists the principal factors and secondary factors shown in Figure 13.

Table 10 Principal Factors and Secondary Factors Influencing IPD Implementation

Principal Factors	Secondary Factors
1. Previous working experience	A. Risk management motivator
2. Remove obstacles	B. Strong motivator
3. Decision making system	C. Information sharing mechanisms
4. Aligned project goals	D. Financial transparency
5. Phase of involvement	E. Building Information Modeling (BIM)
6. Manage	
7. Negotiate	

The seven principal influencing factors identified from the score are also proved to be important, based on the quotations.

1. Previous Working Experience

IPD project participants with strong previous working experience have a good match on organization culture and are familiar with each other's working styles. This cohesion increases the trust among project team members, reduces or eliminates the time for getting used to each other, and encourages willingness to share risk and act in the best interests of the project.

In the content analysis, except for two projects that do not give relevant information, all other projects include major organizations that have worked together before, among which at least seven project teams have three or more organizations with previous cooperation experience. On some projects, almost all the major organizations had done so. In Project 5, for example,

"*participants overwhelmingly indicated [100%] that their organization had previous working experience together. This also carried over to individuals, with 63.9% that had previously worked with other team members.*" (AIA et al., 2012; p. 53)

In Project B, owner and architect have long term cooperation experience, but general contractor and design supplier have never worked with each other or with owner and architect. This situation creates certain issues in team collaboration. For example, the architect points out that general contractor's team has "a different set of standards, a different set of norms" and she thinks

"It [the difference] just made it [cooperation] difficult. They were a very good choice, but not for this project, not this location."

Project manager 1 (SPM1) of the design supplier personally experiences a culture difference in the Midwest, in terms of ways of communication. In addition, owner does not feel comfortable working with SPM1. Although such small issues cannot cause the failure of IPD implementation, they can make team members to consume extra energy getting used to each other and working together, especially under the context of IPD. This state of affairs weakens the innovation climate of the project team. If they had worked together before, they might have already overcome these issues or they might have chosen to avoid them by building a team in which the organizations felt more comfortable working with each other.

2. Remove Obstacles

Remove obstacles refers to a project team taking actions to change the existing mechanisms or resolve problems that might hinder IPD implementation in order to make team members participate easily in the implementation process.

The content analysis projects employ a series of strategies to ensure that IPD is implemented smoothly. Project 1's team intentionally slows down the initial pace to allow more time for team members to learn the new process. Following is another example of removing obstacles in Project 1:

"The team discovered a deficiency in owner involvement as they worked through the value added list (a list of items identified as desirable by the owner but not previously budgeted). The team realized they needed more input at the user group level, specifically clinical operations, to better prioritize those items. The owner addressed this by bringing a representative from hospital operations onto the project team." (AIA et al., 2012; p. 17)

In Project B, the team do not have effective strategies in place to resolve impediments that hinder IPD implementation. One big obstacle is the corporation sponsor issue. The owner looks for corporation contributions to reduce the project cost and build long term relationships with larger companies in the AEC industry. Although a deadline is set for locating sponsors, the whole process makes the construction material and related systems continue to change. Such an effect increases the design complexity and lengthens the ongoing estimation. As the architect notes: "It complicated the whole effort." In addition, this time consuming process also deflates the team's passion for IPD, which in turn negatively impacts the climate for IPD implementation.

3. Decision Making

Collaborative decision making is a critical factor for successful IPD implementation. Compared to centralized decision making, collaborative decision making involves everyone related to the

event, which not only gives the team members a sense of ownership but also improves the efficiency of decision making and ensures the best decision is made for project success.

In content analysis, many projects have structured teams, routine meetings, and other management strategies to provide a good environment for collaborative decision making. Certain decision making tools are used to help higher level groups make efficient decisions. One such instrument is A3 report, by which a document fits on a sheet in a fixed format to identify the problems and provide possible solutions (Forbes & Ahmed, 2011). In Project 8,

"The team structure and decision making process was set up to be collaborative and transparent between the primary project participants, which provided a great deal of flexibility while working towards the best decisions for the project." (AIA et al., 2012; p. 83)

In Project B, the general contractor is very satisfied with the collaborative decision making process and offers an example about the decision of heating system close to a large picture window. The SPM1 of the design supplier, however, gives opposite feedback because she is not involved in making the decision to change the air distribution system from under the floor to ceiling level, which is related to the raised floor system they promise to contribute. She says:

"All we knew is that the audit is being done, and the next thing we knew is that the decision was made. If you are under IPD, you are part of that audit; you are part of making that determination,"

So in general, collaborative decision making is not fully applied in Project B. Furthermore, the researcher determines this situation might be related to management conflict between owner and design supplier, which will be discussed in Section 5.5.

4. Aligned Project Goals

Aligned project goals refers to project goals mutually decided upon and agreed to by all project participants (AIA et al., 2012). Goals developed by all team members collectively are optimized in the best interests of the project, provide the team with a clear target on which to work, and represent the first decision made by the team collaboratively.

In content analysis, most projects decide project goals jointly. In Project 2, for instance:

"Goals were established with collaborative input from the team. The owner's IPD consultant developed and led the process of defining goals. Special effort was dedicated to this process, because lessons learned from other IPD teams warned that a lack of goal definition and alignment at the beginning of a project caused serious problems later." (AIA et al., 2012; p. 28)

In one of the projects under study through content analysis, the initial budget goal is set by a program manager rather than agreed upon by the project team. In that case, owner had to spend extra money fix the issue.

It would be worse if the issue is not fixed and the project continues without aligned goals. For instance, in Project B, architect, contractor, and design supplier all mention that the project budget has not been agreed upon by the team. design supplier points out that

"His [the owner] understanding and expectation and our understanding to what is really going on in the build world were very far apart."

Similarly, architect also comments,

"I think we had too big of a gap of the cost of the building and the true budget."

The project budget disagreement is one critical reason that causes IPD implementation to fail on Project B.

5. Phase of Involvement

Phase of involvement is an indicator about when general contractor and major subcontractors are involved in the project. In this study, involving at or before "criteria design phase" (schematic design phase) is considered as early involvement. Early involvement of major project parties is significant for IPD. It helps the team align project goals. general contractor and subcontractors actively participate in the design phase to provide ongoing estimations to ensure the design is under budget, help architect design the building within the target value the owner wants to achieve, and resolve potential construction issues in advance—which eliminates time wasted on checking constructability after the design is completed and then having to redesign. In addition, the early and active involvement of owner adds great value to a high efficiency team's decision making.

In content analysis, all IPD projects involve major participants earlier than do the non IPD projects. Six project teams clearly mention general contractor and major subcontractors join the team from either the programming or the criteria design phase of the project. Most projects using early involvement (on or before the criteria design phase) reflect effectiveness and values. For example, in Project 3,

"At the time this study was conducted, the team attributed cost savings to the transparency gained through early involvement of subcontractors, who were able to better understand the project and influence design and product/system selection decisions. This allowed cost estimates to be more accurate and product/system selection to be more thoroughly considered in terms of design, installation, and operation." (AIA et al., 2012; p. 39)

In Project B, contractor gets involved when conceptual design is completed. No subcontractor is involved by the end of IPD. Although general contractor is involved relatively early and works closely with architect, when they find out the design is over budget, it is difficult for the team to change the design. As contractor says:

"we were brought a little bit later than the design is already in motion conceptually fairly far along."

"We did our initial budget on it after the IPD process had begun. It makes it very difficult to start to strip away some of the things that you really thought great in the project. Unfortunately some of that had to happen to get the numbers down to where it will be acceptable to the owner. Both the owner and the architect had to sacrifice some of the design to meet the budget."

In this case, the value of early involvement is not fully realized in Project B.

6. Manage

In this study, *manage* refers to how project team members at management level act cooperatively to resolve differences, communicate with other groups, and seek to buffer a project from external forces (Korkmaz et al., 2012). Effective management strategies foster collaboration among interorganizational teams, a key element for success of an IPD project.

In content analysis, as in the "decision making system" factor, many project teams have routine meetings and structured teams to optimize team coordination and resolve problems efficiently. In Project 7, the team has three leadership levels: (1) The "Integrate Project Team (IPT)" consisting of project manager representatives of owner, architect, general contractor, and subcontractors who work closely during the project delivery process, (2) a "higher level Core Team" composed of the three major parties who meet monthly to "resolve issues passed up from IPT," and (3) the "Executive Level Committee" of the three partners responsible for decisions on which lower level teams did not reach consensus. This management mechanism ensures problems are solved collaboratively and effectively with input from all team members.

In Project B, as a small scale project, a three level management team might not be needed, but routine meetings are still necessary. As the architect mentions,

"If the process was fully going to be an IPD we would have organized a timeline where we would say every week we'll have an hour conference call and all these parties need to be part of that period, (but) it did not happened."

According to the architect, one reason for that is the contributor search process stretching the timeline of the IPD process. the architect has a good management process within the architecture firm, in terms of interaction of designers, in-house consultant, and project manager. Yet Project B, as an interorganizational team, does not have management strategies that greatly improve team integration, a disadvantage in building a strong climate for IPD implementation.

7. Negotiate

In this study, *negotiate* refers to members spending time discussing issues and using tradeoffs or making concessions to devise workable solutions. An effective negotiation process helps resolve conflicts in the collective participation of team members and maintain a good innovation climate through communication.

In content analysis, most projects have a disputation resolution condition written into the contract to make sure serious conflicts can be solved appropriately without threatening the project's success. In addition, good management and decision making mechanisms are also valuable for settling disagreements by creating opportunities for negotiation. Some strategies are adopted in certain projects to help team members reach consensus through negotiation. For example, in Project 12,

"During design, the primary decision makers were the Captains, representatives from every major firm involved at the time. The Captains group was responsible for helping resolve issues at many levels, from team structure and relationships to significant project decisions. Sometimes the group would function as mediator if there were disagreements at the cluster level." (AIA et al., 2012; p. 110)

In Project B, the negotiation process is not followed consistently. Using the same examples of decision making, the contractor mentions they provide different opinions on the heating system design during team discussion, so no matter which system is used, the information enables the owner to make an informed decision. design supplier again points out there is no negotiation process to change the air distribution system.

"When the pre-construction quotes were being done, I got an email from OPM1 [owner's name is coded] saying that 'to cut costs we were going with the HVAC units on the roof.' And that is totally contradictory to [what] our raised floors are intended to do. Our product is intended to run the HVAC under the floor. That was something that I had to push back on and say 'This is not what the original agreement was.'"

Deficiency in negotiation here negatively impacts collaborative decision making on the disagreement and shatters the climate for IPD implementation.

5.4 Cross Case Synthesis Findings

The purpose of using cross-case synthesis in this study is to identify common patterns of successful IPD projects, in terms of the relationship among the 5 constructs by comparing the performance of the 12 projects in content analysis. The researcher calculates the score of each project under the 5 constructs and then sorts the projects by different constructs or general information to identify the patterns.

Due to the small quotation quantity in implementation effectiveness and innovation effectiveness, the researcher does not find any strong relationship between influencing factors and implementation effectiveness or innovation effectiveness. The researcher does identify, however, several findings among the three influencing factors.

Table 11 indicates that climate scores are generally higher as a project increases in size. A possible reason is that large projects have longer duration and usually higher complexity than small projects. In the larger projects, teams see the value of training employees, and establish efficient coordination mechanisms to improve team collaboration. Although the learning curve will be steep in the beginning, once the team gets used to the new system, it will benefit much more during the long duration of the project than if it had invested at the start. Usually large projects have a higher risk than small projects, which brings the team stronger motivation and even has the more sophisticated team members completing the project successfully. Although there is no size limitation for IPD implementation, some project participants think it is a better fit for a larger project. For example, in Project 7:

"When asked if IPD was applicable to all projects, [we] felt that it is ideal for larger scaled, complex projects and perhaps does not have [a] proportionate value in smaller, simpler projects." (AIA et al., 2012; p. 76)

Table 11 Influencing Factor Score Sorted by Project Size

Proj. #	Size(sf.)	Climate	Innovation-Values Fit	Communication	Total
Proj. 12	878000	1.24	1.25	1.33	1.28
Proj. 1	860000	1.26	1.27	1.27	1.27
Proj. 9	590000	1.14	0.83	1.19	1.05
Proj. 5	525000	1.15	1.10	1.22	1.16
Proj. 11	223000	1.11	0.85	1.04	1.00
Proj. 10	156000	1.15	1.13	1.35	1.21
Proj. 8	138000	0.95	0.75	1.21	0.97
Proj. 2	94000	1.10	1.27	1.23	1.20
Proj. 7	70000	1.05	0.88	1.00	0.97
Proj. 6	55000	1.10	1.08	1.08	1.09
Proj. 4	15000	1.03	1.19	1.25	1.16
Proj. 3	7000	1.05	1.28	1.13	1.15

Size: Large Small; Score: High Low

Table 11 also indicates the potential relationship between climate and communication mechanisms. Projects with good performance (Projects 1, 5, 10, and 12) on innovation implementation climate have a better performance on communication mechanisms.

Table 12 shows that project teams with a good innovation-values fit have good communication on climate. However, this observation goes against the findings in the pattern-matching section. Both the projects implementing IPD successfully and the project that fails to implement IPD

have a decent performance on the metrics for innovation-values fit. While the former perform well on communication mechanisms, the latter does not.

Table 12 Influencing Factor Score Sorted by Innovation-Values Fit

Proj. #	Size(sf.)	Climate	Innovation-Values Fit	Communication	Total
Proj. 3	7000	1.05	1.28	1.13	1.15
Proj. 1	860000	1.26	1.27	1.27	1.27
Proj. 2	94000	1.10	1.27	1.23	1.20
Proj. 12	878000	1.24	1.25	1.33	1.28
Proj. 4	15000	1.03	1.19	1.25	1.16
Proj. 10	156000	1.15	1.13	1.35	1.21
Proj. 5	525000	1.15	1.10	1.22	1.16
Proj. 6	55000	1.10	1.08	1.08	1.09
Proj. 7	70000	1.05	0.88	1.00	0.97
Proj. 11	223000	1.11	0.85	1.04	1.00
Proj. 9	590000	1.14	0.83	1.19	1.05
Proj. 8	138000	0.95	0.75	1.21	0.97

Size: Large Small; Score: High Low

Table 13 shows that most projects with lower communications scores also have lower scores on innovation-values fit. For IPD project teams, especially those without IPD experience, there are consequences if communication mechanisms are not very effective. For example, if there is neither an appropriate strategy for managing the project team to improve team collaboration nor an approach to promote negotiation to resolve conflict, it will be difficult to earn commitment from project participants and create or keep a collaborative culture in the project.

Table 13 Influencing Factor Score Sorted by Communication

Proj. #	Size(sf.)	Climate	Innovation-Values Fit	Communication	Total
Proj. 10	156000	1.15	1.13	1.35	1.21
Proj. 12	878000	1.24	1.25	1.33	1.28
Proj. 1	860000	1.26	1.27	1.27	1.27
Proj. 4	15000	1.03	1.19	1.25	1.16
Proj. 2	94000	1.10	1.27	1.23	1.20
Proj. 5	525000	1.15	1.10	1.22	1.16
Proj. 8	138000	0.95	0.75	1.21	0.97
Proj. 9	590000	1.14	0.83	1.19	1.05
Proj. 3	7000	1.05	1.28	1.13	1.15
Proj. 6	55000	1.10	1.08	1.08	1.09
Proj. 11	223000	1.11	0.85	1.04	1.00
Proj. 7	70000	1.05	0.88	1.00	0.97

Size: Large Small; Score: High Low

5.5 Insights from the Longitudinally Collected Case Study Data

As mentioned before, the researcher also collects longitudinal data from Project B, including email communication, audio records and minutes of face-to-face meetings, and conference calls. Because these data cannot evenly reflect project performance on all metrics, the researcher doesn't include them in the data analysis score calculation. However, these materials help to understand why Project B does not succeed for IPD. Among the seven factors influencing IPD implementation, the researcher sees problems with decision making systems, aligned project goals, manage, and negotiate from email records and meeting minutes.

First, the project team is not managed well enough to support the effective implementation of IPD. Since the kickoff meeting, during the three-month IPD implementation period, the project teams have only four meetings with three or more major participants involved, which include the

face-to-face kickoff meeting and three conference calls. One of the reasons is the slow workflow caused by seeking corporate contributions. Although the project is small scale and the team might not need to meet as frequently as it would on a large scale project, the lack of routine meetings hinders the communication effectiveness and reduces the chance for efficient and collaborative information sharing, which further impedes IPD implementation. The architect also highlights this situation in the interview. In addition to the meeting frequency issue, the researcher finds a conflict management problem between the owner and the design supplier. As the IPD initiation party, the design supplier has more experience on IPD projects, and the project manager of the design supplier (SPM 1) acts in a Tier 1 role on the project team to manage the IPD process. For example, in the email communication, SPM1 wrote to the owner:

"Is there a time line in place to determine how long the seeking of building contributions will continue? Has an amount/contributions been identified as to what you deem necessary to break ground? These factors will determine the project timeline and building opening, and could also impact the partner relations without clearly defined goals."

"Has or will the phone conference planned with the architecture and the GC take place today? If so, please forward the minutes or summary of that conference call onto the team as a whole. With the fast pace that all these good things are happening, it's critical that communication with the team as a whole remains intact."

The owner still treats SPM 1 as a Tier 3 supplier (and also a corporate sponsor) who can provide more advice on IPD implementation. Of the four meetings mentioned above, the design supplier is involved only in the kickoff meeting. The owner's project manager (OPM 1) feels that SPM 1

is involved too much in project management, which makes the situation complicated. For example, OPM 1 replies to the design supplier (not responding to SPM 1's quoted email):

"Per our discussion I am not promoting design supplier (company name is coded) as a 'Partner', but your status as a contributing supplier has given us credibility for which we are grateful."

"Clearly SPM1 and SPM2 (another member of the design supplier) have valuable input on the nuts and bolts discussions we're having with the architect and the GC. What is the appropriate level to engage you design supplier (company name is code)] now?"

In the IPD process, every organization in the project team should define its roles appropriately and reach consensus on that among the team. There is no right or wrong about the level of involvement of the design supplier, however; only when all the participants agree on that can the IPD management process be more efficient. This is also an important part of team collaboration.

Second, the decision making and negotiation process is not collaborative enough. The lack of routine team meetings reduces the chance for the team member to negotiate and make decisions collaboratively and efficiently. Although some decisions (e.g., general contractor selection, choosing a heating system for large picture windows) are made together with negotiation, they are not consistently implemented. For example, the owner changes the underfloor air distribution system to a ceiling level air distribution system for budget's sake without input from the design

supplier who contributes the raised floor system to Project B. The following email from the design supplier reflects the issue:

"Appreciate the update, OPS1. Quick question: with the design supplier's contribution of access floor listed, does that mean both the HVAC and data will now be run through the floor? I recall from the last minutes something about HVAC units on the roof? Please clarify. The sustainability story becomes stronger and more credible through the full utilization of the access flooring."

"A small footprint is a challenge however I do not recall us being involved in this exercise. [I] would like [to] see the material."

Lack of collaboration in decision making and negotiation fade in the climate for IPD implementation.

Third, the project budget goal is not well aligned among organizations, even though the aligned project goals are emphasized in the kickoff meeting by the external IPD consultant. The owner keeps trying to reduce the budget to a target that is thought to be unrealistic for a high performance green building by architect, general contractor and design supplier. Even two months after the kickoff meeting, the design supplier still tries via email to convenience the owner to have a feasible budget. The disagreement on budget becomes the break point that the team (proposed by the design supplier) gives up IPD and the owner changes the contractor. Therefore, aligned project goals are very critical for IPD's implementation as an innovation.

5.6 Summary

In summary, this chapter introduces two of the three deliverables in this study, and presents the findings of the content analysis and case study based on scores and quotations from the data documents. Then the researcher uses a pattern-matching strategy to identify two tiers of factors that influence IPD implementation. The 7 principal factors are (1) previous work experience, (2) remove obstacles, (3) decision making system, (4) aligned project goals, (5) phase of involvement, (6) manage, and (7) negotiate. Five secondary factors are (1) risk management motivator, (2) strong motivator, (3) information sharing mechanisms, (4) financial transparency, and (5) BIM. Finally, the researcher uses the longitudinal data to strengthen the findings.

CHAPTER 6 CONCLUSIONS

6.1 Introduction

As descripted in Chapter 1, the goals of this study are: 1) Test the revised Klein and Sorra (1996) innovation implementation model (as shown in Figure 1) via content analysis and describe metrics for its constructs in the context of IPD implementation on AEC teams, 2) explore communication mechanisms in IPD teams and their links to the Klein and Sorra (1996) model, and 3) develop propositions to define links among innovation implementation model constructs and communication mechanisms. The four deliverables of this study are an IPD implementation evaluation system, survey questions, IPD implementation quotations, and propositions. This chapter introduces deliverables and conclusions achieved by applying pattern-matching and cross-case synthesis approaches and explains how they met the goals of this study.

6.2 Deliverables

To investigate the factors that influence IPD implementation, as well as the role played by communication mechanisms in IPD implementation and its relationship with innovation climate and values fit, the researcher develops an evaluation system named IPD Implementation Evaluation System. The system consists of 59 metrics, creates the measurements, defines the 3 standard levels, and provides a scoring system to assess the IPD implementation process. Future studies can use this system to evaluate the implementation process of other IPD projects or modify it for use in assessing other innovation implementation processes. A table listing the

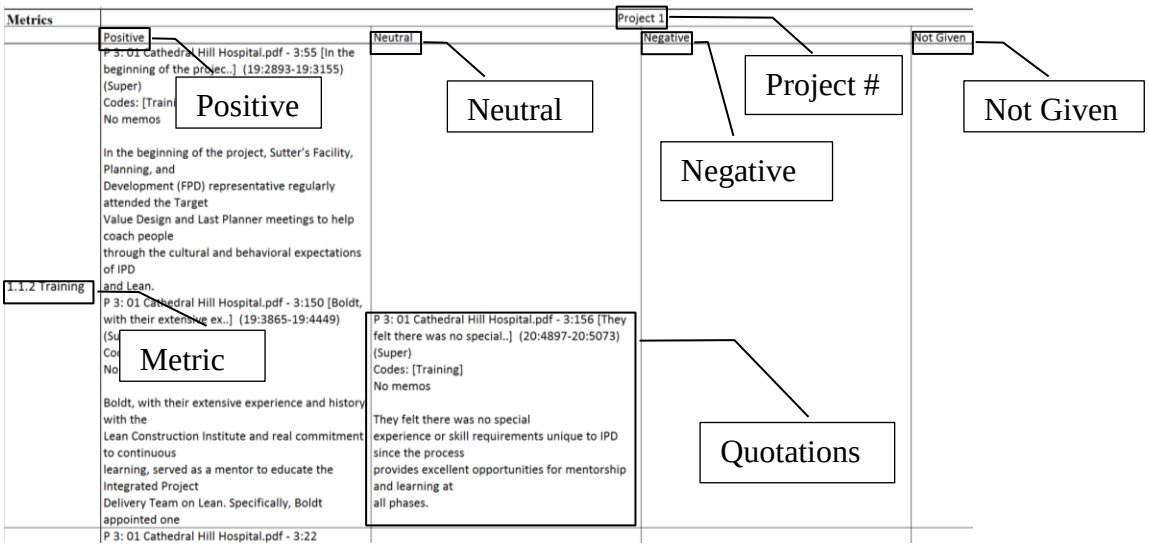
metrics, measurements, and level standards is attached in Appendix A. Table 14 offers a sample of the contents.

Table 14 Sample of Metrics, Measurements, and Standards for Evaluation

Constructs	Metrics	Measure	Standards		
		Description	Good	Neutral	Poor
1. Climate	**1.1 Team member skill levels**				
	1.1.1 Major project participants' IPD experience	Number of IPD projects delivered, or has adequate experience on design-build method	1	0, but has abundant design-build experience	0
	1.1.1.1 Owner	Number of IPD projects an owner experienced, or has adequate experience on design-build method	1	0, but has abundant design-build experience	0

To collect IPD related data in the case study, a series of survey questions is developed based on the IPD implementation evaluation system. The survey questions cover five different aspects: basic information, climate/structures, innovation-values fit, communication behaviors, and innovation effectiveness. The whole survey question list is attached in Appendix B.

As introduced in Chapter 4, all quotations obtained from the content analysis and case study data are coded under each metric and categorized into different levels. These examples help readers to understand how the evaluation process is executed in this study and assist other researchers to follow and validate this research approach. The quotation coding results are attached in Appendix H. A sample of the results is displayed in Figure 14. The third deliverable—propositions—will be presented in Sections 6.2 and 6.3.



The contents of the table are for reference only and not meant to be read.

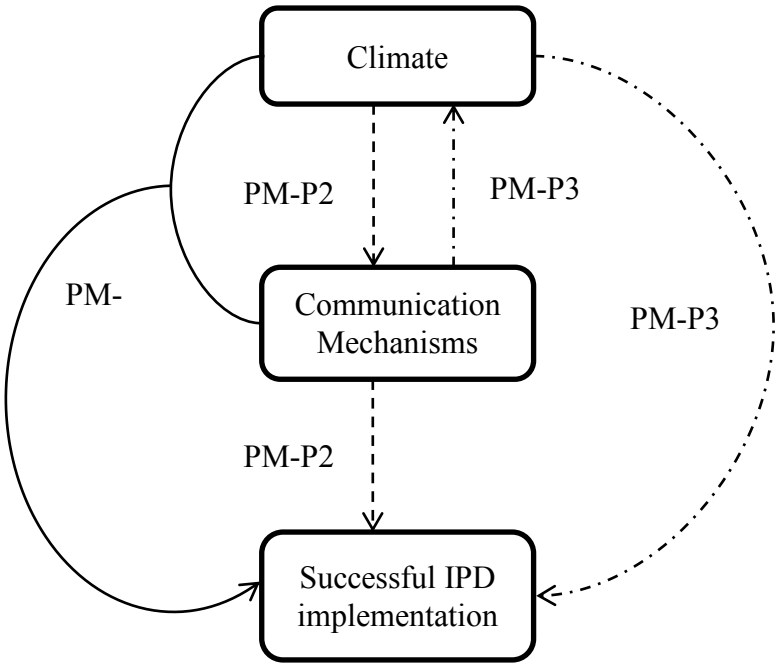
Figure 14 Sample of Quotation Coding Results

6.3 Propositions from Pattern Matching

This section proposes a series of propositions based on the seven principal factors identified and other important patterns observed from the score diagram (Figure 13). In terms of the three influencing constructs, 5 factors belong to climate and 2 factors belong to communication. There is no factor belonging to innovation-values fit.

When linking the findings to Klein and Sorra's model, the researcher finds that unless the IPD implementation success is caused only by a good communication mechanism, a good climate does play a critical role in IPD implementation. In addition, three out of the five influencing factors from climate belong to coordination mechanisms proposed by Miller and Korkmaz (2012). The findings do not, however, establish any impact of innovation-values fit on the IPD implementation success. As shown in Figure 13, under the innovation-values fit construct,

there is no convincing opposite performance as seen in the seven influencing factors. In general, the climate and communication mechanisms of the revised Klein and Sorra (1996) model are strengthened in light of this study. Based on the findings above, the researcher concludes that innovation climate and communication mechanisms foster successful IPD implementation. Furthermore the researcher identifies three possible relationships among them, illustrated in Figure 15, and proposes three propositions that represent those relationships.



PM-P#: Pattern Matching Position #

Figure 15 Constructs Relationship in Pattern-Matching Proposition

PM-Proposition 1. Good innovation climate and communication mechanisms in a project team together facilitate IPD implementation as an innovation.

PM-Proposition 2. Good innovation climate improves the project team's communication mechanisms and further facilitates IPD implementation as an innovation.

PM-Proposition 3. Positive team communication mechanisms provide a good climate for innovation and further facilitate IPD implementation as an innovation.

6.4 Propositions from Cross-Case Synthesis

In this section, the researcher introduces the conclusions achieved from cross-case synthesis findings. These propositions reveal potential relationships among the three performance constructs.

CCS-Proposition 1. Large scale projects have a better climate for innovation implementation than do small scale projects.

CCS-Proposition 2. If the climate for innovation implementation is good, team communication mechanisms are good.

This proposition is congruent with part of PM-Proposition 2a. Due to the overlap, Proposition 2 will not be listed as a separate proposition.

CCS-Proposition 3. If the project team does not have a good communication mechanism, it would be difficult to form an effective innovation-values fit.

6.5 Summary

This chapter identifies the importance of climate and communication in the revised Klein and Sorra (1996) model proposed in Chapter 2. Then, based on the results of pattern matching and cross-case synthesis, the following propositions are developed:

Proposition 1. Good innovation climate and communication mechanisms in a project team facilitate IPD implementation as an innovation.

Proposition 2. Good innovation climate improves the project team's communication mechanisms and further facilitates IPD implementation as an innovation.

Proposition 3. Positive team communication mechanisms provide a good climate for innovation and further facilitate IPD implementation as an innovation.

Proposition 4. Large scale projects have a better climate for innovation implementation than do small scale projects.

Proposition 5. If project team did not have good communication mechanisms, it would be difficult to form an effective innovation-values fit.

CHAPTER 7 DISSCUSSION AND SUMMARY

The final chapter discusses the practical and theoretical application of this study's findings in the AEC industry and other project based industries. The author presents the limitations of this investigation and offers suggestions for future exploration.

7.1 Practical and Theoretical Application

This section compares the findings of this study with those of previous research, generalizes the findings of this study, and highlights the contributions of this study. In this investigation, the researcher identifies seven principal factors and five secondary factors that influence IPD implementation, points out the importance of climate and communication in successful IPD implementation, and proposes the significance of communication to innovation-values fit.

7.1.1 Practical Applications

For IPD, this study validates the contributions to IPD implementation of communication and team coordination, which are pointed out by Nofera, Korkmaz, & Miller (2011). Meanwhile this study strengthens several factors that are valued by *IPD Case Studies* (AIA, 2012), such as previous cooperation experience, aligned project goals, and early involvement. Besides these factors, the researcher highlights the functions of removing obstacles and negotiation in IPD implementation, which are new for IPD related studies.

From the failed IPD project analyzed in the case study, the researcher observes certain issues that might hinder IPD implementation. The general contractor's distance to the project location

makes team collaboration more difficult in the preconstruction phase. Small project scale and low level of complexity make the project less cost efficient for IPD implementation. The disagreement on project budget throughout the whole project delivery process breaks up the climate for IPD implementation. Searching for corporate contributors stretches out the design duration and makes design and estimating more difficult in the context of IPD. The role of a team member is not identified, which hinders team communication and weakens the innovation implementation climate. All these factors intertwine and lead to the failure of IPD implementation.

As discussed in the literature review, IPD as an innovative delivery method optimizes the whole project performance, which benefits all major team members: owner, architects and engineers, general contractor, and major subcontractors (AIA California Council, 2007; Sive, 2009). In general, this study highlights the importance of a positive innovation implementation climate and effective communication mechanisms to successful IPD implementation, and identifies potential relationships among the three performance constructs: climate, innovation-values fit, and communication mechanisms. These conclusions offer guidance for project team members to implement IPD more effectively. Furthermore, the identified Principal Factors and Secondary Factors give more specific directions to project team members. The lessons learned from the failed IPD project remind team members what to pay attention to during IPD implementation. So in an IPD project, the owner should be actively involved in the design and construction process to provide information that the architects, engineers, and contractors need. The owner should also help with efficient and collaborative decision making. The architect should get used to the collaborative design process, incorporating the input of other project participants. The

contractors should join the project earlier to help with identifying design issues from the perspective of construction and to make sure the design meets the budget by providing ongoing estimates. In general, all project participants should always behave as one integrated team working toward the success of the project.

7.1.2 Theoretical Applications

Regarding innovation implementation in the AEC industry, most of the principal influencing factors identified in this study require high level collaboration and communication among different organizational teams, which is congruent with Pekericli, Akinci, & Karaesmen's (2003) theory that emphasizes the importance of integration and communication among interorganizational teams. Because collaboration is highly promoted in the AEC industry, it is not unusual that several innovative methods with integration requirements are implemented at the same time to optimize project performance. In this case, the findings of the current study in the context of IPD are very compatible with those innovative methods. BIM, as a technical tool that promotes team integration, plays an important role in facilitating innovation implementation, such as IPD (Dossic & Neff, 2011). In BIM implementation, even a factor such as "phase of involvement" (which is unique to IPD) is also very valuable in BIM implementation, let alone other factors that are relatively normal. This example is also a good one to highlight the idea that effective collaboration is as important as technical strategies (Chinowsky et al., 2008). Therefore this study's findings on the relationship between communication and innovation implementation generated under the background of IPD can be extended to other innovation implementation processes in the AEC industry.

As for general innovation implementation, this study validates part of Klein and Sorra's (1996) model by pointing out the positive influence of climate on successful innovation implementation. This research also emphasizes the significance of intensive coordination supported by effective communication in dispute resolution and solving emergency issues (Adler, 1995), common in innovation implementation. The relationship between climate and communication proposed in this study is also implied in the literature. Lewis, Hamel, and Richardson (2011) point out communication is critical in removing the concerns of participants for collaboration, and Higgs and Rowland (2011) emphasize the importance of equal participation in reaching consensus on disagreements. Also, this study proposes the importance of communication in improving the innovation-values fit (team members' "buy-in"), which is posited by Lewis (2007). But other proposed propositions based on IPD implementation need further testing to verify whether they are generic for general innovation implementation.

Table 15 lists studies from the literature discussed above that support findings about innovation implementation on a different scale, from IPD to the AEC industry to general industry. The studies with dash underlining are less strong than others. As can be seen, most findings are supported on different scales. These studies also act as external validation to support the new innovation implementation model proposed by Miller and Korkmaz (2012) in Chapter 2. Future research can test the findings in those areas. Some suggestions are provided for prospective researchers later.

To summarize, in addition to validating the findings of previous research, this study identifies certain new factors (e.g., remove obstacles and negotiation) that influence IPD implementation.

The applicability of some innovation implementation findings—both to the AEC industry and general industry— need to be tested further.

Table 15 Literature Supporting Findings for External Validation

Constructs	Findings and Propositions	Practical Applications	Theoretical Application	
		IPD Implementation	**Innovation Implementation in AEC Industry**	**Innovation Implementation in Organizations**
Climate	Good climate facilitates innovation implementation	AIA et al. (2012); Nofera et al. (2011)	No related reference	Klein & Sorra (1996)
	Good climate facilitates communication	No related reference	No related reference	Lewis et al. (2001)
	Large scale projects have better climate	No related reference	No related reference	No related reference
Communication	Effective team communication mechanisms facilitates innovation implementation	AIA et al. (2012); Nofera et al. (2011)	Chinowski et al. (2008); Dossic & Neff (2011); Pekericli et al. (2003)	Adler (1995); Klein & Sorra (1996)
	Effective team communication mechanisms facilitate climate of innovation implementation	No related reference	No related reference	Higgs & Rowland (2011)
	Ineffective team communication mechanisms may impede innovation-values fit	No related reference	No related reference	Lewis (2007); Lewis et al. (2001)

7.2 Limitations

In this section, the researcher points out several limitations of the research.

1. By using content analysis and a case study, this study achieves its objectives of successfully testing Klein and Sorra's (1996) model and developing propositions about the relationships between communication and other constructs. Due to the limited number of samples used in this project, however, the researcher is not able to statistically validate the findings of this study.

2. A unique feature of Project B used for the case study is that the owner looks for corporate sponsors for building materials for economic and long term cooperation. This aspect makes the situation more complicated in terms of motivation for pursuing IPD, team recruiting, and cost and schedule control. This factor might make the IPD implementation process somewhat different from a typical construction project. Because IPD is relatively new, however, there are limited number of projects implementing it, not to mention the projects that tried but failed. It is a rare opportunity for a researcher to have so much access on a project that does not implement IPD successfully. So the case study used in this research is still quite valuable.

3. Considering the characteristic of content analysis, the researcher is only able to obtain data from the written report rather than collect data directly from the project participants. This limitation causs an uneven distribution of quotations among different metrics and variation in quotation quantities among different projects. The variation could potentially influence accuracy of the results. Meanwhile, the scores of metrics with fewer or even no quotations

are less convincing. All major findings of this study, however, are based on metrics supported by a large number of quotations.

4. The study has limited data on the constructs of implementation effectiveness and innovation effectiveness, due either to a project not being finished or to the related information not being provided. Although there is no doubt that all projects in the content analysis implement IPD successfully and the project in the case study does not, the researcher is unable to identify the links between the influencing factors and the detailed metrics in both implementation effectiveness and innovation effectiveness.

5. The interview questions used by the researcher for the case study project to collect data are different from those used by other researchers to collect data in content analysis projects. The differing emphasis in interview questions might lead to variation in quotation quantities under certain metrics, which could influence accuracy of the results.

7.3 Suggestions for Future Research

Based on the insights achieved from this study, the researcher suggests employing social network analysis and surveys in future research on the implementation of IPD and other innovations to test, consolidate, or extend the findings of this research. Researchers ought to pay more attention to the findings and propositions with limited literature as validation, as shown in Table 15.

7.3.1 Adopting Social Network Analysis

The email data collected is not heavily used in this study, but these longitudinal data are still quite valuable for investigating team communication behavior and team integration. Chinowsky, Diekmann, and Galotti (2008) highlight the importance of a project network in building a high performance project team in the AEC industry. They conclude that social network analysis (SNA) can be used to reflect and further improve AEC team performance. For example, SNA can be applied to investigate email communication among AEC teams. Researchers can employ certain metrics to assess social network performance by running UCINET software. *Degree centrality*—number of connections one individual has to other individuals—reflects the influence of one individual among the team members (Halgin, 2008). Specifically, *in-degree centrality* and *out-degree centrality* can be used to measure the degree of information sent or received by certain individuals (Hanneman & Mark, 2005). *Closeness-Eigenvector Centrality* can be used to measure the influence of an individual to the whole interorganizational team by diminishing the influence of a small region, such as the organization to which the individual belongs (Hanneman & Mark, 2005). *Betweenness centrality* (Freeman's approach) can be used to measure the importance of an individual to linking other individuals for team performance (Halgin, 2008). In addition, *geodesic distance*—referring to the quantity of links on the shortest pass between two individuals—can be used to measure team cohesion (Borgatti, Everett, & Freeman, 2002). Meanwhile, researchers can generate NetDraw in UCINET to visualize a social network model of the project team and clearly demonstrate the connections among team members, as well as the influence each individual has on the others.

Future research can establish social network models for a project that implements IPD successfully, and also for a project that fails to implement IPD, and compare the metrics and visual NetDraws to investigate the influence of team communication, information sharing mechanisms, and distributive decision making on IPD implementation. Furthermore, if the quantitative SNA can be combined with the qualitative content analysis and case study of this research, the findings will be even more solid.

7.3.2 Developing a Survey

The researcher conducts structured interviews to collect data for one case study here. In future research, it is necessary to collect data on a larger number of IPD projects to test statistically the propositions proposed by this study. To do so, a survey questionnaire is needed to collect quantitative data. Compared to performing a structured interview, using the survey method to collect data is less time consuming, and it is easier to obtain responses among a larger sample.

The survey might be developed based on the IPD implementation evaluation system originated in this study. There could be six sections in the survey, including the project's general information section and five sections for each construct—climate, innovation-values fit, communication mechanisms, implementation effectiveness, and innovation effectiveness. Under each construct, the measuring standard for a metric can be turned into a survey question by using a Likert scale (Likert, 1961). In addition, the quantity and standard of the survey metrics can be adjusted based on the findings of this study and other literature to serve the survey purposes better. If future researchers need more detailed information, they could use open-ended questions in the survey, or conduct structured interviews at the same time based on demand.

7.4 Summary

By using content analysis and a case study approach, this research identifies two tiers of factors that influence IPD implementation as an innovation, as listed below, among which principal factors are stronger than secondary factors.

Principal influencing factors:

(1) Previous work experience: Positive previous cooperation experience enhances the level of trust and makes team integration much easier.

(2) Remove obstacles: Strategies that remove the concerns of project team members about IPD implementation and provide easier access to the understanding and execution of IPD create a good climate for IPD implementation.

(3) Decision making system: A decision making system encouraging collaborative and informative decision making helps the team efficiently identify optimal solutions to project success.

(4) Aligned project goal: Common project goals decided in the early phases of projects reduce potential conflicts and foster project teams to work collaboratively under the guidance of the goals.

(5) Phase of involvement: Early and active involvement of the owner, general contractor, and major subcontractors help to make the design meet the owner's requirements within the budget provided, reduce constructability issues, and enhance team collaboration, which makes construction much more efficient.

(6) Manage: Strategies or leadership promoting team collaboration enhance the level of integration of interorganizational teams and benefit IPD implementation.

(7) Negotiate: Effective negotiation mechanisms help project teams resolve disputes, reach consensus efficiently, and keep team integration at a high level.

Secondary influencing factors:

(1) Risk management motivator: Project teams highly motivated by the effective risk management features of IPD achieve greater benefits by being more active in the execution of strategies related to reducing and sharing risk.

(2) Strong motivator: The innovative features and expected benefits on which the project teams count highly become strong motivators that stimulate team members to dedicate themselves to the IPD process, which is considered the most effective way for them to deliver the project.

(3) Information sharing mechanisms: Effective information sharing tools (e.g., meetings, conference calls, or web-based systems) provide a good platform for the interaction and collaboration of interorganizational teams, and facilitate a collaborative decision making process.

(4) Financial transparency: Sharing budget or cost information among major project team members during design and construction phases on an ongoing basis helps identify and resolve project cost issues and enhances the level of trust among project teams.

(5) Building Information Modeling (BIM): BIM as a tool requires team collaboration to work synergistically with IPD and foster information sharing in an IPD project, and makes the design more accurate and the construction more efficient.

Based on the analysis results, the researcher develops five propositions that need to be tested by future researchers:

Proposition 1. Good innovation climate and communication mechanisms in a project team facilitate IPD implementation as an innovation.

Proposition 2. Good innovation climate improves the project team's communication mechanisms and further facilitates IPD implementation as an innovation.

Proposition 3. Positive team communication mechanisms provide a good climate for innovation and further facilitate IPD implementation as an innovation.

Proposition 4. Large scale projects have a better climate for innovation implementation than do small scale projects.

Proposition 5. If a project team did not have good communication, it would be difficult to form an effective innovation-values fit.

These propositions reflect the importance of climate to successful IPD implementation as presented in Klein and Sorra's(1996) model. Furthermore, these propositions show the role of communication in innovation implementation and its relationship in climate and innovation-values fit. These findings are established in the context of IPD innovation and match conclusions found in prior literature. Generalization of some findings to innovation implementation in the AEC industry and general industry, however, need to be further tested.

To reach these findings, this study develops an IPD implementation evaluation system to assess the implementation of IPD in construction projects as an innovation. The system provides metrics, measurements, standards, and a scoring approach for evaluation. The quotation coding results, as a middle product of the study generated by the data coding process, are provided as a guide during the execution phase of the evaluation system. Future research can introduce

quantitative analysis in similar studies by employing social network analysis and conducting a survey.

APPENDICES

APPENDIX A Metrics description and measuring criteria

Table 16 Metrics description and measuring criteria

Constructs	**Metrics**	**Measure**	**Standards**		
		Description	**Good**	**Neutral**	**Poor**
1. climate	**1.1 Team member skill levels**				
	1.1.1 Major project participants' IPD experience	Number of IPD projects delivered or has adequate experience on design-build method	1	0, but has abundant design-build experience	0
	1.1.1.1 Owner	Number of IPD projects an owner experienced or has adequate experience on design-build method	1	0, but has abundant design-build experience	0
	1.1.1.2 Architect	Number of IPD projects an architect delivered or has adequate experience on design-build method	1	0, but has abundant design-build experience	0
	1.1.1.3 General Contractor	Number of IPD projects a contractor delivered or has adequate experience on design-build method	1	0, but has abundant design-build experience	0
	1.1.1.4 Other	Number of IPD projects other parties delivered or has adequate experience on design-build method	1	0, but has abundant design-build experience	0

Table 16 (cont'd)

	1.1.2 Training	The amount of training or project related team building strategies	Adequate training with positive description and/or commentaries	Stated without description or commentaries	No or not adequate
	1.1.3 Previous Cooperation Experience	To what extent the project parties had a good previous working experience	All major project participants have good cooperation experience	Some of major project participants have good cooperation experience	None of major project participants have cooperation experience or have a bad experience
	1.2Rewards				
	1.2.1 Motivators				
	1.2.1.1 Market Advantage	Whether market advantage is the major motivator of implementing IPD in this project	Yes and stated with positive description and/or commentaries	No, but IPD is seen to be very helpful in this area	No and no benefit related to this motivator is stated
	1.2.1.2 Cost Predictability	Whether cost predictability is the major motivator of implementing IPD in this project	Yes and stated with positive description and/or commentaries	No, but IPD is seen to be very helpful in this area	No and no benefit related to this motivator is stated
	1.2.1.3 Schedule Predictability	Whether schedule predictability is the major motivator of implementing IPD in this project	Yes and stated with positive description and/or commentaries	No, but IPD is seen to be very helpful in this area	No and no benefit related to this motivator is stated
	1.2.1.4 Risk Management	Whether risk management is the major motivator of implementing IPD in this project	Yes and stated with positive description and/or commentaries	No, but IPD is seen to be very helpful in this area	No and no benefit related to this motivator is stated

Table 16 (cont'd)

	1.2.1.5 Technical Complexity	Whether technical complexity is the major motivator of implementing IPD in this project	Yes and stated with positive description and/or commentaries	No, but IPD is seen to be very helpful in this area	No and no benefit related to this motivator is stated
	1.2.1.6 Strong Motivator	Whether the initiators feel that IPD is the only or the most efficient way to deliver the process in terms of any of the motivators above	Yes and stated with positive description and/or commentaries	NA	No
	1.2.2 Reward structure				
	1.2.2.1 Incentives	Whether incentives are provided	Yes, with positive description and/or commentaries provided	Yes but without description or commentaries	No reward
	1.2.2.2 Risk Pool	Whether risk pool is established	Yes, with positive description and/or commentaries provided	Yes but without description or commentaries	No risk pool
	1.2.2.3 Liability Waiver	To what extent the liabilities are waived or the "no sue" clause is included	Fully waived	Partially waived	Not waived
	1.2.2.4 Insurance for IPD	Whether the project have insurance for IPD	Yes, with positive description and/or commentaries provided	Yes but without description or commentaries	No IPD insurance
	1.3 Absence of Obstacles				

Table 16 (cont'd)

	1.3.1 Respond to complaints	To what extent the participants' complaints about IPD are responded to effectively	The complaints are responded effectively with description or example provided	The complaints are responded effectively, but without description or example provided	The complaints are not responded or the responses are not effective.
	1.3.2 Remove Obstacles	To what extent the obstacles are removed effectively	Have effective strategies to remove obstacles, with descriptions or examples provided	Have effective strategies, but without description or example, or the strategies are not very effective	No strategy or the strategies provided are not effective at all.
	1.3.3 Exhibits no obstacles	Whether the report states that the case study exhibits no obstacles	Yes, the report states that the case study exhibits no obstacles	NA	No, there were obstacles no matter they were removed or not
	1.4 Coordination mechanisms				
	1.4.1 Decision making system	The extent to which the project teams make decisions in a participatory manner	High participatory with description or example provided	High participatory without description or example provided or medium participatory	Low participatory or no participatory (autocratical decision making)
	1.4.1.1 Aligned Project Goals	To what extent the project goals are made together by major project parties and agreed by all team members.	Most goals or all the goals	Part of the goals	A few goals or none of the goals
	1.4.2 Information sharing mechanisms				

Table 16 (cont'd)

	1.4.2.1 Financial Transparency	Whether open book accounting is used	Yes and stated with positive description and/or commentaries	Yes but stated without description or commentaries	No or not used effectively
	1.4.2.2 Building Information Modeling (BIM)	To what extent BIM is used and reached the goals of project participants	Yes, use intensively and most goals are reached	Yes, use intensively but some main goals are not achieved OR only use some function of BIM and goals are reached	No, not used or implement failure
	1.4.2.3 Lean Construction Related Tools				
	1.4.2.3.1 Last Planner System	Whether LPS is used	Yes and stated with positive description and/or commentaries	Yes but stated without description or commentaries	No or not used effectively
	1.4.2.3.2 Target Value Design	Whether TVD is used	Yes and stated with positive description and/or commentaries	Yes but stated without description or commentaries	No or not used effectively
	1.4.2.3.3 A3	Whether A3 is used	Yes and stated with positive description and/or commentaries	Yes but stated without description or commentaries	No or not used effectively
	1.4.2.3.4 A4	Whether A4 is used	Yes and stated with positive description and/or commentaries	Yes but stated without description or commentaries	No or not used effectively
	1.4.2.3.5 Choosing by Advantage	Whether CBA is used	Yes and stated with positive description and/or commentaries	Yes but stated without description or commentaries	No or not used effectively
	1.4.2.3.6 Visual management	Whether visual management is used	Yes and stated with positive description and/or commentaries	Yes but stated without description or commentaries	No or not used effectively

Table 16 (cont'd)

	1.4.2.3.7 Daily huddle	Whether daily huddle is used	Yes and stated with positive description and/or commentaries	Yes but stated without description or commentaries	No or not used effectively
	1.4.2.3.8 Other Tools	Whether other tools are used	Yes and stated with positive description and/or commentaries	Yes but stated without description or commentaries	No or not used effectively
	1.4.3 Confidence in project management	To what extent the project team members have confidence about the success of the project	High confidence	Medium Confidence	Low or no confidence
	1.4.4 Strategies				
	1.4.4.1 Early Involvement	The phase when general contractors and subcontractors are involved	Schematic Design	design development or construction document	Construction
	1.4.4.1.1 Phase of Involvement	When did general contractors and subcontractors get involved	Schematic Design	design development or construction document	Construction
	1.4.4.1.2 Early Involvement Effectiveness	To what extent the early involvement strategy is implemented effectively	Very effective, with description or example provided	Very effective, but without description or example, or somewhat effective	Not effective
	1.4.4.2 Co-location	To what extent the major project participants work together at the same place.	Most or all major participants during the whole delivery process	Only for part of the team or part of the project delivery process	No
	1.5 Trust	To what extent project participants give positive comments in terms of trust between team members.	All positive comments	Neutral comments or have both positive and negative comments	negative comments

Table 16 (cont'd)

2. Values Fit	**2.1 Commitment**	To what extent project participants are willing to devote time, resource and energy to the IPD process	Very willing, and with description or example provided	Very willing, but without description or example, or somewhat willing	Not willing
	2.2 Culture fit	The extent to which the host organization typically ??? participatory and collaborative project management tools; information is shared not hoarded	Yes and stated with description or example	Yes but stated without description or example	No
3. Communication	**3.1 Monitor**	Whether the project participants points out the problems in the project which they might not be responsible for	Yes, with description or example provided	Yes but without description or example	No
	3.2 Manage	To what extent the delivery processes are organized effectively to encourage the project participants to work collaboratively.	Management strategies effectively encourage the team collaboration, with description or example provided	Management strategies effectively encourage the team collaboration, but without description or example, or the strategies are not very effective	No manage strategies are used to encourage collaboration or the strategies are not effective at all
	3.3 Challenge	Whether team members try to use new methods to benefit the project delivery	Yes, with description or example provided	Yes but without description or example	No

Table 16 (cont'd)

	3.4 Negotiate	To what extent project participants resolved conflict and / or controversies effectively.	Conflicts / controversies are resolved with effective negotiation, with description or example provided	1) Conflicts / controversies are resolved with effective negotiation, but without description or example. Or 2) The above information is not given, but disputation resolution strategies are provided	1) Conflicts / controversies are not resolved because of poor negotiation. 2) The above information is missing, and no disputation resolution strategies are provided
4. Implementation Effectiveness	**4.1 Commitment to IPD process**	To what extent project participants are willing to devote time, resource and energy to the IPD process in the future	Very willing, and with description or example provided	Very willing, but without description or example, or somewhat willing	Not willing
	4.2 Problem Addressed	To what extent the problems the participants intend to solve by using IPD are solved	Most or all problems are solved, with description or example provided	Most or all problems are solved, but without description or example, or only some of the problems are solved	A few or no problems are solved
	4.3 Adequate Progress	To what the project is delivered on time or ahead of schedule at specific phase	Most times or always	About 50%	Only a few times or never
5. Innovation Effectiveness	**5.1 Project quality**	Whether positive commentaries are stated by project participants	Yes and stated with examples	Yes but stated without examples	No, there are negative commentaries.

Table 16 (cont'd)

	5.1.1 Turnover Quality	To what extent the owner satisfies with the turnover quality of the project	Very satisfied, with description or example provided	Very satisfied, but without description or example, or somewhat satisfied	Unsatisfied
	5.1.2 System Quality	To what extent the owner satisfies with the system quality of the project	Very satisfied, with description or example provided	Very satisfied, but without description or example, or somewhat satisfied	Unsatisfied
	5.1.3 Overall Quality	To what extent the project team satisfies with the overall quality of the project	Very satisfied, with description or example provided	Very satisfied, but without description or example, or somewhat satisfied	Unsatisfied
	5.1.4 Owner's satisfaction to cost	To what extent the owner satisfies with the cost performance of the project	Very satisfied, with description or example provided	Very satisfied, but without description or example, or somewhat satisfied	Unsatisfied
	5.2 Cost				
	5.2.1 Perceived Cost Performance	Whether the project participants perceive that IPD project costs less than traditional projects	Yes, it costs less	It is similar	No, it costs more
	5.2.2 Actual Cost Growth	Whether the project costs less comparing to project using traditional delivery method	Yes, it costs less	It is similar	No, it costs more
	5.3 Schedule				

Table 16 (cont'd)

	5.3.1 Perceived Schedule Performance	Whether the project participants perceive that IPD project needs less time than traditional projects.	Yes, it needs less time	It is similar	No, it needs more time
	5.3.2 Actual Schedule Growth	Whether the IPD project needs less time comparing to project using traditional delivery method	Yes, it needs less time	It is similar	No, it needs more time
	5.4 Change Order	Whether the IPD project has less change orders comparing to project using traditional delivery method	Yes, it has less change orders.	It is similar	No, it has more change orders.
	5.5 Safety	Whether the project has less safety issues comparing to project using traditional delivery method	Yes, it has less safety issues	It is similar	No, it has more safety issues
	5.6 Participants' Satisfaction	To what extent the project participants satisfy with the IPD process	Very satisfied, with description or example provided	Very satisfied, but without description or example, or somewhat satisfied	Unsatisfied
	5.7 Sustainability	Whether the project achieved the sustainable goals or the LEED Certification level the project team intended to achieve	The project exceeds the sustainable goals or achieve a higher level of LEED Certification	The project reaches the sustainable goals or intended LEED Certification level	The project does not achieve the sustainable goals or the intended LEED Certification level

APPENDIX B Structured Interview

Sections

Section1. Basic Information

Section2. Climate/Structures

Section3. Innovation-Values Fit

Section4. Communication Mechanisms

Section5. Innovation Effectiveness

Section1. Basic Information

1. Respondent Information

Name: _ _____

Position/ Title: _____

Company: _____

E-mail Address: _____

Phone Number: _____

Case Study Project Name: _

2. Project Profile

Building Size: _____

Building Type: ☐ Residential Building ☐ Commercial Building ☐ Industry facility,

☐ Hospital ☐ Other _____

Number of floors: _____

Location: _____

Owner: _____

Type of owner: ☐Public ☐Private ☐K-12 ☐Higher Education

☐ Developer ☐Other_____

3. Tiers of Project Participants

		Project parties				
		Owner	**Architect**	**Contractor**	**Subcontractors**	**Suppliers**
Project Tiers	**Tier 1**					
	Tier 2					
	Tier 3					

Section2. Climate/Structures

In this section, you will be asked some questions about the team skill levels to master innovation, project reward structure and obstacles to assess the climate and structures of your organization for innovation application. Please ask the following questions based on your experience in this project or the specific requirement of the question.

1. The skill level of team members

1) What, if any, prior experiences have you had in IPD projects (either philosophy or contractual) before?
2) (If applicable) Please briefly describe those projects.
3) To what extent have you worked with the other parties in the project team before?

4) To what extent have you ever been involved in sustainable construction projects before (i.e., LEED® project)?
5) What, if any prior projects have you use collaborative deliver methods (i.e., partnering, design-build)?
6) You quit IPD, but were you satisfied with the skill levels of the project participants or not (incentives/incentives management efforts to remove obstacles for implement)?
7) What communication tools did you use?
8) Have there been any major changes (other than the change of delivery method) in the project so far? [If yes= who requested the change(s)? What was the impact of the change(s) to the project?]

2. Reward Structure

1) To your best knowledge, why is IPD being pursued in this project?
2) What were your motivations (individual aspect and organizational aspect) to join this IPD project?
3) What kinds of rewards will be given to you and your organization contractually for IPD adoption?
4) What kinds of rewards will be given if any for performance, process contributions etc.?
5) Do you have more thoughts on reward of joining an IPD project to you before you decided to adopt it?

3. Obstacles

1) What, if any, obstacles were there during project team procurement?

2) Were there any obstacles for choosing IPD in this project? [If yes= please tell me about each obstacle.]
3) Are there any obstacles (sharing risk, collaboration, etc.) for you to participate in this IPD project so far?
4) Do you have any comments about obstacles in this IPD project?

4. Coordination Mechanisms

In this section you will be ask some questions about decision making system, information sharing patterns and confidence in project management which respect the coordination mechanisms of construction teams. Please answer the follow questions based on your experience in this project.

a) Decision making system

4. What were the general processes followed and the factors considered to making important decisions in this project?
5. To what extent was everyone in the project able to unify their different thoughts and perspectives to reach final decisions on the project? If you were able to reach unity in your collective decision making, how was this achieved?
6. Who took part in what major decision making in this project?
7. Did IPD help with the decision making? If so, how?
8. Did IPD hinder decision making? If so, how?

b) Information sharing patterns (survey available)

1) What kind of information sharing tools (e.g. e-mail, web-based system, BIM) do you use in this project?
2) What kind of information do you share in this project? Whom do you share with?
3) To what extent do those tools help with team collaboration?
4) To what extent do you share information with other parties actively or with the requests of others?
5) Has the information sharing process been effective? Why/why not?
6) Is there anything you would like to talk about information sharing?

c) Confidence in project management (survey available)

1) What, if any, controversies have appeared in the project so far? How was it handled?
2) How do you handle different opinions in project team? How will this action/these actions influence the collaboration of the teams?
3) In the project so far, have you been convinced to follow and trust a different opinion? What happened?
4) So far, have you had to convince other members or teams to follow and trust your opinion which was different from theirs? How?
5) Is there a project leader in this project to manage information exchange on a regular basis? [If yes= How is it conducted?]
6) Is there anything you want to share about confidence in project management?

Section3. Innovation-Values Fit

In this project you will be asked some questions about project commitment and culture-fit to assess the innovative value-fit of your company. Please answer the following questions based on your experience in this project.

1. **Commitment**
    1) How willing were you to devote time, resources and energy to this IPD project?
    2) What is your commitment to the IPD process?
    3) How did you participate in this IPD project and collaborated with other participants? What did you learn from this IPD project so far?
    4) Who suggested using IPD in this project?
    5) How confident were you about the successful application of IPD in this project when you joined in? Has your perception changed so far? Why or why not?
    6) Did any of the major parties/trades have problems in their job with IPD or related to the conduct of IPD (e.g., openly shared information or not)?
2. **Culture fit (survey available)**
    1) Was the conduct of IPD on this project make this experience any different than your previous experiences? [If yes= in what ways this experience differed from your pervious experiences?]
    2) The following are some innovative features about IPD project. Please explain how the features fit or not in the culture of your organization.

Innovative Features in IPD Project (Created based on AIA 2007)

Categories	**Innovative Features**	**Applicable or not (check the box)**	**Extent of fit (Use Likert Scale from 1-5)**
Design Process	Process Planning-Design Charrettes	☐	
	Target Value Design	☐	
	Set based Design-Early Contribution	☐	
Risk Management	Reduced Risk	☐	
	Shared Risk	☐	
Compensation/ Reward	Performance Compensation	☐	
	Behavior Compensation Evaluation	☐	
Communication Technology	Building Information Modeling (BIM)	☐	
	Project Documentation Management Software	☐	
Agreements	Relational Contract	☐	
Communication Tools	IPD Training	☐	
	Sessions	☐	
	Project Meetings	☐	
	Daily Huddle	☐	
	Project Steward	☐	
	Commitment Log	☐	
	A3's Documents and Project Newsletter	☐	

(1: not fit at all; 2: fit a little 3: fit normally 4: fit a lot; 5; fit perfectly)

3) Do you have to make some changes about the traditional culture of your organization to make it fit for the IPD execution? If yes, to what extent are you willing to make the changes?

4) How do you balance conflict or lack of "fit," if there is any conflict or lack of "fit," between your organization culture and the IPD features?

5) Is there any other comment you want to share about culture fit of IPD in your organization?

Section4. Communication Mechanisms

The purpose of this section is to assess team communication mechanisms from four perspective of monitor, manage, challenge, negotiate and integrate. Please answer the following questions based on your experience in this project.

1. **Monitor (survey available)**
    1) Who was responsible for monitoring the internal or external factors (prerequisite work need to be finished by other teams, material delivery, weather, teamwork) which might influence the project?
    2) To what extent are members of your team encouraged to monitor those factors? How are members encouraged?
    3) Do you have some examples that shows the advantage of monitoring or pitfall of not monitoring in this project?

2. **Manage (survey available)**
    1) What strategies (e.g. schedule, project control) do you use to improve the performance of the team?
    2) How would you describe the effectiveness of those strategies so far (during IPD period)?
    3) How you promote the collaboration within the team and with other teams?

4) How would you describe the effectiveness of those collaborations so far (during IPD period)?

5) Any new management tools (e.g., target value design, value stream mapping) you use with adoption of IPD in this project? [If yes = what are they?]

3. Challenge (survey available)

1) Did do try to adopt or accept some new ideas which your organization is not familiar with in this project? What are they?
2) Did you encourage the members of your organization to challenge the existing mechanism with this IPD project and provide some new methods or ideas to this project? How did that go?
3) Do you think challenging existing mechanism can contribute to the performance of this project? How? Do you have any examples from the project so far?

4. Negotiate (survey available)

1) How did everyone perform in the negotiation process? Was the process efficient? [If so, how could it have been better?]
2) If known, what is your main principle (e.g., refuse any changes if you are right; will to compromise your approach to contribute to the whole project) in negotiation to reach a consensus?
3) In your opinion, what kind negotiation processes are the best for the success of the project? Which is useful and which is not useful for this project?
4) Is there any specific problems leading to conflicts due to or about IPD? Please explain.

5) Has there been a situation that required negotiation so far in this project? Please briefly tell me about it.

6) Did anyone take a central role in conflict management and negotiation? How?

5. Integrate

1)Who worked as integrator between tiers? How did they work?

2)What did they do to enable or hinder communication and information exchange

Section5. Implementation Effectiveness

In this section you will be asked some questions of different criterion variables including commitment to the IPD process, problem addressed, making adequate process, project quality, construction performance and project performance at the end of construction completion.

5. Commitment to the IPD process (survey available)

(Use the same question as Section 4-1 commitment)

1) After this experience in your future projects, how willing are you to devote time, resources and energy to the IPD project?
2) What is your commitment to IPD project in the future?
3) Are you likely to pursue IPD project in the future? Why or why not?
4) Do you have any further feedback?

6. Problem addressed

1) Have there been any problems about time lost, communication loops and changes appearing in the project so far? What are they?
2) What is the root cause of that problem and which participants need to be involved to solve the problem? How do you solve it?
3) Have IPD features contributed to or hindered problem solving in this project? Please explain.
4) How satisfied are you with the overall process?
5) Based on lessons learned in this project, what would you do again or change in future project?

7. Making adequate progress compared to traditional approaches

1) How satisfied are you with the progress made in the project's current phases?
2) Does IPD promote or hinder this progress flow? How so? If possible, please compare IPD as promoting or hindering with previous experiences and earlier phases of the project?

8. Project quality

1) Have there been any quality issues in the project so far? If yes, how will you fix it?
2) In what ways has IPD contributed to your positive or negative perceptions about this project and process flow?
3) How does IPD help with the improvement of project quality and process flow?

9. Construction performance

1) What is the amount of request for information for the project so far?
2) How satisfied are you with delivery speed of the project? [Delivery speed= Area/ Total Time/ 30 (sf./month)]
3) What factors impacted the delivery speed of the project?
4) What do you think of the cost growth and cost performance of the project?
5) Did IPD contribute to design quality and implementation of sustainable features so far (during the IPD period)?

APPENDIX C Consent Form for Interview

Research Participant Information and Consent Form

You are being asked to participate in a research study. Investigators are required to provide a consent form to inform you about the research study, to convey that participation is voluntary, to explain risks and benefits of participation, and to empower you to make an informed decision. Please feel free to ask the researchers/investigators any questions you may have.

Study Title: Implementation of IPD as an Innovation in Construction Industry
Researcher and Title: Dr. Sinem Korkmaz, Weida Sun (Graduate Assistant)
Department and Institution: School of Planning, Design and Construction; Michigan State University
Address and Contact Information: 552 W. Circle Drive Room 405A, East Lansing, MI 48824
Sponsors: MSU, NSF pending.

PURPOSE OF RESEARCH

- You are being asked to participate in a research study of adoption of innovation in construction project teams.
- You were selected as a possible participant in this study because you recently got involved with a project delivered via the integrated project delivery (IPD) method.
- From this study, the investigators aim to learn the ways construction project teams adopt IPD as an innovation.
- Your participation in this study will take about an hour.
    - *We received your name via the project manager on the IPD project you worked on.*
    - In the entire study, about 50 people are being asked to participate.

WHAT YOU WILL DO

- You will be asked to participate in a structured interview. The interview will be audio recorded for research purposes.
- In the interview, you will be asked questions about climate/structure, innovation value-fit, communication behaviors, and implementation effectiveness for innovation adoption. You will be asked to answer the questions based on your experience in the given IPD project.
- After transcribing the interviews, we will share your interview transcription with you to receive your verification on the text before we code or further analyze it for our research.

POTENTIAL BENEFITS

- You will not directly benefit from your participation in this study. However, your participation in this study may contribute to the understanding of factors which will contribute to IPD adoption or any other innovation adoption processes in the industry. Your company might also benefit from the results of our study.

POTENTIAL RISKS

- There are no foreseeable risks associated with participation in this study.

PRIVACY AND CONFIDENTIALITY

- The entire interview records, transcriptions, interview notes, and survey results (i.e., hard copies) will be locked in a file cabinet, which only the investigators can access.
- The data for this project will be coded in such a way before its use in any publications so that participants cannot be identified. The key to this coding will be kept separately in the password-protected computer, which only the investigators can access. Except the investigators, no one will be able to link the data to the participants in the published outcomes. The interview data for this project will be kept completely confidential. The Institutional Review Board (IRB) has access to them if when necessary.
- The data collected in interviews will be audio recorded for research purposes only and will remain confidential. Research results will never disclose any specific information about case studies or study participants; Information about the participants will be kept confidential to the maximum extent allowed by law.
- The data will be stored or a minimum of three years after research closing.
- The results of this study may be published or presented at professional meetings, but the identities of all research participants will remain anonymous.
- *The interview will be audiotaped for only research purpose.*
    - I agree to allow audiotaping of the interview.

☐ Yes ☐ No Initials_____

YOUR RIGHTS TO PARTICIPATE, SAY NO, OR WITHDRAW

- Participation is voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.
- You have the right to say no.
- You may change your mind at any time and withdraw.
- You may choose not to answer specific questions or to stop participating at any time.

COSTS AND COMPENSATION FOR BEING IN THE STUDY

There is no cost to you to participate in this survey and/or interview.

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact the researchers (Weida Sun: sunweida@msu.edu, cell: (517) 580-9557; Dr. Sinem Korkmaz: korkmaz@msu.edu, 517-353-3252)

If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 207 Olds Hall, MSU, East Lansing, MI 48824.

DOCUMENTATION OF INFORMED CONSENT

Your signature below means that you voluntarily agree to participate in this research study.

_____ _____

Signature Date

You will be given a copy of this form to keep.

APPENDIX D Consent Form for Project Data

Research Participant Information and Consent Form

You are being asked to participate in a research study. Researchers are required to provide a consent form to inform you about the research study, to convey that participation is voluntary, to explain risks and benefits of participation, and to empower you to make an informed decision. Please feel free to ask the researchers/investigators any questions you may have.

Study Title: Implementation of IPD as an Innovation in Construction Industry
Researcher and Title: Dr. Sinem Korkmaz, Weida Sun (Graduate Assistant)
Department and Institution: School of Planning, Design and Construction; Michigan State University
Address and Contact Information: 552 W. Circle Drive Room 405A, East Lansing, MI 48824
Sponsor: MSU, NSF pending.

PURPOSE OF RESEARCH

- You are being asked to participate in a research study of adoption of innovation in construction project teams.
- We will collect project related information exchange from the project manager of the integrated project delivery (IPD) project you were involved with which might include your names, actions, and communications throughout the case of this project. Documentation we will collect include e-mails, meeting minutes, and any other web based information exchange.
- We will analyze the collected data via social network analyses, qualitative data analyses, and process maps.
- From this study, the researchers aim to learn the ways construction project teams adopt IPD as an innovation.

WHAT YOU WILL DO

- You will only be asked to give permission to the researchers to use the project information exchange logs in the IPD project you are involved with. These logs include your name and your project related actions.

POTENTIAL BENEFITS

- You will not directly benefit from this study when you participate in. However, your participation in this study may help you to understand the factors which will contribute to IPD adoption or any other innovation adoption processes in the industry. Your company might also benefit from the results of our study.

POTENTIAL RISKS

- There are no foreseeable risks associated with participation in this study.

PRIVACY AND CONFIDENTIALITY

- All the digital data will be stored in secured computer with password that only the researchers have access to. All the hard copy of collected data will be stored in a file cabinet that only the researchers have access to.
- Collected data for this study will be coded before it is use in research publications in such a way that you will not be identified. The key to this code will be kept separately in a computer with password that only the researchers have access to. Except the study investigators, no one will be able to link data to you in the published outcomes. The raw and coded data for this project will be kept confidential.
- Research results will never disclose any specific information about case studies or study participants; Information about the participants will be kept confidential to the maximum extent allowed by law.
- The data will be stored or a minimum of three years after researching closing. The Institutional Review Board (IRB) has access to it if necessary.
- The results of this study may be published or presented at professional meetings, but the identities of all research participants will remain anonymous.

YOUR RIGHTS TO PRTICIPATE, SAY NO, OR WITHDRAW

- Participation is voluntary. Refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.
- You have the right to say no.
- You may change your mind at any time and withdraw.

COSTS AND COMPENSATION FOR BEING IN THE STUDY

There is no cost to you to participate in this survey and/or interview.

CONTACT INFORMATION

If you have concerns or questions about this study, such as scientific issues, how to do any part of it, or to report an injury, please contact the researcher: (Weida Sun: sunweida@msu.edu, cell: (517) 580-9557; Dr. Sinem Korkmaz: korkmaz@msu.edu, 517-353-3252)

If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Michigan State University's Human Research Protection Program at 517-355-2180, Fax 517-432-4503, or e-mail irb@msu.edu or regular mail at 207 Olds Hall, MSU, East Lansing, MI 48824.

DOCUMENTATION OF INFORMED CONSENT

Your signature below means that you voluntarily agree to participate in this research study.

_____ _____

Signature Date

You will be given a copy of this form to keep.

APPENDIX E Quotation Quantity of Content Analysis and Case Study

Table 17 Quotation Quantity of Content Analysis and Case Study

#	Metrics	Content Analysis Projects												Case Study
		P1	P2	P3	P4	P5	P6	P7	P8	P9	P 10	P 11	P 12	Proj. B
1	1.1.1.1 Owner	1	0	1	0	0	1	1	1	1	1	0	1	1
2	1.1.1.2 Architect	1	1	1	0	0	1	1	1	1	1	0	1	2
3	1.1.1.3 General Contractor	1	1	1	0	0	1	1	1	1	1	0	1	3
4	1.1.1.4 Others	0	0	0	0	0	0	0	0	0	0	0	0	1
5	1.1.2 Training	5	1	2	2	2	0	0	1	2	0	2	1	4
6	1.1.3 Previous Cooperation Experience	5	1	5	1	1	0	1	1	0	3	1	1	3
7	1.2.1.1 Market Advantage	1	1	1	1	1	1	1	1	1	0	1	2	5
8	1.2.1.2 Cost Predictability	1	1	1	1	1	1	1	1	1	0	1	1	0
9	1.2.1.3 Schedule Predictability	1	1	1	1	1	1	1	1	0	0	2	1	0
10	1.2.1.4 Risk Management	1	2	1	1	2	1	1	1	1	0	1	1	0
11	1.2.1.5 Technical Complexity	1	1	1	1	2	1	1	1	1	0	1	2	0
12	1.2.1.6 Strong Motivator	0	0	0	0	2	1	0	0	1	0	2	2	0
13	1.2.2.1 Incentives	4	3	2	2	4	1	1	1	1	2	1	3	2
14	1.2.2.2 Risk Pool	4	1	2	1	1	1	0	2	0	1	1	1	1
15	1.2.2.3 Liability Waiver	2	3	1	1	1	1	0	1	0	1	1	1	0
16	1.2.2.4 Insurance for IPD	1	1	1	1	1	1	1	1	0	1	0	1	0
17	1.3.1 Respond to compaints	0	0	0	2	0	0	0	0	0	0	0	0	0
18	1.3.2 Remove Obstacles	3	5	3	2	6	0	0	0	2	0	1	4	11
19	1.3.3 Exhibits no obstacles	0	0	0	1	0	0	0	0	0	0	0	0	0
20	1.4.1 Decision making system	5	2	1	4	5	0	1	3	1	1	3	3	9
21	1.4.1.1 Aligned Project Goals	3	2	1	2	2	0	0	1	2	1	1	2	4

Table 17 (cont'd)

22	1.4.2 Information sharing mechanisms	5	7	2	4	7	2	1	0	1	1	1	7	9
23	1.4.2.1 Financial Transparency	2	2	2	1	4	2	1	1	1	1	1	1	1
24	1.4.2.2 Building Information Modeling (BIM)	9	2	1	5	7	7	2	1	1	1	4	8	0
25	1.4.2.3 Lean Construction Related Tools	0	0	1	1	0	0	0	0	0	0	1	0	0
26	1.4.2.3.1 Last Planner System	4	2	0	1	0	0	1	0	1	0	0	1	0
27	1.4.2.3.2 Target Value Design	4	0	0	1	0	0	0	0	0	0	0	1	0
28	1.4.2.3.3 A3	3	0	0	0	0	0	0	0	0	0	0	0	0
29	1.4.2.3.4 A4	2	0	0	0	0	0	0	0	0	0	0	0	0
30	1.4.2.3.5 Choosing by Advantage	1	0	0	0	0	0	0	0	0	0	0	0	0
31	1.4.2.3.6 Visual management	4	0	0	0	0	0	0	0	0	0	0	1	0
32	1.4.2.3.7 Daily huddle	0	2	0	0	0	0	1	0	0	0	0	1	0
33	1.4.2.3.8 Other Tools	0	1	0	0	0	0	1	0	0	1	0	2	0
34	1.4.3 Confidence in project management	0	1	0	0	2	0	0	0	0	0	0	0	3
35	1.4.4.1.1 Phase of Involvement	1	1	1	3	2	1	0	0	2	1	1	2	4
36	1.4.4.1.2 Early Involvement Effectiveness	5	7	4	1	5	3	3	1	1	3	1	2	3
37	1.4.4.2 Co-location	2	1	1	1	8	1	0	0	1	0	1	8	0
38	1.5 Trust	2	3	0	0	1	0	0	0	0	1	2	2	8
39	2.1 Commitment	6	4	9	5	12	3	2	1	0	1	1	5	18
40	2.2 Culture fit	8	16	6	4	17	1	2	0	3	2	5	12	40
41	3.1 Monitor	5	3	0	1	4	0	0	0	0	0	0	0	5
42	3.2 Manage	13	9	2	2	26	5	2	3	2	5	3	14	17
43	3.3 Challenge	3	0	0	0	0	0	0	0	0	2	0	2	2
44	3.4 Negotiate	1	5	1	1	1	1	0	1	1	2	0	3	6
45	4.1 Commitment to IPD process	0	1	1	0	0	0	0	0	1	0	1	0	5
46	4.2 Problem Addressed	1	3	0	1	3	0	0	1	1	1	0	5	3
47	4.3 Adequate Progress	0	0	0	0	1	0	0	0	0	0	0	0	0
48	5.1.1 Turnover Quality	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 17 (cont'd)

49	5.1.2 System Quality	0	0	0	0	0	0	0	0	0	0	0	0	0
50	5.1.3 Overall Quality	0	0	0	0	0	0	0	0	0	0	0	0	0
51	5.1.4 Owner's satisfaction to cost	0	0	0	0	0	0	0	0	0	0	0	0	0
52	5.2.1 Perceived Cost Performance	1	0	1	0	0	0	0	0	0	0	0	0	0
53	5.2.2 Actual Cost Growth	3	1	0	0	0	1	1	0	0	0	1	1	0
54	5.3.1 Perceived Schedule Performance	1	0	1	0	0	0	0	0	0	2	0	2	0
55	5.3.2 Actual Schedule Growth	0	0	0	0	1	0	1	1	0	0	0	1	0
56	5.4 Change Order	1	0	0	0	2	0	1	0	0	0	0	0	0
57	5.5 Safety	0	0	0	0	0	0	0	0	0	0	0	0	0
58	5.6 Participants's Satisfaction	0	2	0	0	0	0	1	0	0	1	0	0	2
59	5.7 Sustainability	0	0	0	0	1	0	0	0	0	0	0	0	1

APPENDIX F Project Scores under Including Neutral Quotation Situation

Table 18 Project Scores under Including Neutral Quotation Situation

Metrics	Content Analysis														Case Study
	1	2	3	4	5	6	7	8	9	10	11	12	Total	Avg.	Proj. B
1.1.1.1 Owner	1.50	1.00	1.00	1.00	1.00	1.50	0.50	0.50	1.50	0.50	1.00	1.00	12.00	1.00	0.50
1.1.1.2 Architect	0.50	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	1.50	1.00	1.00	10.00	0.83	0.75
1.1.1.3 General contractor	1.50	1.00	1.00	1.00	1.00	0.50	0.50	0.50	1.50	1.50	1.00	1.00	12.00	1.00	0.83
1.1.1.4 Other	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.50
1.1.2 Training	1.40	1.50	1.50	1.00	1.25	1.00	1.00	1.00	1.50	1.00	0.50	1.50	14.15	1.18	1.25
1.1.3 Previous cooperation experience	1.40	1.00	1.40	1.50	1.50	1.00	1.50	1.50	1.00	1.50	1.00	1.50	15.80	1.32	0.83
1.2.1.1 Market advantage	1.00	1.50	1.50	1.50	1.50	1.50	1.00	1.00	1.50	1.00	0.50	1.50	15.00	1.25	1.20
1.2.1.2 Cost predictability	1.50	1.00	1.50	0.50	1.50	1.00	1.50	0.50	0.50	1.00	1.50	1.50	13.50	1.13	1.00
1.2.1.3 Schedule predictability	1.50	1.00	0.50	0.50	1.50	1.50	1.50	0.50	1.00	1.00	1.50	1.50	13.50	1.13	1.00
1.2.1.4 Risk management	1.50	1.25	0.50	0.50	1.50	1.50	1.50	1.50	1.50	1.00	1.50	1.50	15.25	1.27	1.00
1.2.1.5 Technical complexity	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.50	1.50	1.00	1.50	1.50	11.50	0.96	1.00
1.2.1.6 Strong motivator	1.00	1.00	1.00	1.00	1.50	1.50	1.00	1.00	1.50	1.00	1.50	1.50	14.50	1.21	1.00
1.2.2.1 Incentives	0.88	1.33	1.25	1.25	1.00	1.50	0.50	1.50	1.00	1.25	0.50	1.50	13.46	1.12	1.00
1.2.2.2 Risk pool	1.13	1.50	1.00	1.50	0.50	1.50	1.00	1.25	1.00	1.50	0.50	0.50	12.88	1.07	1.00
1.2.2.3 Liability waiver	1.25	0.83	0.50	1.50	0.50	1.50	1.00	0.50	1.00	1.00	1.00	0.50	11.08	0.92	1.00
1.2.2.4 Insurance for IPD	1.50	0.50	0.50	0.50	0.50	1.00	1.00	0.50	1.00	0.50	1.00	0.50	9.00	0.75	1.00
1.3.1 Respond to complaints	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
1.3.2 Remove obstacles	1.33	1.40	1.50	1.00	1.50	1.00	1.00	1.00	1.50	1.00	0.50	1.50	14.23	1.19	0.50
1.3.3 Exhibits no obstacles	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00

Table 18 (cont'd)

1.4.1 Decision-making system	1.50	1.25	1.50	1.50	1.40	1.00	1.50	1.33	1.50	1.50	1.50	1.50	16.98	1.42	0.78
1.4.1.1 Aligned project goals	1.50	1.25	1.50	1.25	1.50	1.00	1.00	0.50	0.75	1.50	1.50	1.50	14.75	1.23	0.50
1.4.2 Information-sharing mechanisms	1.50	1.43	1.50	1.50	1.50	1.25	1.50	1.00	1.50	1.50	1.50	1.43	17.11	1.43	1.06
1.4.2.1 Financial transparency	1.50	1.25	1.25	1.50	1.38	1.50	1.00	1.00	1.00	1.50	1.50	1.00	15.38	1.28	1.00
1.4.2.2 Building Information Modeling (BIM)	1.44	0.75	1.00	1.20	1.21	1.21	1.50	0.50	1.50	1.50	1.25	1.50	14.57	1.21	1.00
1.4.2.3 Lean Construction-Related Tools	1.00	1.00	0.50	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	11.00	0.92	1.00
1.4.2.3.1 Last Planner System	1.38	1.25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	13.13	1.09	1.00
1.4.2.3.2 Target Value Design	1.38	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	12.88	1.07	1.00
1.4.2.3.3 A3	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
1.4.2.3.4 A4	1.25	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.25	1.02	1.00
1.4.2.3.5 Choosing by Advantage	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
1.4.2.3.6 Visual management	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	13.00	1.08	1.00
1.4.2.3.7 Daily huddle	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	13.00	1.08	1.00
1.4.2.3.8 Other tools	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.50	1.00	1.25	13.25	1.10	1.00
1.4.3 Confidence in project management	1.00	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	11.50	0.96	0.83
1.4.4.1.1 Phase of involvement	1.50	1.50	1.50	1.00	1.50	1.00	1.00	1.00	1.50	1.50	1.50	1.00	15.50	1.29	0.75
1.4.4.1.2 Early involvement effectiveness	1.40	1.43	1.38	0.50	1.50	1.50	1.33	1.00	1.50	1.50	1.50	1.50	16.04	1.34	1.33

Table 18 (cont'd)

1.4.4.2 Colocation	1.50	0.50	0.50	0.50	1.50	1.00	1.00	1.00	1.00	1.00	1.50	1.44	12.44	1.04	1.00
1.5 Trust	1.25	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.50	1.50	14.08	1.17	1.19
2.1 Commitment	1.17	1.38	1.22	1.00	1.08	1.17	0.75	0.50	1.00	1.00	0.50	1.30	12.06	1.01	0.97
2.2 Culture fit	1.38	1.16	1.33	1.38	1.12	1.00	1.00	1.00	0.67	1.25	1.20	1.21	13.68	1.14	1.08
3.1 Monitor	1.40	1.33	1.00	1.50	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	13.73	1.14	1.00
3.2 Manage	1.35	1.39	1.50	1.50	1.38	1.30	1.00	1.33	1.25	1.40	1.17	1.50	16.07	1.34	0.91
3.3 Challenge	1.33	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.00	1.50	13.33	1.11	1.00
3.4 Negotiate	1.00	1.20	1.00	1.00	1.00	1.00	1.00	1.50	1.50	1.50	1.00	1.33	14.03	1.17	0.75
4.1 Commitment to IPD process	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.00	13.00	1.08	1.40
4.2 Problem addressed	1.50	1.00	1.00	0.50	1.50	1.00	1.00	1.50	1.50	1.50	1.00	1.40	14.40	1.20	1.33
4.3 Adequate progress	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
5.1.1 Turnover quality	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.1.2 System quality	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.1.3 Overall quality	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.1.4 Owner's satisfaction with cost	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.2.1 Perceived cost performance	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
5.2.2 Actual cost growth	1.50	1.00	1.00	1.00	1.00	1.50	1.50	1.00	1.00	1.00	1.50	1.50	14.50	1.21	1.00
5.3.1 Perceived schedule performance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.00	1.25	12.75	1.06	1.00
5.3.2 Actual schedule growth	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.50	1.00	1.00	1.00	1.50	13.50	1.13	1.00
5.4 Change order	1.50	1.00	1.00	1.00	1.50	1.00	1.50	1.00	1.00	1.00	1.00	1.00	13.50	1.13	1.00
5.5 Safety	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.6 Participants' satisfaction	1.00	1.25	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.50	1.00	1.00	13.25	1.10	1.00
5.7 Sustainability	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	0.50

APPENDIX G Project Scores under Excluding Neutral Quotation Situation

Table 19 Project Scores under Excluding Neutral Quotation Situation

Metrics	Content Analysis														Case Study
	1	2	3	4	5	6	7	8	9	10	11	12	Total	Avg.	Proj. B
1.1.1.1 Owner	1.50	1.00	1.00	1.00	1.00	1.50	0.50	0.50	1.50	0.50	1.00	1.00	12.00	1.00	0.50
1.1.1.2 Architect	0.50	1.00	1.00	1.00	1.00	0.50	0.50	0.50	0.50	1.50	1.00	1.00	10.00	0.83	0.50
1.1.1.3 General contractor	1.50	1.00	1.00	1.00	1.00	0.50	0.50	0.50	1.50	1.50	1.00	1.00	12.00	1.00	0.50
1.1.1.4 Other	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.50
1.1.2 Training	1.50	1.50	1.50	1.00	1.50	1.00	1.00	1.00	1.50	1.00	0.50	1.50	14.50	1.21	1.50
1.1.3 Previous cooperation experience	1.50	1.00	1.50	1.50	1.50	1.00	1.50	1.50	1.00	1.50	1.00	1.50	16.00	1.33	0.83
1.2.1.1 Market advantage	1.00	1.50	1.50	1.50	1.50	1.50	1.00	1.00	1.50	1.00	0.50	1.50	15.00	1.25	1.50
1.2.1.2 Cost predictability	1.50	1.00	1.50	0.50	1.50	1.00	1.50	0.50	0.50	1.00	1.50	1.50	13.50	1.13	1.00
1.2.1.3 Schedule predictability	1.50	1.00	0.50	0.50	1.50	1.50	1.50	0.50	1.00	1.00	1.50	1.50	13.50	1.13	1.00
1.2.1.4 Risk management	1.50	1.50	0.50	0.50	1.50	1.50	1.50	1.50	1.50	1.00	1.50	1.50	15.50	1.29	1.00
1.2.1.5 Technical complexity	0.50	1.00	0.50	0.50	1.00	0.50	0.50	1.50	1.50	1.00	1.50	1.50	11.50	0.96	1.00
1.2.1.6 Strong motivator	1.00	1.00	1.00	1.00	1.50	1.50	1.00	1.00	1.50	1.00	1.50	1.50	14.50	1.21	1.00
1.2.2.1 Incentives	0.50	1.50	1.50	1.50	1.00	1.50	0.50	1.50	1.00	1.50	0.50	1.50	14.00	1.17	1.00
1.2.2.2 Risk pool	1.17	1.50	1.00	1.50	0.50	1.50	1.00	1.50	1.00	1.50	0.50	0.50	13.17	1.10	1.00
1.2.2.3 Liability waiver	1.50	0.50	0.50	1.50	0.50	1.50	1.00	0.50	1.00	1.00	1.00	0.50	11.00	0.92	1.00
1.2.2.4 Insurance for IPD	1.50	0.50	0.50	0.50	0.50	1.00	1.00	0.50	1.00	0.50	1.00	0.50	9.00	0.75	1.00
1.3.1 Respond to complaints	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
1.3.2 Remove obstacles	1.50	1.50	1.50	1.00	1.50	1.00	1.00	1.00	1.50	1.00	0.50	1.50	14.50	1.21	0.50
1.3.3 Exhibits no obstacles	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00

Table 19 (cont'd)

1.4.1 Decision-making system	1.50	1.50	1.50	1.50	1.50	1.00	1.50	1.50	1.50	1.50	1.50	1.50	17.50	1.46	0.75
1.4.1.1 Aligned project goals	1.50	1.50	1.50	1.50	1.50	1.00	1.00	0.50	0.50	1.50	1.50	1.50	15.00	1.25	0.50
1.4.2 Information-sharing mechanisms	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.00	1.50	1.50	1.50	1.50	17.50	1.46	1.10
1.4.2.1 Financial transparency	1.50	1.50	1.50	1.50	1.50	1.50	1.00	1.00	1.00	1.50	1.50	1.00	16.00	1.33	1.00
1.4.2.2 Building Information Modeling (BIM)	1.50	0.50	1.00	1.50	1.50	1.50	1.50	0.50	1.50	1.50	1.25	1.50	15.25	1.27	1.00
1.4.2.3 Lean Construction-Related Tools	1.00	1.00	0.50	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	11.00	0.92	1.00
1.4.2.3.1 Last Planner System	1.50	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	13.50	1.13	1.00
1.4.2.3.2 Target Value Design	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	13.00	1.08	1.00
1.4.2.3.3 A3	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
1.4.2.3.4 A4	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
1.4.2.3.5 Choosing by Advantage	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
1.4.2.3.6 Visual management	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	13.00	1.08	1.00
1.4.2.3.7 Daily huddle	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	13.00	1.08	1.00
1.4.2.3.8 Other tools	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.50	1.00	1.50	13.50	1.13	1.00
1.4.3 Confidence in project management	1.00	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	11.50	0.96	0.50
1.4.4.1.1 Phase of involvement	1.50	1.50	1.50	1.00	1.50	1.00	1.00	1.00	1.50	1.50	1.50	1.00	15.50	1.29	0.50
1.4.4.1.2 Early involvement effectiveness	1.50	1.50	1.50	0.50	1.50	1.50	1.50	1.00	1.50	1.50	1.50	1.50	16.50	1.38	1.50

Table 19 (cont'd)

1.4.4.2 Colocation	1.50	0.50	0.50	0.50	1.50	1.00	1.00	1.00	1.00	1.00	1.50	1.50	12.50	1.04	1.00
1.5 Trust	1.50	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.50	1.50	14.50	1.21	1.30
2.1 Commitment	1.50	1.50	1.33	1.00	1.17	1.50	0.50	0.50	1.00	1.00	0.50	1.50	13.00	1.08	0.95
2.2 Culture fit	1.50	1.36	1.50	1.50	1.17	1.00	1.00	1.00	0.50	1.50	1.50	1.36	14.88	1.24	1.13
3.1 Monitor	1.50	1.50	1.00	1.50	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	14.00	1.17	1.00
3.2 Manage	1.50	1.50	1.50	1.50	1.45	1.50	1.00	1.50	1.50	1.50	1.17	1.50	17.12	1.43	0.86
3.3 Challenge	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.00	1.50	13.50	1.13	1.00
3.4 Negotiate	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.50	1.50	1.50	1.00	1.50	14.50	1.21	0.70
4.1 Commitment to IPD process	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.00	13.00	1.08	1.50
4.2 Problem addressed	1.50	1.00	1.00	0.50	1.50	1.00	1.00	1.50	1.50	1.50	1.00	1.50	14.50	1.21	1.50
4.3 Adequate progress	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
5.1.1 Turnover quality	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.1.2 System quality	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.1.3 Overall quality	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.1.4 Owner's satisfaction with cost	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.2.1 Perceived cost performance	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	1.00
5.2.2 Actual cost growth	1.50	1.00	1.00	1.00	1.00	1.50	1.50	1.00	1.00	1.00	1.50	1.50	14.50	1.21	1.00
5.3.1 Perceived schedule performance	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50	1.00	1.50	13.00	1.08	1.00
5.3.2 Actual schedule growth	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.50	1.00	1.00	1.00	1.50	13.50	1.13	1.00
5.4 Change order	1.50	1.00	1.00	1.00	1.50	1.00	1.50	1.00	1.00	1.00	1.00	1.00	13.50	1.13	1.00
5.5 Safety	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.00	1.00	1.00
5.6 Participants' satisfaction	1.00	1.50	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.50	1.00	1.00	13.50	1.13	1.00
5.7 Sustainability	1.00	1.00	1.00	1.00	1.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	12.50	1.04	0.50

APPENDIX H Quotation Coding Results

Table of Contents for Appendix H

Instruction of Quotation Source Coding

The source information of each quotation is list in the following order:
Document ID: Case study number, project name-Quotation ID [quotation content(i.e. Document #: Quotation #)] (location (i.e. page: location #)) (author)
Codes: [Metric]
For example, The code—"P 3: 01 Cathedral Hill Hospital.pdf - 3:55 [In the beginning of the projec..] (19:2893-19:3155) (Super) Codes: [Training]"—means that the author "Super" (default name) code the sentence "In the beginning of the project..." under the metric "training" and it is Quotation #55 locating at the nineteenth page of Primary Document 3 "01 Cathedral Hill Hospital" , a PDF file.

Content Analysis Projects

Project 1

General Information

P 3: 01 Cathedral Hill Hospital.pdf - 3:135 [Cathedral Hill Hospital] (13:132-13:156) (Super)
Codes: [Project Name]
Cathedral Hill Hospital

P 3: 01 Cathedral Hill Hospital.pdf - 3:2 [Healthcare - New Construction] (14:208-14:236) (Super)
Codes: [Project Type]
Healthcare - New Construction

"P 3: 01 Cathedral Hill Hospital.pdf - 3:1 [San Francisco, California] (14:174-14:198) (Super)
Codes: [Location]
San Francisco, California

"P 3: 01 Cathedral Hill Hospital.pdf - 3:3 [Single Multi-party Contract – ..] (14:250-14:283) (Super)
Codes: [Contract]
Single Multi-party Contract – IFOA

P 3: 01 Cathedral Hill Hospital.pdf - 3:140 [Single Multi-party Contract • ..] (16:4373-16:4553) (Super)
Codes: [Contract]
Single Multi-party Contract
Integrated Agreement for Lean Project Delivery between Owner, Architect & CM/GC – also referred as Integrated Form of Agreement (IFOA)

P 3: 01 Cathedral Hill Hospital.pdf - 3:4 [August 2007] (14:445-14:455) (Super)
Codes: [Project Start Time]
August 2007

P 3: 01 Cathedral Hill Hospital.pdf - 3:5 [March 2015] (14:475-14:484) (Super)
Codes: [Est. Completion Time]

March 2015

Positive

"P 3: 01 Cathedral Hill Hospital.pdf - 3:28 [Sutter was fairly experienced ..] (17:357-17:590) (Super)
Codes: [Team member IPD experience] [Owner]
Sutter was fairly experienced with IPD and Lean Construction having completed the Fairfield Medical Office two years before. On Fairfield, Sutter used an innovative IFOA agreement created for them by attorney William A. Lichtig.

P 3: 01 Cathedral Hill Hospital.pdf - 3:73 [Of great value to this project..] (21:915-21:1291) (Super)
Codes: [Team member IPD experience] [Owner] [General Contractor]
Of great value to this project was past experience in IPD and Lean Construction by Sutter, Boldt and many key individuals of the IPD Team. The team leveraged their experience and resources, which allowed them to further refine previously developed IPD process, such as the Target Value Design plan and the Last Planner Process, for the Cathedral Hill Hospital project

P 3: 01 Cathedral Hill Hospital.pdf - 3:146 [California Pacific Medical Cen..] (19:267-19:485) (Super)
Codes: [Team member IPD experience] [Owner] [General Contractor]
California Pacific Medical Center (CPMC) is an affiliate of Sutter Health, a large healthcare owner that has pioneered IPD since 2005 (see Contract). Sutter and Boldt have experience with IPD and Lean Construction

P 3: 01 Cathedral Hill Hospital.pdf - 3:73 [Of great value to this project..] (21:915-21:1291) (Super)
Codes: [Team member IPD experience] [Owner] [General Contractor]
Of great value to this project was past experience in IPD and
Lean Construction by Sutter, Boldt and many key individuals of the IPD Team. The team leveraged their experience and resources, which allowed them to further refine previously developed IPD process, such as the Target Value Design plan and the Last Planner Process, for the Cathedral Hill Hospital project

P 3: 01 Cathedral Hill Hospital.pdf - 3:146 [California Pacific Medical Cen..] (19:267-19:485) (Super)
Codes: [Team member IPD experience] [Owner] [General Contractor]
California Pacific Medical Center (CPMC) is an affiliate of Sutter Health, a large healthcare owner that has pioneered IPD since 2005 (see Contract). Sutter and Boldt have experience with IPD and Lean Construction

P 3: 01 Cathedral Hill Hospital.pdf - 3:151 [Sutter and Boldt both studied ..] (20:1073-20:1215) (Super)
Codes: [Previous cooperation experience] [Owner] [General Contractor] [Team member IPD experience]
Sutter and Boldt both studied IPD and Lean Construction for over seven years and had formed key relationships through that mutual interest."

"P 3: 01 Cathedral Hill Hospital.pdf - 3:73 [Of great value to this project..] (21:915-21:1291) (Super)
Codes: [Team member IPD experience] [Owner] [General Contractor]
Of great value to this project was past experience in IPD and Lean Construction by Sutter, Boldt and many key individuals of the IPD Team. The team leveraged their experience and resources, which allowed them to further refine previously developed IPD process, such as the Target Value Design plan and the Last Planner Process, for the Cathedral Hill Hospital project

P 3: 01 Cathedral Hill Hospital.pdf - 3:146 [California Pacific Medical Cen..] (19:267-19:485) (Super)
Codes: [Team member IPD experience] [Owner] [General Contractor]
California Pacific Medical Center (CPMC) is an affiliate of Sutter Health, a large healthcare owner that has pioneered IPD since 2005 (see Contract). Sutter and Boldt have experience with IPD and Lean Construction

P 3: 01 Cathedral Hill Hospital.pdf - 3:73 [Of great value to this project..] (21:915-21:1291) (Super)
Codes: [Team member IPD experience] [Owner] [General Contractor]
Of great value to this project was past experience in IPD and Lean Construction by Sutter, Boldt and many key individuals of the IPD Team. The team leveraged their experience and resources, which allowed them to further refine previously developed IPD process, such as the Target Value Design plan and the Last Planner Process, for the Cathedral Hill Hospital project

P 3: 01 Cathedral Hill Hospital.pdf - 3:146 [California Pacific Medical Cen..] (19:267-19:485) (Super)
Codes: [Team member IPD experience] [Owner] [General Contractor]
California Pacific Medical Center (CPMC) is an affiliate of Sutter Health, a large healthcare owner that has pioneered IPD since 2005 (see Contract). Sutter and Boldt have experience with IPD and Lean Construction

P 3: 01 Cathedral Hill Hospital.pdf - 3:151 [Sutter and Boldt both studied ..] (20:1073-20:1215) (Super)
Codes: [Previous cooperation experience] [Owner] [General Contractor] [Team member IPD experience]
Sutter and Boldt both studied IPD and Lean Construction for over seven years and had formed key relationships through that mutual interest."

"P 3: 01 Cathedral Hill Hospital.pdf - 3:55 [In the beginning of the projec..] (19:2893-19:3155) (Super)
Codes: [Training]
In the beginning of the project, Sutter's Facility, Planning, and Development (FPD) representative regularly attended the Target Value Design and Last Planner meetings to help coach people through the cultural and behavioral expectations of IPD and Lean.

P 3: 01 Cathedral Hill Hospital.pdf - 3:150 [Boldt, with their extensive ex..] (19:3865-19:4449) (Super)
Codes: [Training]
Boldt, with their extensive experience and history with the Lean Construction Institute and real commitment to continuous learning, served as a mentor to educate the Integrated Project Delivery Team on Lean. Specifically, Boldt appointed one individual as the Value and Lean Process Manager, responsible for incorporating Lean Construction practices into the IPD Team. This individual trained team members in Lean practices and task management tools through regular Study Action Groups. All team members, regardless of experience level, participated in these groups.

P 3: 01 Cathedral Hill Hospital.pdf - 3:152 [All consultants that committed..] (20:2425-20:2582) (Super)
Codes: [Training]
All consultants that committed to the project went through the Study Action Group training to educate them in the philosophy of IPD and Lean Construction.

P 3: 01 Cathedral Hill Hospital.pdf - 3:78 [This project employed individu..] (21:4476-21:4766) (Super)
Codes: [Manage][training]
This project employed individuals at multiple leadership levels to manage the integrated team performance through education of the team on information exchange and process management tools, planning of design and production sequencing and supporting continuous improvement ideas.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:22 [Participants overwhelmingly in..] (15:4397-15:4517) (Super)
Codes: [Previous cooperation experience]
Participants overwhelmingly indicated (92.2%) that their organizations had previous working experience with each other.

P 3: 01 Cathedral Hill Hospital.pdf - 3:63 [Boldt is experienced in large-..] (20:1808-20:1938) (Super)
Codes: [Previous cooperation experience] [General Contractor]
Boldt is experienced in large-scale healthcare projects and Lean Construction and had a long-standing relationship with Sutter
P 3: 01 Cathedral Hill Hospital.pdf - 3:139 [Furthermore, 60.9% of individu..] (16:132-16:394) (Super)
Codes: [Previous cooperation experience][Commitment]
Furthermore, 60.9% of individuals had previously worked with other team members. This past experience was likely a factor in organizations' willingness to embark on an integrated, collaborative delivery model, still a very new model with several unknowns.

P 3: 01 Cathedral Hill Hospital.pdf - 3:151 [Sutter and Boldt both studied ..] (20:1073-20:1215) (Super)

Codes: [Previous cooperation experience] [Owner] [General Contractor] [Team member IPD experience]
Sutter and Boldt both studied IPD and Lean Construction for over seven years and had formed key relationships through that mutual interest.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:13 [Cost Predictability was Sutter..] (15:1149-15:1224) (Super)
Codes: [Motivator_Cost]
Cost Predictability was Sutter's primary driver for using IPD as a company

"P 3: 01 Cathedral Hill Hospital.pdf - 3:137 [Schedule Predictability was an..] (15:1574-15:2117) (Super)
Codes: [Motivator_Schedule]
Schedule Predictability was an important driver of using IPD because of several critical variables bearing on the project. California instated a 2013 deadline for meeting seismic and seismic retrofit requirements (California State Senate Bill 1953 and 1661). The complexity of the building and permitting process in San Francisco will make that deadline difficult to meet. Aging current facilities for CPMC demand investment to keep them functional, creating additional financial incentives to complete the new facility quickly

"P 3: 01 Cathedral Hill Hospital.pdf - 3:17 [Reduced Risk was a major motiv..] (15:2530-15:2706) (Super)
Codes: [Motivator_Risk]
Reduced Risk was a major motivator for the owner to shift to IPD. Sutter realized that their capital investments in construction could be better protected from risk with IPD

"P 3: 01 Cathedral Hill Hospital.pdf - 3:36 [The IFOA established a risk-po..] (17:3726-17:4045) (Super)
Codes: [Reward Structure-risk pool]
The IFOA established a risk-pool that the architect, CM/GC, primary design consultants and primary trade contractors were bound to. In this case, the IPD team members participating in the pool put a percentage of their profit at risk to partially fund cost overruns or other project liabilities if any occurred.

P 3: 01 Cathedral Hill Hospital.pdf - 3:39 [One of the revisions Sutter ha..] (18:791-18:1049) (Super)
Codes: [Reward Structure-risk pool]
One of the revisions Sutter had made to their standard IFOA was the elimination of risk sharing and incentives for pre-construction. Instead of putting 25% of preconstruction profits at risk, they shifted to a 100% construction profits at risk model.

P 3: 01 Cathedral Hill Hospital.pdf - 3:142 [The architect and CM/GC placed..] (18:134-18:629) (Super)
Codes: [Reward Structure-risk pool]

The architect and CM/GC placed 25% of their preconstruction and construction fixed fee profits at risk. At the time the contract was executed, the following additional parties were included in the Risk Pool IPD Team:
Architect's Consultants: Degenkolb Engineers (structural),
Silverman & Light Inc. (electrical), Ted Jacob Engineering
Group Inc. (M/P),
Trade Contractors: Rosendin Electric (electrical), Southland Industries (mechanical), Charles Pankow Builders, Ltd. (concrete)

P 3: 01 Cathedral Hill Hospital.pdf - 3:143 [The architect, however, is con..] (18:1150-18:1528) (Super)
Codes: [Reward Structure-risk pool]
The architect, however, is concerned that these changes will negatively affect the target value design process. With the original model, the team was incentivized to reduce costs below the estimated maximum price during the design phase. The shift to construction-phase-only incentives may result in the team holding onto cost savings ideas until construction starts.

P 3: 01 Cathedral Hill Hospital.pdf - 3:39 [One of the revisions Sutter ha..] (18:791-18:1049) (Super)
Codes: [Reward Structure-risk pool]
One of the revisions Sutter had made to their standard IFOA was the elimination of risk sharing and incentives for pre-construction. Instead of putting 25% of preconstruction profits at risk, they shifted to a 100% construction profits at risk model.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:43 [Sutter's IFOA Article 33.1 exp..] (18:1840-18:1968) (Super)
Codes: [Reward structure liability waiver]
Sutter's IFOA Article 33.1 explicitly limits liability between all Risk Pool IPD Team members (see Risk/Reward) and the owner.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:145 [At the time this case study wa..] (18:4079-18:4882) (Super)
Codes: [Reward structure_insurance]
At the time this case study was conducted, the Cathedral Hill
Hospital IPD Team was still determining how the project specific insurance would be handled. This project will be one of the first to use an insurance product designed specifically for Integrated Project Delivery. Two major insurers visited the project site to familiarize their understanding of the processes and will be presenting IPD insurance options to the team in January 2011. General Liability and Professional Liability insurance is required for the architect and the architect's consultants. The contract requires standard CM/GC insurance, however as noted above, the team will be using an IPD specific insurance product. It is yet to be determined if this will be an owner or contractor controlled policy.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:189 [Because IPD was new for a larg..] (21:609-21:909) (Super)
Codes: [Remove Obstacles]

Because IPD was new for a large number of individuals on the team, the project moved intentionally slow in the beginning. This allowed team members to develop and learn new processes while getting to know each other. There was a great deal of time spent on planning before design work began.

P 3: 01 Cathedral Hill Hospital.pdf - 3:147 [The team discovered a deficien..] (19:1740-19:2168) (Super)
Codes: [Manage] [remove obstacles]
The team discovered a deficiency in owner involvement as they worked through the value added list (a list of items identified as desirable by the owner but not previously budgeted). The team realized they needed more input at the user group level, specifically clinical operations, to better prioritize those items. The owner addressed this by bringing a representative from hospital operations onto the project team.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:123 [Any changes to BIM software we..] (26:1684-26:1831) (Super)
Codes: [Decision Making System] [A3]
Any changes to BIM software were made following the A3 decision-making process (see Implementation) and required consensus of the BIM Champions.

P 3: 01 Cathedral Hill Hospital.pdf - 3:120 [Meeting Frequency • Weekly Cor..] (25:2309-25:2575) (Super)
Codes: [Decision Making System] [Information Sharing Patterns]
Meeting Frequency
- Weekly Core Group Meetings
- Bi-weekly/weekly IPD Team (Cluster Group Coordination) Meetings
- Target Value Design
- Last Planner System
- Daily Cluster Group Meetings
- Detailer Meetings
- Specialized as needed

P 3: 01 Cathedral Hill Hospital.pdf - 3:175 [The primary vehicle used to fo..] (24:149-24:1448) (Super)
Codes: [A3] [Decision Making System]
The primary vehicle used to formalize, document and evaluate project decisions is called an A3 report, named after the size of the piece of paper upon which it's printed. The team borrowed this tool from the car company, Toyota who uses it to evaluate complex decisions. The standard form A3 facilitated consistent problem identification, analysis, assessment and solutions. A3's could be initiated by anyone on the team and cover a range of issues; the criteria for its use was intentionally left undefined to give IPD Team members the ability to follow their own intuition and take initiative. Once an individual formally initiated an A3, the form was submitted to the Core Group for review and final decision.
The benefit of A3 reporting is that it documents the problem, records the involved parties, and establishes the assumptions for consideration. This provided the Core Group with a holistic

understanding and created a consistent and effective format for them to evaluate the situation and make a final decision. At the time of this report, over 300 A3's had been generated and more than 200 had reached resolution. So effective has the formal A3 process proven, Cluster Groups began to use informal A3 processes to work through routine problems.

P 3: 01 Cathedral Hill Hospital.pdf - 3:125 [The results of the test inform..] (26:2095-26:2273) (Super)
Codes: [Decision Making System] [A3]
The results of the test informed A3 decision making, provided feedback to software vendors, and informed decisions on how the model would be divided into specific design areas

P 3: 01 Cathedral Hill Hospital.pdf - 3:176 [The team also implemented the ..] (24:1451-24:1744) (Super)
Codes: [Choosing by Advantage] [Decision Making System]
The team also implemented the Choosing by Advantages (CBA) decision-making system. CBA a rigorous methodology for evaluating complex decisions with multiple stakeholders by identifying the relative advantages and importance of each option. The CBA method complemented the Lean A3 tool.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:34 [These goals were clearly commu..] (17:3338-17:3398) (Super)
Codes: [Aligned Project Goals]
These goals were clearly communicated to the integrated team.

P 3: 01 Cathedral Hill Hospital.pdf - 3:46 [Owner involvement is one of th..] (19:640-19:882) (Super)
Codes: [Aligned Project Goals]
Owner involvement is one of the key differences between IPD and design-build, see Goals. The owner's ongoing input was critical to inform the team of items most valuable to them as the team went through the process of Target Value Design

P 3: 01 Cathedral Hill Hospital.pdf - 3:85 [This is one of the key reasons..] (22:3287-22:3430) (Super)
Codes: [Aligned Project Goals]
This input was intended to help shape the design, especially informing system selection and detail development, thus ensuring the design met the value targets established by the Core Group. This is one of the key reasons owner involvement is critical, they provide ongoing feedback to prioritize items of greatest value to them.

P 3: 01 Cathedral Hill Hospital.pdf - 3:180 [Other protocols and tools, suc..] (25:1321-25:1733) (Super)
Codes: [Adequate Progress] [Visual management] [Aligned Project Goals]
Other protocols and tools, such as decision-making pyramids, were posted in multiple locations, such as conference rooms, to keep team members aligned with the design and team performance goals of the project. These visual reminders encouraged the team to embrace the Lean Culture,

facilitate the integrated philosophy, and continue to serve as “advocates of the client” when making project decisions.

P 3: 01 Cathedral Hill Hospital.pdf - 3:33 [one of the most critical compo..] (17:2454-17:2586) (Super)
Codes: [Aligned Project Goals]
One of the most critical components of goal development and alignment on an integrated team is having an actively involved owner.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:86 [Increased collaboration and co..] (22:3626-22:3742) (Super)
Codes: [Information Sharing Patterns]
Increased collaboration and coordination inherent to IPD resulted in an increased number and frequency of meetings.

P 3: 01 Cathedral Hill Hospital.pdf - 3:115 [The office space included an a..] (25:628-25:853) (Super)
Codes: [Information Sharing Patterns]
The office space included an abundance of publicly shared information to help communicate status, report on Last Planner System metrics, identify process issues, and remind individuals they are part of an Integrated Team

P 3: 01 Cathedral Hill Hospital.pdf - 3:119 [Tool s • SMART Boards • BIM • ..] (25:2032-25:2176) (Super)
Codes: [Information Sharing Patterns]
Tool s
- SMART Boards
- BIM
- Face-to-face exchange – co-location
- Autodesk Buzzsaw
- Shared server (at co-located site)

P 3: 01 Cathedral Hill Hospital.pdf - 3:120 [Meeting Frequency • Weekly Cor..] (25:2309-25:2575) (Super)
Codes: [Decision Making System] [Information Sharing Patterns]
Meeting Frequency
- Weekly Core Group Meetings
- Bi-weekly/weekly IPD Team

(Cluster Group Coordination) Meetings
- Target Value Design
- Last Planner System
- Daily Cluster Group Meetings
- Detailer Meetings
- Specialized as needed

P 3: 01 Cathedral Hill Hospital.pdf - 3:165 [This process required the CM/G..] (22:2950-22:3285) (Super)
Codes: [Information Sharing Patterns]
This process required the CM/GC and trade contractors assigned to each Cluster Group to provide ongoing cost information and estimating. This input was intended to help shape the design, especially informing system selection and detail development, thus ensuring the design met the value targets established by the Core Group.

P 3: 01 Cathedral Hill Hospital.pdf - 3:183 [Frequent sharing of progress m..] (26:2318-26:2653) (Super)
Codes: [Information Sharing Patterns]
Frequent sharing of progress models was encouraged. Progress models could be shared in their draft form as long as the file content and degree of completion was articulated and a File Sharing Checklist had been completed. Progress models could be posted for use by other IPD team members without requiring tedious “clean up.”

P 3: 01 Cathedral Hill Hospital.pdf - 3:100 [This structure makes project f..] (23:4031-23:4220) (Super)
Codes: [Financial Transparency]
This structure makes project finances transparent and ensures that all estimates are based on cost. According to the team, there have been no hidden contingencies or hidden allowances.

P 3: 01 Cathedral Hill Hospital.pdf - 3:26 [This project was fiscally tran..] (16:3442-16:3607) (Super)
Codes: [Financial Transparency]
This project was fiscally transparent between contracting parties, see Transparency, and widely displayed visual metrics of cost targets throughout the workplace,

"P 3: 01 Cathedral Hill Hospital.pdf - 3:124 [The VDC document allowed each ..] (26:1429-26:1683) (Super)
Codes: [BIM]
The VDC document allowed each company to select the software and authoring tools with which they were familiar, with the caveat that their choices were clearly communicated to all BIM champions and were compatible with Autodesk Navisworks Manage.

P 3: 01 Cathedral Hill Hospital.pdf - 3:121 [On this project, they set a go..] (26:279-26:560) (Super)
Codes: [BIM]
On this project, they set a goal to have the BIM fully describe 4D (time), enabling the IPD team to simulate the construction process and virtually test construction alternatives to find an optimal method. The team also used BIM for 5D quantity take-offs on a weekly basis.

P 3: 01 Cathedral Hill Hospital.pdf - 3:122 [A Cluster Group assembled to m..] (26:823-26:924) (Super)
Codes: [BIM] [Manage]

A Cluster Group assembled to manage BIM resources was comprised of a BIM champion from each company.

P 3: 01 Cathedral Hill Hospital.pdf - 3:169 [The use of BIM coupled with co..] (23:134-23:507) (Super)
Codes: [BIM] [Co-location]
The use of BIM coupled with co-location facilitated informal and formal Cluster Group interactions and had significant positive impact on team relationships and design coordination and implementation. BIM coordination happened in real time and provided an accurate picture of each Cluster's status and co-location allowed many issues to be resolved within minutes.

P 3: 01 Cathedral Hill Hospital.pdf - 3:182 [A custom Virtual Design and Co..] (25:3050-25:3285) (Super)
Codes: [BIM]
A custom Virtual Design and Construction (VDC) document was developed that clearly articulated the procedures and responsibilities for modeling, coordinating and sharing the BIM model. BIM use was required of all IPD team members,

P 3: 01 Cathedral Hill Hospital.pdf - 3:186 [Sequencing trades to avoid mod..] (26:3378-26:4105) (Super)
Codes: [BIM]
Sequencing trades to avoid model clashes required frequent progress updates and communication between IPD team members to ensure systems were populated in an orderly way. For example, the team discovered the designed ceiling height in the cafeteria and the size of the mechanical systems were in conflict. The issue was resolved, but the BIM team realized that a change in their process would have been allowed earlier discovery of the problem. The initial BIM process started with the first trade through a building area. The team revised the sequence to start with ductwork and sloping systems, which are the largest systems and ones which typically reveal conflicts with the architecture immediately

P 3: 01 Cathedral Hill Hospital.pdf - 3:196 [The team cited a $400,000 savi..] (23:3219-23:3397) (Super)
Codes: [Actual Cost Growth] [BIM]
The team cited a $400,000 savings gained by eliminating continuous backing for handrails. The BIM model accurately located each metal stud, so that backing was made redundant.

P 3: 01 Cathedral Hill Hospital.pdf - 3:187 [Detailing was executed in two ..] (26:4111-26:4741) (Super)
Codes: [BIM] [Manage]
Detailing was executed in two phases. Phase 1 modeling was done at a macro scale that followed a modeling sequence that mirrored construction installation. Phase 2 was done at a micro scale to meet the final construction level of detail (LOD). LOD was defined in a matrix form, similar to the AIA E202 document. The matrix identified the LOD of each building system or component for Phase 1 and 2, the responsible party, and the software platform used. Following a common LOD scale, most of the building systems were specified to reach 400, defined as 3D actual objects modeled for use in fabrication and assembly

P 3: 01 Cathedral Hill Hospital.pdf - 3:196 [The team cited a $400,000 savi..] (23:3219-23:3397) (Super)
Codes: [Actual Cost Growth] [BIM]
The team cited a $400,000 savings gained by eliminating continuous backing for handrails. The BIM model accurately located each metal stud, so that backing was made redundant.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:81 [The Last Planner process not o..] (22:1894-22:2077) (Super)
Codes: [Last Planner System]
The Last Planner process not only helped individuals become more reliable, it also improved their ability to identify and communicate what they need to achieve their commitments.

P 3: 01 Cathedral Hill Hospital.pdf - 3:161 [The Integrated Form of Agreeme..] (22:287-22:863) (Super)
Codes: [Last Planner System]
The Integrated Form of Agreement (IFOA) stipulates that the IPD Team use the Last Planner System (a Lean Construction tool) for planning and scheduling of design coordination and implementation. As part of the Last Planner System, the IFOA requires, at a minimum, the development of "a milestone schedule, collaboratively created phase schedules, 'make ready' look ahead plans, weekly work plans, and a method for measuring, recording and improving planning reliability." The IFOA describes each one of these Last Planner System tools and processes in detail.

P 3: 01 Cathedral Hill Hospital.pdf - 3:163 [Work within each Cluster Group..] (22:1232-22:2303) (Super)
Codes: [Last Planner System] [manage]
Work within each Cluster Group was facilitated using the Last Planner System. The Last Planner system required each group to work backward from the milestone and phase schedules to develop their weekly work plan. Work plans in conjunction with detailed weekly look-ahead schedules identified activities required to meet schedule and any constraints in the way of those activities. Activities were converted into commitments, which were assumed by individuals who promised to fulfill them within a week or two week time period. By tracking commitments, groups were held accountable by a reliability metric that was measured on a weekly basis. The Last Planner process not only helped individuals become more reliable, it also improved their ability to identify and communicate what they need to achieve their commitments. The goal on the Cathedral Hill Project was to maintain 90% reliability in each Cluster Group, a significant improvement from the 50% average estimated by the CM/GC's project executive for a traditional delivery process.

P 3: 01 Cathedral Hill Hospital.pdf - 3:164 [Each Cluster Group also follow..] (22:2724-22:2948) (Super)
Codes: [Target Value Design]
Each Cluster Group also followed a Target Value Design (TVD) process, which designates value, cost, schedule, and constructability as basic components of the design criteria, see Early Involvement for advantages of TVD.

P 3: 01 Cathedral Hill Hospital.pdf - 3:170 [These significant savings have..] (23:1726 23:2115) (Super)
Codes: [Target Value Design]
These significant savings have been primarily attributed to the Target Value Design (TVD) process. This process held all team members accountable for designing the most value within the target cost. Cost information was collaboratively developed before the design was fixed, allowing cost to influence design instead of applying value engineering to revise a completed design.

P 3: 01 Cathedral Hill Hospital.pdf - 3:171 [By feeding information into an..] (23:2302-23:2609) (Super)
Codes: [Target Value Design]
By feeding information into an iterative design process, design ideas can be tested against costs. Besides controlling costs, the TVD provided an important benefit by placing control of design and its cost with the architect; this ensured design ideas were not unreasonably diluted or compromised.
"P 3: 01 Cathedral Hill Hospital.pdf - 3:123 [Any changes to BIM software we..] (26:1684-26:1831) (Super)
Codes: [Decision Making System] [A3]
Any changes to BIM software were made following the A3 decision-making process (see Implementation) and required consensus of the BIM Champions.

P 3: 01 Cathedral Hill Hospital.pdf - 3:175 [The primary vehicle used to fo..] (24:149-24:1448) (Super)
Codes: [A3] [Decision Making System]
The primary vehicle used to formalize, document and evaluate project decisions is called an A3 report, named after the size of the piece of paper upon which it's printed. The team borrowed this tool from the car company, Toyota who uses it to evaluate complex decisions. The standard form A3 facilitated consistent problem identification, analysis, assessment and solutions. A3's could be initiated by anyone on the team and cover a range of issues; the criteria for its use was intentionally left undefined to give IPD Team members the ability to follow their own intuition and take initiative. Once an individual formally initiated an A3, the form was submitted to the Core Group for review and final decision. The benefit of A3 reporting is that it documents the problem, records the involved parties, and establishes the assumptions for consideration. This provided the Core Group with a holistic understanding and created a consistent and effective format for them to evaluate the situation and make a final decision. At the time of this report, over 300 A3's had been generated and more than 200 had reached resolution. So effective has the formal A3 process proven, Cluster Groups began to use informal A3 processes to work through routine problems.

P 3: 01 Cathedral Hill Hospital.pdf - 3:125 [The results of the test inform..] (26:2095-26:2273) (Super)
Codes: [Decision Making System] [A3]
The results of the test informed A3 decision making, provided feedback to software vendors, and informed decisions on how the model would be divided into specific design areas

"P 3: 01 Cathedral Hill Hospital.pdf - 3:184 [An important tool used in this..] (26:2900-26:3257) (Super)
Codes: [A4]
An important tool used in this process is called an A4 report. The A4 is a standard one-page form that allowed the BIM Cluster Group to identify and record the detailing issues, identify the root cause of each issue in order to prevent future problems, prioritize issues to maintain streamlined production, and ultimately plot a path of resolution.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:176 [The team also implemented the ..] (24:1451-24:1744) (Super)
Codes: [Choosing by Advantage] [Decision Making System]
The team also implemented the Choosing by Advantages (CBA) decision-making system. CBA a rigorous methodology for evaluating complex decisions with multiple stakeholders by identifying the relative advantages and importance of each option. The CBA method complemented the Lean A3 tool.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:141 [Additional reminders were prin..] (17:3516-17:3710) (Super)
Codes: [Visual management]
Additional reminders were printed at large scale for posting in prominent locations around the co-located office. The posters acted as a constant reminder of client expectation to the team.

P 3: 01 Cathedral Hill Hospital.pdf - 3:180 [Other protocols and tools, suc..] (25:1321-25:1733) (Super)
Codes: [Adequate Progress] [Visual management] [Aligned Project Goals]
Other protocols and tools, such as decision-making pyramids, were posted in multiple locations, such as conference rooms, to keep team members aligned with the design and team performance goals of the project. These visual reminders encouraged the team to embrace the Lean Culture, facilitate the integrated philosophy, and continue to serve as “advocates of the client” when making project decisions.

P 3: 01 Cathedral Hill Hospital.pdf - 3:191 [Information and educational ma..] (25:903-25:1316) (Super)
Codes: [Visual management]
Information and educational materials about Lean processes, learning resources, and Last Planner metric reports by Cluster Group were posted along a main central corridor within the office. Each Cluster Group was provided pin up space where images, diagrams, outstanding design issues and Target Value Design status were posted to help inform other groups of their status or coordination items needed.

P 3: 01 Cathedral Hill Hospital.pdf - 3:149 [After several years of working..] (19:3161-19:3860) (Super)
Codes: [Monitor] [Visual management]
After several years of working together, the team’s culture did not need extensive oversight. However members of the Core Group continued to engage the team to stay up to date of progress

and to observe team performance, making adjustments and improvements when needed. For example, leaders noticed that visual metrics were prevalent around the office, but metrics and formats were not standard between cluster groups. In preparation for construction, leadership requested cluster group leaders coordinate one set of graphic conventions so that a viewer could immediately comprehend the status of each team and the project as a whole, a rule referred to as "30 seconds at 3 feet."

"P 3: 01 Cathedral Hill Hospital.pdf - 3:7 [Shortly after SmithGroup commi..] (14:1792-14:1946) (Super)
Codes: [Phase of Involvement]
Shortly after SmithGroup committed, Sutter brought in the contractor HerreroBoldt, and immediately thereafter, primary trade contractors were engaged.

P 3: 01 Cathedral Hill Hospital.pdf - 3:90 [Early Involvement CM/GC • Vali..] (23:529-23:657) (Super)
Codes: [Early involvement] [Phase of Involvement]
Early Involvement
CM/GC
• Validation (Feasibility/Programming)
Trade Contractors
• Validation (Feasibility/Programming)

"P 3: 01 Cathedral Hill Hospital.pdf - 3:94 [Early involvement was essentia..] (23:2120-23:2300) (Super)
Codes: [Early involvement] [Early Involvement Effectivensee]
Early involvement was essential to the Target Value Design process. For example, each Cluster Group had an estimator who provided cost feedback to designers on an ongoing basis.

P 3: 01 Cathedral Hill Hospital.pdf - 3:160 [Team members observed that ear..] (21:4151-21:4379) (Super)
Codes: [Early involvement] [Early involvement effectiveness]
Team members observed that early and continued involvement by consistent team members reduced the number of handoff points, thereby maintaining project knowledge and reducing disconnects between designers and contractors.

P 3: 01 Cathedral Hill Hospital.pdf - 3:172 [Complementary to the Cluster G..] (23:2612-23:2952) (Super)
Codes: [Early involvement] [Early involvement effectiveness]
Complementary to the Cluster Group estimators, trades involved in early decisions brought detail and accuracy to the design. Additionally, as trade partners became more familiar with the project, they gained greater confidence in their ability to estimate costs, helping to eliminate inflation of prices and costly contingencies.

P 3: 01 Cathedral Hill Hospital.pdf - 3:181 [Co-location, coupled with earl..] (25:1736-25:2008) (Super)
Codes: [Co-location] [Early involvement] [Early involvement effectiveness] [Trust]

Co-location, coupled with early involvement greatly supported the relationship-building mission of IPD. These strategies allowed the team to become quickly acquainted with each other, build familiarity and trust that supported open communication and transparency.

P 3: 01 Cathedral Hill Hospital.pdf - 3:197 [It's important to note that wh..] (23:3551-23:3730) (Super)
Codes: [Early involvement effectiveness]
It's important to note that while early involvement contributed expertise, the structure of the risk pool, see risk/reward, provided incentive for the IPD Team to reduce costs.
"
"P 3: 01 Cathedral Hill Hospital.pdf - 3:89 [Co-location] (22:266-22:276) (Super)
Codes: [Co-location]
Co-location

P 3: 01 Cathedral Hill Hospital.pdf - 3:113 [At the time of this study, the..] (25:217-25:287) (Super)
Codes: [Co-location]
At the time of this study, the team had been co-located for 3 years.

P 3: 01 Cathedral Hill Hospital.pdf - 3:114 [According to the Boldt project..] (25:523-25:625) (Super)
Codes: [Co-location]
According to the Boldt project executive, "people keep taking partitions down. We don't need them."

P 3: 01 Cathedral Hill Hospital.pdf - 3:169 [The use of BIM coupled with co..] (23:134-23:507) (Super)
Codes: [BIM] [Co-location]
The use of BIM coupled with co-location facilitated informal and formal Cluster Group interactions and had significant positive impact on team relationships and design coordination and implementation. BIM coordination happened in real time and provided an accurate picture of each Cluster's status and co-location allowed many issues to be resolved within minutes.

P 3: 01 Cathedral Hill Hospital.pdf - 3:181 [Co-location, coupled with earl..] (25:1736-25:2008) (Super)
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Co-location, coupled with early involvement greatly supported the relationship-building mission of IPD. These strategies allowed the team to become quickly acquainted with each other, build familiarity and trust that supported open communication and transparency.

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Codes: [Co-location] [Early involvement] [Early involvement effectiveness] [Trust]
Co-location, coupled with early involvement greatly supported the relationship-building mission of IPD. These strategies allowed the team to become quickly acquainted with each other, build familiarity and trust that supported open communication and transparency.

P 3: 01 Cathedral Hill Hospital.pdf - 3:59 [The architect observed that Sm..] (20:605-20:1049) (Super)
Codes: [Culture Fit] [commitment]
The architect observed that SmithGroup has been trending away from the traditional design-bid-build to alternative delivery models. They discovered that the IPD arrangement used in this project is far superior to the other delivery models and they intend to identify appropriate clients who agree to work this way in the future. They found that the team relationship formed through the IPD process allows for a better design process.

P 3: 01 Cathedral Hill Hospital.pdf - 3:153 [Three primary trade partners w..] (20:2845-20:3121) (Super)
Codes: [Commitment]
Three primary trade partners who had established relationships with Boldt were brought onto the project very early. Each had already incorporated Lean Construction practices into their organizations and demonstrated willingness to pursue Integrated Project Delivery.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:62 [Given this shared history and ..] (20:1330-20:1458) (Super)
Codes: [Culture Fit]
Given this shared history and mutual respect, Boldt was well aligned with CPMC and Sutter's values and goals for the project.

P 3: 01 Cathedral Hill Hospital.pdf - 3:103 [The contractual arrangement, m..] (24:1860-24:2004) (Super)
Codes: [Culture Fit]
The contractual arrangement, management tools, early involvement and co-location all contributed to the creation of a learning environment.

P 3: 01 Cathedral Hill Hospital.pdf - 3:108 [At the time of this study, Bol..] (24:3362-24:3603) (Super)
Codes: [Culture Fit]
At the time of this study, Boldt's project executive observed that after 3 years of co-location and collaborative working, the cultural shift to collaboration, innovation, and integration had become ingrained in the team's work habits.

P 3: 01 Cathedral Hill Hospital.pdf - 3:177 [For example, the Cluster Group..] (24:2006-24:2605) (Super)
Codes: [Culture Fit]
For example, the Cluster Groups create highly collaborative interdisciplinary teams that might include two plumbing trade detailers, one HVAC trade detailer, and a technical architect – all sitting and working together. As the contractor described it, "that is unique because that would never happen on a traditional project." The architect observed that IPD allowed them design to a much higher level of detail than in a traditional project. The process provided them greater knowledge of construction assemblies and cost and thereby gave them more control of the design outcomes.

P 3: 01 Cathedral Hill Hospital.pdf - 3:178 [In general, team members adapt..] (24:2610-24:3355) (Super)
Codes: [Culture Fit]
In general, team members adapted easily to the collaborative and integrated work style of IPD. Even though the team included well over 100 people, the project executives could identify only a handful of people who did not fit the culture and were removed from the team. IPD is difficult for individuals who have worked a certain way for many years and feel strongly that certain roles are sacred. For these people, it was difficult to change and relinquish some control. Given the nature of the Cluster Groups, those individuals quickly became apparent and typically were removed. While the learning curve varied, the vast majority of team members found IPD to be a very different but very rewarding way of working together.

P 3: 01 Cathedral Hill Hospital.pdf - 3:59 [The architect observed that Sm..] (20:605-20:1049) (Super)
Codes: [Culture Fit] [commitment]
The architect observed that SmithGroup has been trending away from the traditional design-bid-build to alternative delivery models. They discovered that the IPD arrangement used in this project is far superior to the other delivery models and they intend to identify appropriate clients who agree to work this way in the future. They found that the team relationship formed through the IPD process allows for a better design process.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:54 [Members of the Core Group occa..] (19:2768-19:2890) (Super)
Codes: [Monitor]
Members of the Core Group occasionally dropped into Cluster Group meetings to observe the process and offer suggestions.
P 3: 01 Cathedral Hill Hospital.pdf - 3:134 [To ensure the Virtual Design a..] (26:4747-26:4865) (Super)
Codes: [Monitor]
To ensure the Virtual Design and Construction (VDC) process was followed, Sutter Health regularly reviewed the team.

P 3: 01 Cathedral Hill Hospital.pdf - 3:149 [After several years of working..] (19:3161-19:3860) (Super)
Codes: [Monitor][visual management]
After several years of working together, the team's culture did not need extensive oversight. However members of the Core Group continued to engage the team to stay up to date of progress and to observe team performance, making adjustments and improvements when needed. For example, leaders noticed that visual metrics were prevalent around the office, but metrics and formats were not standard between cluster groups. In preparation for construction, leadership requested cluster group leaders coordinate one set of graphic conventions so that a viewer could immediately comprehend the status of each team and the project as a whole, a rule referred to as "30 seconds at 3 feet."

P 3: 01 Cathedral Hill Hospital.pdf - 3:101 [the criteria for its use was i..] (24:613-24:762) (Super)
Codes: [Monitor]
The criteria for its use was intentionally left undefined to give IPD Team members the ability to follow their own intuition and take initiative.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:32 [Meeting frequency requirements..] (17:2187-17:2420) (Super)
Codes: [Manage]
Meeting frequency
Requirements were clearly defined for the Core Group, the executive level leadership, as well as their responsibilities in terms of developing work procedures for leading the Integrated Project Delivery Team.

P 3: 01 Cathedral Hill Hospital.pdf - 3:78 [This project employed individu..] (21:4476-21:4766) (Super)
Codes: [Manage]
This project employed individuals at multiple leadership levels to manage the integrated team performance through education of the team on information exchange and process management tools, planning of design and production sequencing and supporting continuous improvement ideas.

P 3: 01 Cathedral Hill Hospital.pdf - 3:148 [Leadership was further distrib..] (19:2173-19:2634) (Super)
Codes: [Manage]
Leadership was further distributed into a series of Cluster Groups, which are interdisciplinary groups comprised of architects, engineers and trade partners. Cluster Groups were assigned to specific design areas, for example, structural, exterior, interior, and medical equipment. Each cluster was responsible for designing their assigned segment within the Target Value (see Implementation and Early Involvement) using whatever resources required.

P 3: 01 Cathedral Hill Hospital.pdf - 3:159 [Documents are significantly mo..] (21:3123-21:3536) (Super)
Codes: [Manage]
Documents are significantly more coordinated on an IPD project than on traditional projects, and it is expected that the architect's involvement in the construction phase will be less demanding than early phases. The architect also anticipates that their increased involvement in the coordination activities will lead to additional efficiency, reduced waste in the field and a return to the risk pool.

P 3: 01 Cathedral Hill Hospital.pdf - 3:162 [To implement the design, the I..] (22:868-22:1229) (Super)
Codes: [Manage]
To implement the design, the IPD team organized into interdisciplinary Cluster Groups. These groups were separated by design area, for example exterior architecture, interior architecture,

structural, medical equipment, etc. Each group was responsible for coordinating their design area both internally and between other Cluster Groups or design areas.

P 3: 01 Cathedral Hill Hospital.pdf - 3:168 [Lean tools such as Target Valu..] (22:4737-22:5141) (Super)
Codes: [Manage]
Lean tools such as Target Value Design were used in conjunction with the budget flexibility provided by the IFOA agreement. Cluster Groups could make trade-offs between building systems, i.e. spend an additional $1 million on electrical but save $5 million on mechanical. A non-integrated contract would require contract renegotiation, reductions in scope, and other time consuming obstacles.

P 3: 01 Cathedral Hill Hospital.pdf - 3:122 [A Cluster Group assembled to m..] (26:823-26:924) (Super)
Codes: [BIM] [Manage]
A Cluster Group assembled to manage BIM resources was comprised of a BIM champion from each company.

P 3: 01 Cathedral Hill Hospital.pdf - 3:163 [Work within each Cluster Group..] (22:1232-22:2303) (Super)
Codes: [Last Planner System] [manage]
Work within each Cluster Group was facilitated using the Last Planner System. The Last Planner system required each group to work backward from the milestone and phase schedules to develop their weekly work plan. Work plans in conjunction with detailed weekly look-ahead schedules identified activities required to meet schedule and any constraints in the way of those activities. Activities were converted into commitments, which were assumed by individuals who promised to fulfill them within a week or two week time period. By tracking commitments, groups were held accountable by a reliability metric that was measured on a weekly basis. The Last Planner process not only helped individuals become more reliable, it also improved their ability to identify and communicate what they need to achieve their commitments. The goal on the Cathedral Hill Project was to maintain 90% reliability in each Cluster Group, a significant improvement from the 50% average estimated by the CM/GC's project executive for a traditional delivery process.

P 3: 01 Cathedral Hill Hospital.pdf - 3:185 [Design and detailing in the BI..] (26:2656-26:3257) (Super)
Codes: [Manage]
Design and detailing in the BIM was guided by a Coordination Master Process. The goal of this process was to create a detailing environment and workflow that ideally eliminated all construction issues and conflicts before construction. An important tool used in this process is called an A4 report. The A4 is a standard one-page form that allowed the BIM Cluster Group to identify and record the detailing issues, identify the root cause of each issue in order to prevent future problems, prioritize issues to maintain streamlined production, and ultimately plot a path of resolution.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:110 [One of outcomes of the integra..] (24:4057-24:4324) (Super)
Codes: [Challenge]
One of outcomes of the integrated, collaborative culture was a team that was willing to question almost anything. According to the project architect, "you don't have to listen to the people who say, 'you know we've never been able to do that so let's not do it.

P 3: 01 Cathedral Hill Hospital.pdf - 3:112 ["" An example of benefit from ..] (24:4327-24:4971) (Super)
Codes: [Challenge]
An example of benefit from the interdisciplinary cluster group approach was a new design for patient lifts. The owner decided late in the project that they would like to have a patient lift in every room, however this was not feasible given the structural bracing, space and coordination requirements of the standard system. A junior level project engineer from the contractor asked why they couldn't use the booms already required for the medical monitoring devices. The boom manufacturer agreed it might work and this solution is currently under study, illustrating the team's willingness to explore ideas from any member.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:136 [This added two years to the de..] (14:2093-14:2619) (Super)
Codes: [Problem Addressed]
This added two years to the design phase; the flexibility of IPD enabled the team to slow down the pace of production without claims or added change orders to the owner.
Resources were shifted from anticipated 40-50 detailers to maintaining 16 detailers over a longer period of time. The focused effort with fewer people actually resulted in a higher productivity rate, likely due to the continuity of team members and intimacy of the team, and avoided the inefficiencies of coordinating within a large team.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:193 [The team has tracked metrics a..] (15:1328-15:1475) (Super)
Codes: [Actual Cost Growth]
The team has tracked metrics and found that the owner has earned a 400% ROI on the costs invested beyond typical design to bring trades on early

P 3: 01 Cathedral Hill Hospital.pdf - 3:194 [Involving the contractor and t..] (23:978-23:1720) (Super)
Codes: [Actual Cost Growth]
Involving the contractor and trade partners from the very beginning of the project was a significant investment, but at the time this study was conducted, had yielded measurable savings. According to the contractor's project executive, the owner had already achieved a 200% return on investment (ROI) for the additional cost of IPD pre-construction services. The return comes from savings in project costs. The initial target cost developed by the team early in the project was approximately 14% or $80 million below market average. At the time of this report, the team estimates an additional $22 million dollars will be saved below the market average. The team is continuing to track this ROI throughout the process.

P 3: 01 Cathedral Hill Hospital.pdf - 3:196 [The team cited a $400,000 savi..] (23:3219-23:3397) (Super)
Codes: [Actual Cost Growth] [BIM]
The team cited a $400,000 savings gained by eliminating continuous backing for handrails. The BIM model accurately located each metal stud, so that backing was made redundant.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:8 [the flexibility of IPD enabled..] (14:2134-14:2265) (Super)
Codes: [Change order]
The flexibility of IPD enabled the team to slow down the pace of production without claims or added change orders to the owner.

Neutral

"P 3: 01 Cathedral Hill Hospital.pdf - 3:156 [They felt there was no special..] (20:4897-20:5073) (Super)
Codes: [Training]
They felt there was no special experience or skill requirements unique to IPD since the process provides excellent opportunities for mentorship and learning at all phases.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:65 [For consultants, previous expe..] (20:2094-20:2291) (Super)
Codes: [Previous cooperation experience]
For consultants, previous experience in IPD or pre-qualifying their ability to collaborate was secondary to the continuity gained by building on previously established goals, values and ideas.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:12 [Market Position was not a moti..] (15:132-15:180) (Super)
Codes: [Motivator_Market]
Market Position was not a motivator for the owner

"P 3: 01 Cathedral Hill Hospital.pdf - 3:29 [The Sutter IFOA included well-..] (17:1244-17:1391) (Super)
Codes: [Reward Structure- Incentive]
The Sutter IFOA included well-known collaborative commercial terms such as: shared risk/reward, performance incentives, compensation incentives,

P 3: 01 Cathedral Hill Hospital.pdf - 3:37 [As a positive incentive, this ..] (17:4046-17:4175) (Super)
Codes: [Reward Structure- Incentive]
As a positive incentive, this pool would provide payments if the team achieved actual costs below the estimated maximum price.

P 3: 01 Cathedral Hill Hospital.pdf - 3:41 [The shift to construction-phas..] (18:1396-18:1529) (Super)
Codes: [Reward Structure- Incentive]

Instead of putting 25% of preconstruction profits at risk, they shifted to a 100% construction profits at risk model. These revisions did not change the risk profile or actual financial numbers much for the CM/GC. The architect, however, is concerned that these changes will negatively affect the target value design process. With the original model, the team was incentivized to reduce costs below the estimated maximum price during the design phase.
The shift to construction-phase-only incentives may result in the team holding onto cost savings ideas until construction starts. "

"P 3: 01 Cathedral Hill Hospital.pdf - 3:24 [This team had a shared risk/re..] (16:1794-16:1849) (Super)
Codes: [Reward Structure-risk pool]
This team had a shared risk/reward pool on this project,

"P 3: 01 Cathedral Hill Hospital.pdf - 3:25 [This team had waivers on liabi..] (16:2346-16:2394) (Super)
Codes: [Reward structure liability waiver]
This team had waivers on liability, see Liability

"P 3: 01 Cathedral Hill Hospital.pdf - 3:190 [The strong relationship with t..] (21:1342-21:1893) (Super)
Codes: [Remove Obstacles]
The strong relationship with the Lean Construction Institute (LCI), who is partnered with UC Berkeley, was an asset for this project. The project benefited from regular visits by Glenn Ballard of LCI, an expert in Lean Project Delivery, and graduate students who observed and reported their observations of the project team. Students reported on different areas of their practice, such as the Last Planner System, change order processes, and accounting practicing, which helped the team evaluate and improve their own performance.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:21 [BIM was implemented to an adva..] (15:3789-15:3830) (Super)
Codes: [BIM]
BIM was implemented to an advanced degree,

"P 3: 01 Cathedral Hill Hospital.pdf - 3:199 [Many of the tools implemented ..] (17:1984-17:2185) (Super)
Codes: [Last Planner System] [Target Value Design]
Many of the tools implemented on this project were based on Lean Construction practices, such as reliable promising, pull-based design production, Target Value Design, and the Last Planner System.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:199 [Many of the tools implemented ..] (17:1984-17:2185) (Super)
Codes: [Last Planner System] [Target Value Design]
Many of the tools implemented on this project were based on Lean Construction practices, such as reliable promising, pull-based design production, Target Value Design, and the Last Planner System.

P 3: 01 Cathedral Hill Hospital.pdf - 3:168 [Lean tools such as Target Valu..] (22:4737-22:5141) (Super)
Codes: [Manage] [Target Value Design]
Lean tools such as Target Value Design were used in conjunction with the budget flexibility provided by the IFOA agreement. Cluster Groups could make trade-offs between building systems, i.e. spend an additional $1 million on electrical but save $5 million on mechanical. A non-integrated contract would require contract renegotiation, reductions in scope, and other time consuming obstacles.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:166 [An A4 report embraced a simila..] (22:4197-22:4306) (Super)
Codes: [A4]
An A4 report embraced a similar strategy that assisted the BIM design and detailing coordination, see BIM.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:188 [Based on the bell curves of ef..] (21:2401-21:2674) (Super)
Codes: [Early involvement effectiveness]
Based on the bell curves of effort often cited for IPD projects, they expected most of their effort to be expended during schematic design and design development before handing off much of the work during construction documents to the contractor and trade partners.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:138 [IPD has significantly improved..] (15:2731-15:2813) (Super)
Codes: [Trust]
IPD has significantly improved trust between trades and eliminated contingencies."

"P 3: 01 Cathedral Hill Hospital.pdf - 3:30 [The agreement included some so..] (17:1539-17:1804) (Super)
Codes: [Commitment]
The agreement included some soft language defining the relational and behavioral expectations, for example Article 3.3 Trust states, “Parties shall work together in the spirit of cooperation, collaboration, and mutual respect for the benefit of the Project.”

P 3: 01 Cathedral Hill Hospital.pdf - 3:139 [Furthermore, 60.9% of individu..] (16:132-16:394) (Super)
Codes: [Previous cooperation experience] [Commitment]
Furthermore, 60.9% of individuals had previously worked with other team members. This past experience was likely a factor in organizations’ willingness to embark on an integrated, collaborative delivery model, still a very new model with several unknowns.

P 3: 01 Cathedral Hill Hospital.pdf - 3:154 [These pre- qualified firms wer..] (20:3369-20:3596) (Super)
Codes: [Commitment]

These pre-qualified firms were required to respond to an RFP presenting typical budget and profit margin information as well as their experience with or willingness to be a part of an integrated project delivery process.

P 3: 01 Cathedral Hill Hospital.pdf - 3:67 [In contrast to the selection o..] (20:2608-20:2844) (Super)
Codes: [Culture Fit] [Commitment]
In contrast to the selection of the design consultants, trade partners (or sub-contractors) were subject to a thorough selection process specifically targeting their collaborative experience or demonstrated ability to collaborate.

P 3: 01 Cathedral Hill Hospital.pdf - 3:69 [The most highly prized charact..] (20:3882-20:3956) (Super)
Codes: [Commitment]
The most highly prized characteristic was the willingness to collaborate."

"P 3: 01 Cathedral Hill Hospital.pdf - 3:109 [In his experience, this has no..] (24:3808-24:4044) (Super)
Codes: [Culture Fit]
In his experience, this has not been the case on smaller projects where people go on and off the project at shorter time increments; they require much more continued and sustained leadership and guidance in the principles of IPD.

P 3: 01 Cathedral Hill Hospital.pdf - 3:67 [In contrast to the selection o..] (20:2608-20:2844) (Super)
Codes: [Culture Fit] [Commitment]
In contrast to the selection of the design consultants, trade partners (or sub-contractors) were subject to a thorough selection process specifically targeting their collaborative experience or demonstrated ability to collaborate. "

"P 3: 01 Cathedral Hill Hospital.pdf - 3:155 [Because everyone on the team h..] (20:4344-20:4456) (Super)
Codes: [Challenge] [Monitor]
Because everyone on the team had the ability to influence the design, confidence to offer input was crucial.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:49 [Team Structure • Core Group • ..] (19:216-19:264) (Super)
Codes: [Manage]
Team Structure
- Core Group
- Cluster Groups

P 3: 01 Cathedral Hill Hospital.pdf - 3:50 [the Core Group provides primar..] (19:983-19:1025) (Super)
Codes: [Manage]

the Core Group provides primary leadership.

P 3: 01 Cathedral Hill Hospital.pdf - 3:51 [The Core Group was responsible..] (19:1299-19:1442) (Super)
Codes: [Manage]
The Core Group was responsible for project coordination, management and administration consistent with principles of Lean Project Delivery.

P 3: 01 Cathedral Hill Hospital.pdf - 3:187 [Detailing was executed in two ..] (26:4111-26:4741) (Super)
Codes: [BIM] [Manage]
Detailing was executed in two phases. Phase 1 modeling was done at a macro scale that followed a modeling sequence that mirrored construction installation. Phase 2 was done at a micro scale to meet the final construction level of detail (LOD). LOD was defined in a matrix form, similar to the AIA E202 document. The matrix identified the LOD of each building system or component for Phase 1 and 2, the responsible party, and the software platform used. Following a common LOD scale, most of the building systems were specified to reach 400, defined as 3D actual objects modeled for use in fabrication and assembly

P 3: 01 Cathedral Hill Hospital.pdf - 3:147 [The team discovered a deficien..] (19:1740-19:2168) (Super)
Codes: [Manage] [remove obstacles]
The team discovered a deficiency in owner involvement as they worked through the value added list (a list of items identified as desirable by the owner but not previously budgeted). The team realized they needed more input at the user group level, specifically clinical operations, to better prioritize those items. The owner addressed this by bringing a representative from hospital operations onto the project team.

P 3: 01 Cathedral Hill Hospital.pdf - 3:155 [Because everyone on the team h..] (20:4344-20:4456) (Super)
Codes: [Challenge] [Monitor]
Because everyone on the team had the ability to influence the design, confidence to offer input was crucial.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:44 [Should any claim arise in conn..] (18:2663-18:2875) (Super)
Codes: [Negotiate]
Should any claim arise in connection with the agreement, the Parties, including all consultants and sub-contractors, are required to follow the dispute resolution procedure defined in Article 41 of the IFOA.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:195 [information gained through the..] (23:3031-23:3218) (Super)
Codes: [Perceived Cost Performance] [perceived schedule performance]information gained through the involvement of the trade partners brought a level of detail to the BIM model that the team believes will reduce material waste and construction time.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:195 [information gained through the..] (23:3031-23:3218) (Super)
Codes: [Perceived Cost Performance] [Perceived Schedule Performance]information gained through the involvement of the trade partners brought a level of detail to the BIM model that the team believes will reduce material waste and construction time.

Negative

"P 3: 01 Cathedral Hill Hospital.pdf
For the architect, this project allowed them to enter the IPD arena.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:20 [Technical Complexity was not a..] (15:2817-15:2895) (Super)
Codes: [Motivator_Technical]
Technical Complexity was not a primary motivator for the owner to pursue IPD.

P 3: 01 Cathedral Hill Hospital.pdf - 3:144 [At the same time, the architec..] (18:1530-18:1825) (Super)
Codes: [Reward Structure- Incentive]

At the same time, the architect believed that the risk/reward incentives were not the primary motivator for team members to successfully collaborate and take ownership of the project. He felt the financial incentives primarily function as “bait” for the firms at an executive or VP level.

"P 3: 01 Cathedral Hill Hospital.pdf - 3:143 [The architect, however, is con..] (18:1150-18:1528) (Super)
Codes: [Reward Structure-risk pool]

The architect, however, is concerned that these changes will negatively affect the target value design process. With the original model, the team was incentivized to reduce costs below the estimated maximum price during the design phase. The shift to construction-phase-only incentives may result in the team holding onto cost savings ideas until construction starts.

Not Given

There is no quotation under this category.

Project 2

General Information

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:113 [MERCY Master Plan Facility Rem..] (1:157-1:194) (Super)
Codes: [Project Name]
MERCY Master Plan Facility Remodel

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:2 [Healthcare - Renovation] (2:221-2:243) (Super)
Codes: [Project Type]
Healthcare - Renovation

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:1 [Lorain, Ohio] (2:199-2:210) (Super)
Codes: [Location]
Lorain, Ohio

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:3 [Single Multi-party Contract – ..] (2:257-2:295) (Super)
Codes: [Contract]
Single Multi-party Contract – AIA C-191

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:4 [February 2010] (2:458-2:470) (Super)
Codes: [Project Start Time]
February 2010

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:78 [January 2013] (2:490-2:501) (Super)
Codes: [Est. Completion Time]
January 2013

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:5 [After receiving Board approval..] (2:889-2:995) (Super)
Codes: [Initiation Party]
After receiving Board approval, Array proposed an Integrated Project Delivery approach for the project.

Positive

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:50 [The Project Management team wa..] (6:1698-6:1893) (Super)
Codes: [Manage] [training]
The Project Management team was tasked with educating, training and managing the Implementation team, ensuring that the entire team adhered to the principles of Integrated Project Delivery.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:116 [Market Position was important ..] (3:541-3:830) (Super)
Codes: [Motivator_Market]
Market Position was important for all parties involved. Array works exclusively in healthcare and recognized IPD was where their market was headed. They made the strategic decision to gear up their multiple offices and worked to prepare their regional partners for the shift to IPD.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:118 [Reduced Risk was a long-term m..] (3:2303-3:2436) (Super)
Codes: [Motivator_Risk]
Reduced Risk was a long-term motivation for the owner. As a healthcare system they wanted to find a better way to manage projects.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:41 [From this list, a scorecard wa..] (5:246-5:395) (Super)
Codes: [Reward Structure- Incentive]
From this list, a scorecard was created to measure achievement. The architect's profit and contractor's fee earned were tied to goal achievement.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:43 [The team agreed to the AIA C-1..] (5:1621-5:1894) (Super)
Codes: [Reward Structure- Incentive]
The team agreed to the AIA C-191 standard Incentive Compensation. This compensation is paid if the actual costs are less than the target costs. As per contract, the owner would retain 50% of the cost differential with the architect and contractor each receiving 25%.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:40 [According to the modified cont..] (5:1128-5:1598) (Super)
Codes: [Reward Structure-risk pool]
One of the modifications made to the AIA C-191 was the limitation of the Goal Achievement Compensation, which are payments made to the team for achieving project goals developed according to the Target Criteria Amendment process and are not contingent on the actual costs of the project, even if they exceed the target cost. According to the modified contract, the architect and contractor waived the rights to the Goal Achievement Compensation; however, revisions to Article 4, Compensation, established a compensation structure similar to the Goal Achievement Compensation, but puts the architect's profit and contractor's fee at risk. Payment is contingent on points earned for each goal as defined by collaboratively developed metrics, tracked using the project goals scorecard.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:99 [Some of the owner's facility m..] (10:2841-10:3006) (Super)
Codes: [Commitment] [remove obstacles]
Some of the owner's facility managers had reservations going into IPD because it was new and required some changes in roles, but they have now fully embraced IPD.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:151 [To ensure qualified team membe..] (10:2475-10:2838) (Super)
Codes: [Remove Obstacles]
To ensure qualified team members were present at the table, they modified roles for existing personnel and hired an IPD consultant to act as the Owner's Representative. Changes also had to be made to their in-house Quality Assurance and Quality Control (QAQC) processes, redefining the intentions for QAQC to align with the new delivery phases of IPD.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:152 [In spring of 2010, after sever..] (2:1208-2:1916) (Super)
Codes: [Negotiate] [Remove Obstacles]
In spring of 2010, after several months of contract negotiations, the owner acknowledged that their understanding of IPD, particularly with regard to the legal terms, was not aligned with the architect and contractor. To facilitate resolving these differences, the owner brought in an IPD consultant. The owner's IPD consultant suggested using the recently released AIA C-191 Standard Form Multi-Party Agreement for Integrated Project Delivery as the basis for agreement. All parties felt the AIA document represented the majority of what they were trying to do with their custom agreement; however the contract continued to be negotiated for an additional 8 months until November 2010.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:153 [After reviewing the agreement,..] (3:4467-4:542) (Super)
Codes: [Remove Obstacles]
After reviewing the agreement, the owner realized their expertise did not grant them a high level of comfort with the contract. In spring 2010 Mercy hired an independent consultant, an architect with experience in AIA contract documents and familiar with Lean Construction. The IPD consultant recommended using AIA C-191 Standard Form Multi-Party Agreement for Integrated Project Delivery in lieu of the custom agreement proposed by Array.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:154 [To supplement the scarcity of ..] (7:3534-7:3829) (Super)
Codes: [Remove Obstacles]
To supplement the scarcity of IPD resources, the owner's IPD consultant contacted other companies experienced with healthcare and IPD. The contractor Boldt was willing to share resources and advice based on their experience integrating Lean Construction with IPD in the healthcare sector.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:84 [Communication and decision-mak..] (9:2825-9:3227) (Super)
Codes: [Decision Making System]
Communication and decision-making also occurred outside the weekly meeting schedule. When team members judged an issue arising in the field too urgent to wait for resolution at the weekly Wednesday meeting, an ad-hoc conference call with the integrated team members would be assembled. Simply having a conversation among the diverse array of team members often resulted in a quick decision.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:105 [They also noted that project d..] (11:1196-11:1370) (Super)
Codes: [Decision Making System]
They also noted that project decisions were made immediately, whereas in their previous experience issues raised in project meetings typically took 2-3 days to resolve.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:121 [Goals were established with co..] (4:4039-4:4507) (Super)
Codes: [Aligned Project Goals]
Goals were established with collaborative input from the team. The owner's IPD consultant developed and led the process of defining goals. Special effort was dedicated to this process, because lessons learned from other IPD teams warned that a lack of goal definition and alignment at the beginning of a project caused serious problems later. Compared with the long and difficult contract negotiation, consensus on goal definition was very easily reached.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:80 [Contract Section 2.4 Team Meet..] (9:1170-9:1546) (Super)
Codes: [Information Sharing Mechanisms]
Contract Section 2.4 Team Meetings, Communication and Recordkeeping empower team members to share relevant project information directly with one another, eliminating contractual hierarchy and pre-defined communication channels. This allows all team members, including design consultants, sub-contractors, advisors and agents to communicate directly with one another.
P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:102 [The furniture is laid out in a..] (10:4126-10:4347) (Super)
Codes: [Information Sharing Mechanisms]
The team set up an easily accessible "hub" within the hospital. The team uses this space to review and work with documents and to conduct user meetings. The furniture is laid out in a doughnut configuration with pin-up space on three of the walls and a SMART Board, see Information Sharing, on the fourth. Network connectivity is also provided for individual laptops.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:103 [Tool s • SMART Board • Confere..] (11:178-11:269) (Super)
Codes: [Information Sharing Mechanisms]
Tool s
- SMART Board
- Conference calls
- Emails
- Networked Project Management Site

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:104 [When the team compared the pro..] (11:966-11:1194) (Super)
Codes: [Information Sharing Mechanisms]
When the team compared the project meetings for this project against their previous experience with non-IPD projects, they found a much more diverse group of people attended and the information shared was at a higher level.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:136 [In this case, one of the bigge..] (8:2881-8:3738) (Super)
Codes:[Early involvement effectiveness] [Information Sharing Mechanisms]
In this case, one of the biggest benefits of having the sub-contractors on board during criteria design was the information gained through their access to the facility. They were able to look behind ceilings and walls, discovering conditions that normally would not have been known until construction. Having that information early allowed the design team to make better design decisions and develop strategic construction phasing solutions. Sub-contractors also provided valuable feedback based on their expertise. For example, there was a condition where the mechanical engineer recommended the removal of a section of the ceiling. Sub-contractors pointed out that removal would require both an inspection and upgrade of the area to bring it up to code. To avoid these additional costs and delays, an alternate solution was found.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:146 [Meeting Frequency • Daily Hudd..] (11:647-11:963) (Super)
Codes: [Information Sharing Mechanisms]
Meeting Frequency
- Daily Huddles (Implementation Team and Project Managers as needed)
- Weekly Last Planner Meetings (Project Management & Implementation Teams)
- Weekly Cost Review Meetings (Project Management & Implementation Teams)
- Monthly Project Executive Meetings
- Conference calls as needed

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:147 [From the facilities management..] (11:1375-11:1968) (Super)
Codes: [Information Sharing Mechanisms] [manage]
From the facilities management standpoint, the IPD process has increased meeting frequency and interdisciplinary communication. This has been incredibly valuable in terms of increasing the construction team's awareness of the special requirements of constructing within an actively operational healthcare environment. The daily huddles (see Implementation) have been instrumental in facilitating effective communication between the construction team, the facility manager, and hospital staff in order to maintain uninterrupted and safe hospital operations during construction.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:82 [The open book contract languag..] (9:1891-9:2063) (Super)
Codes: [Financial Transparency]
The open book contract language gives the owner the right to audit or review any information relating to accounting records and business methods used to determine costs.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:133 [The Last Planner System also h..] (8:404-8:735) (Super)
Codes: [Last Planner System] [monitor]
The Last Planner System also helps to monitor the effectiveness of the team. According to the owner's IPD consultant, a University of Pennsylvania study reported that a traditional project

delivery approach typically achieves 50% reliability of work completed and that last measurement recorded for this IPD team was 80%.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:134 [For fieldwork, the team used a..] (8:740-8:1347) (Super)
Codes: [Daily Huddle]
For fieldwork, the team used a Lean tool called “daily huddles.” Donley’s superintendant and project foreman led these huddles. Participants included the trade workers, the owner’s facility personnel, and sometimes hospital nurses and staff. These short 15-20 minute meetings, held each morning, have been very effective in communicating the daily activities and ensuring the team is aligned in their goals for the day. This has been especially valuable for daily logistics, coordinating security and scheduling shutdowns, all critical to keep the hospital functioning during construction.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:148 [The daily huddles (see Impleme..] (11:1703-11:1969) (Super)
Codes: [Daily Huddle]
The daily huddles (see Implementation) have been instrumental in facilitating effective communication between the construction team, the facility manager, and hospital staff in order to maintain uninterrupted and safe hospital operations during construction.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:59 [The three major sub-contractor..] (7:1883-7:1997) (Super)
Codes: [Phase of Involvement]
The three major sub-contractors were selected by Donley’s and brought on board at the start of criteria design.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:69 [Early Involvement (early contr..] (8:1388-8:1489) (Super)
Codes: [Phase of Involvement]
Early Involvement (early contribution of expertise)
CM/GC Criteria Design
Trades Criteria Design

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:70 [Unique compared to the team’s ..] (8:1702-8:1888) (Super)
Codes: [Phase of Involvement]
Unique compared to the team’s previous design-build experience was that sub-contractors were on board during criteria design, only a month after the prime contractor was brought on.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:71 [With early involvement of both..] (8:1890-8:2160) (Super)
Codes: [Commitment] [Early involvement effectiveness]
With early involvement of both the contractor and sub-contractors, everyone started when the project was still in development; this allowed for creation of aligned goals, a sense of ownership, and eliminated the knowledge disconnect during project handoff points.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:73 [Sub- contractors reported that..] (8:2527-8:2876) (Super)
Codes: [Commitment] [Trust] [Early involvement effectiveness]
Sub-contractors reported that they avoided getting wrapped up in their own isolated issues because, by working closely with other team members early on in the process, they were able to see how each discipline was inter-dependent. This built respect and helped motivate the team to be more responsive and better support other disciplines.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:96 [The contractor observed that e..] (10:1479-10:1605) (Super)
Codes: [Early involvement effectiveness]
The contractor observed that early involvement created the biggest change, eliminating silos within the construction trades.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:136 [In this case, one of the bigge..] (8:2881-8:3738) (Super)
Codes:[Early involvement effectiveness] [Information Sharing Mechanisms]
In this case, one of the biggest benefits of having the sub-contractors on board during criteria design was the information gained through their access to the facility. They were able to look behind ceilings and walls, discovering conditions that normally would not have been known until construction. Having that information early allowed the design team to make better design decisions and develop strategic construction phasing solutions. Sub-contractors also provided valuable feedback based on their expertise. For example, there was a condition where the mechanical engineer recommended the removal of a section of the ceiling. Sub-contractors pointed out that removal would require both an inspection and upgrade of the area to bring it up to code. To avoid these additional costs and delays, an alternate solution was found.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:137 [Another benefit of early invol..] (8:3743-8:4242) (Super)
Codes:[Early involvement effectiveness]
Another benefit of early involvement was an increased accuracy in estimating. The sub-contractors had to revise their typical estimating procedures because criteria design required early estimation to be done without detailed information. But because sub-contractors were involved in design decisions that influenced cost and provided them with more intimate knowledge of the project as it evolved, they were able to arrive at more accurate estimates when establishing the Target Cost.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:138 [Responsiveness, enabled by ear..] (8:4245-8:4743) (Super)
Codes:[Early involvement effectiveness]
Responsiveness, enabled by early involvement, has proven to add significant value to the owner. Early involvement may be particularly advantageous for renovation projects, where unknown conditions are routinely discovered and benefit greatly from fast collaborative response by an integrated team. As the owner's consultant commented, "there have been bigger projects, but this

one is complex and we are dealing with unforeseen conditions everyday. It is good to have a team approach."

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:142 [The early involvement of key s..] (10:2061-10:2300) (Super)
Codes: [Early involvement effectiveness] [Culture fit]
The early involvement of key subs has had a tremendous impact on the culture of the team – it helped build trust and respect among team members, eliminated the knowledge transfer disconnection and achieved buy-in from the entire team.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:73 [Sub- contractors reported that..] (8:2527-8:2876) (Super)
Codes: [Commitment] [Trust] [Early involvement effectiveness]
Sub-contractors reported that they avoided getting wrapped up in their own isolated issues because, by working closely with other team members early on in the process, they were able to see how each discipline was inter-dependent. This built respect and helped motivate the team to be more responsive and better support other disciplines.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:140 [Working as part of a transpare..] (10:3110-10:3480) (Super)
Codes: [Trust] [Culture Fit]
Working as part of a transparent team has created the opportunity for the facility managers to provide input, greatly reducing their stress compared to previous renovation experiences, see Implementation for more information on Daily Huddles. Transparency provides a higher level of awareness and trust between the facility managers and the construction team.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:8 [During this negotiation period..] (2:1917-2:2185) (Super)
Codes: [Commitment]
During this negotiation period, the entire integrated team, which included the owner, architect, contractor, design consultants and first tier sub-contractors, was committed to the IPD process, worked (and were compensated) as if there was a contract in place.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:29 [This time period was difficult..] (4:905-4:1172) (Super)
Codes: [Commitment]
This time period was difficult but the entire integrated team, including the owner, architect, contractor, design consultants, and first tier sub-contractors, remained committed to IPD throughout the negotiations and continued work without a contract in place.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:71 [With early involvement of both..] (8:1890-8:2160) (Super)
Codes: [Commitment] [Early involvement effectiveness]
With early involvement of both the contractor and sub-contractors, everyone started when the project was still in development; this allowed for creation of aligned goals, a sense of ownership, and eliminated the knowledge disconnect during project handoff points.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:73 [Sub- contractors reported that..]
(8:2527-8:2876) (Super)
Codes: [Commitment] [Trust] [Early involvement effectiveness]
Sub-
contractors reported that they avoided getting wrapped up in their own isolated issues because, by working closely with other team members early on in the process, they were able to see how each discipline was inter-dependent. This built respect and helped motivate the team to be more responsive and better support other disciplines.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:89 [As the owner's representative ..]
(9:4503-9:4730) (Super)
Codes: [Commitment] [culture fit]
As the owner's representative said, "The team worked for months without a contract. The team got paid without a contract. The commitment, collaboration and communication were the outstanding pieces of this whole process."

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:16 [The integrated nature of the t..]
(3:1906-3:2300) (Super)
Codes: [Culture Fit]
The integrated nature of the team and close coordination with the owner allowed all of the activities occurring on the medical center campus, including activities internal and external to the project, to be combined into the team's construction schedule. This allowed the team to accommodate all of the owner's other initiatives, avoid conflicts, and better achieve the owner's goals

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:86 [Team members observed that alt..]
(9:3710-9:3927) (Super)
Codes: [Culture Fit]
Team members observed that although some of their colleagues initially tried to stay within familiar roles, after a few meetings all team members became accustomed to sharing information and communicating openly.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:87 [Instead of just sending an RFI..]
(9:4056-9:4202) (Super)
Codes: [culture fit]
Instead of just sending an RFI telling the designers and engineers to fix it, sub-contractors used their experience to help suggest solutions.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:119 [the team has recognized that t..]
(3:3062-3:3578) (Super)
Codes: [Culture Fit]
the team has recognized that the collaborative nature of the process coupled with early involvement has been a significant advantage, especially for a hospital remodel. Design and construction were happening concurrently for a significant portion of this project. With a 60+ year old medical center, there were many unforeseen conditions discovered during renovations

that allowed the field team to provide detailed input to the design team to make better design decisions and avoid issues in the field.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:140 [Working as part of a transpare..] (10:3110-10:3480) (Super)
Codes: [Trust] [Culture Fit]
Working as part of a transparent team has created the opportunity for the facility managers to provide input, greatly reducing their stress compared to previous renovation experiences, see Implementation for more information on Daily Huddles. Transparency provides a higher level of awareness and trust between the facility managers and the construction team.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:142 [The early involvement of key s..] (10:2061-10:2300) (Super)
Codes: [Early involvement effectiveness] [Culture fit]
The early involvement of key subs has had a tremendous impact on the culture of the team – it helped build trust and respect among team members, eliminated the knowledge transfer disconnection and achieved buy-in from the entire team.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:75 [Sub-contractors also provided ..] (8:3337-8:3738) (Super)
Codes: [Monitor]
Sub-contractors also provided valuable feedback based on their expertise. For example, there was a condition where the mechanical engineer recommended the removal of a section of the ceiling. Sub-contractors pointed out that removal would require both an inspection and upgrade of the area to bring it up to code. To avoid these additional costs and delays, an alternate solution was found.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:133 [The Last Planner System also h..] (8:404-8:735) (Super)
Codes: [Last Planner System] [monitor]
The Last Planner System also helps to monitor the effectiveness of the team. According to the owner's IPD consultant, a University of Pennsylvania study reported that a traditional project delivery approach typically achieves 50% reliability of work completed and that last measurement recorded for this IPD team was 80%.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:50 [The Project Management team wa..] (6:1698-6:1893) (Super)
Codes: [Manage] [training]
The Project Management team was tasked with educating, training and managing the Implementation team, ensuring that the entire team adhered to the principles of Integrated Project Delivery.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:83 [The meetings became more effec..] (9:2391-9:2822) (Super)
Codes: [Manage]

The meetings became more effective by splitting the time into two halves. The first half of the meeting includes the entire team and typically focuses on the Last Planner Schedule, discussion of field issues, and communicating relevant information to the foreman. The second half of the meeting is only for those who need to be there and is focused mostly on project costs, schedule and design progress under review.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:157 [This is primarily due to the f..] (3:2677-3:2987) (Super)
Codes: [Manage]
There was not necessarily a clear understanding of this advantage going into IPD, but the team has discovered that having an integrated and consistent team through the duration of the project significantly reduces risk to the owner. This is primarily due to the fact that the entire integrated team (owner, architect, consultants, GC, and subs) is responsible for addressing schedule, constructability, and cost; one discipline can't deflect issues to another. Positive or negative, the integrated team has to solve problems together.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:124 [The owner's IPD consultant cha..] (6:2011-6:2440) (Super)
Codes: [Manage]
The owner's IPD consultant characterized the underlying values of an integrated team as, "everyone steps up when they need to step up; whether it is a foreman, project manager, estimator, project engineer, or project architect." Essentially, the Project Management team needs to set up an environment that allows team members to take leadership as needed and create a culture of distributed leadership and ownership.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:126 [The IPD consultant brought on ..] (6:692-6:1060) (Super)
Codes: [Manage]
The IPD consultant brought on board by the owner was experienced with fast track projects, Lean Construction techniques, and early involvement. The consultant became integral to the project, coordinating with the owner's legal team through the contract negotiation as well as facilitating the IPD process and eventually serving as the Owner's Representative.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:141 [Plus, the increase in communic..] (10:3482-10:3713) (Super)
Codes: [Manage]
Plus, the increase in communication allows the design and construction team to plan work more intelligently and coordinate work with the facility managers, giving them more time to prepare the hospital staff for interruptions.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:147 [From the facilities management..] (11:1375-11:1968) (Super)
Codes: [Information Sharing Mechanisms] [manage]
From the facilities management standpoint, the IPD process has increased meeting frequency and interdisciplinary communication. This has been incredibly valuable in terms of increasing the construction team's awareness of the special requirements of constructing within an actively

operational healthcare environment. The daily huddles (see Implementation) have been instrumental in facilitating effective communication between the construction team, the facility manager, and hospital staff in order to maintain uninterrupted and safe hospital operations during construction.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:27 [All parties agreed the AIA doc..] (4:543-4:700) (Super)
Codes: [Negotiate]
All parties agreed the AIA document aligned well with what they were trying to develop in their custom document, so the owner opted to use the AIA C-191.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:28 [After the AIA C-191 was chosen..] (4:705-4:904) (Super)
Codes: [Negotiate]
After the AIA C-191 was chosen, it took the owner, architect and contractor almost 8 months to negotiate and revise the document to develop an agreement with which all parties were comfortable.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:152 [In spring of 2010, after sever..] (2:1208-2:1916) (Super)
Codes: [Negotiate] [Remove Obstacles]
In spring of 2010, after several months of contract negotiations, the owner acknowledged that their understanding of IPD, particularly with regard to the legal terms, was not aligned with the architect and contractor. To facilitate resolving these differences, the owner brought in an IPD consultant. The owner's IPD consultant suggested using the recently released AIA C-191 Standard Form Multi-Party Agreement for Integrated Project Delivery as the basis for agreement. All parties felt the AIA document represented the majority of what they were trying to do with their custom agreement; however the contract continued to be negotiated for an additional 8 months until November 2010.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:9 [They get long-term reliability..] (2:2376-2:2630) (Super)
Codes: [Problem Addressed]
They get long-term reliability. Maintenance issues are addressed during construction that normally aren't, so they get a building that is more economical to maintain and get the features that they truly need based on what their budget could afford."

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:10 [I think in the end, the owner ..] (2:2312-2:2405) (Super)
Codes: [Participants Satisfaction]
I think in the end, the owner gets the most for their money. They get long-term reliability

Neutral

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:112 [The architect, engineers, and ..] (8:1492-8:1699) (Super)
Codes: [Team member IPD experience] [Architect] [General Contractor]

The architect, engineers, and contractor were very experienced with the design-build delivery approach, which typically involves the contractor much earlier than in a traditional design-bid-build model.
P 6: 02 MERCY Facility Master Plan Remodel.pdf
Code: [Team member IPD experience] [Architect]
Array was inexperienced with IPD but had been researchingthe method for some time."

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:112 [The architect, engineers, and ..] (8:1492-8:1699) (Super)
Codes: [Team member IPD experience] [Architect] [General Contractor]
The architect, engineers, and contractor were very experienced with the design-build delivery approach, which typically involves the contractor much earlier than in a traditional design-bid-build model.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:53 [Donley's and Array had previou..] (6:3817-6:4010) (Super)
Codes: [Previous cooperation experience]
Donley's and
Array had previous shared project experience, including a $30 million parking garage for a University hospital that was ongoing during the selection process for this project.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:14 [Cost Predictability was not id..] (3:1164-3:1331) (Super)
Codes: [Motivator_Cost]
Cost Predictability was not identified as an initial motivator for selecting IPD, but the team has already recognized the cost management advantages of the process.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:15 [Schedule Predictability was no..] (3:1527-3:1743) (Super)
Codes: [Motivator_Schedule] [Culture Fit]
Schedule Predictability was not identified as an initial motivator for selecting IPD, but the team discovered the scheduling advantages of having all the team members (owner, architect, contractor) coordinating

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:23 [the team has discovered that h..] (3:2526-3:2676) (Super)
Codes: [Motivator_risk]
the team has discovered that having an integrated and consistent team through the duration of the project significantly reduces risk to the owner.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:19 [Design Complexity was not an i..] (3:2990-3:3233) (Super)
Codes: [Motivator_Technical] [Early involvement Effectiveness]
Design Complexity was not an initial motivator for selecting IPD, but the team has recognized that the collaborative nature of the process coupled with early involvement has been a significant advantage, especially for a hospital remodel.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:42 [According to the modified cont..] (5:1128-5:1386) (Super)
Codes: [Reward Structure- Incentive]
According to the modified contract, the architect and contractor waived the rights to the Goal Achievement Compensation; however, revisions to Article 4, Compensation, established a compensation structure similar to the Goal Achievement Compensation,

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:92 [The team refers to the resulti..] (10:157-10:241) (Super)
Codes: [Reward Structure- Incentive]
The team refers to the resulting culture as, “everybody has some skin in the game.”

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:44 [in this case the document was ..] (5:2286-5:2757) (Super)
Codes: [Reward structure liability waiver]
in this case the document was modified to waive claims only between the architect and contractor and their respective consultants and sub-contractors. The owner declined to waive claims or liability. The waivers are general, but also include specific waivers of claims for consequential damages and subrogation. Other exceptions generally included issues arising out of “willful misconduct,” unfulfilled warranty obligations, or failure to procure insurance.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:123 [Two contingencies were establi..] (4:2492-4:3027) (Super)
Codes: [Reward structure liability waiver]
Two contingencies were established as part of the Target Cost breakdown, a Design and Construction Contingency and an Owner Contingency. The Design and Construction Contingency would cover “reasonable refinement” of design details within the original scope of the contract documents, and changes required by code officials. The Owner Contingency would cover owner scope changes, extraordinary events or circumstances, and unforeseen construction conditions that could not have been reasonably determined prior to work.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:129 [The team had a difficult time ..] (7:3014-7:3405) (Super)
Codes: [remove obstacles]
The team had a difficult time finding resources to help them prepare documents and management strategies for the IPD process. Without references, they had to invent new ways of doing things. For example Array put a great deal of effort into strategizing the RFQ process for selecting the engineer consultant, which was different than their previous practices (see Firm Selection).

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:56 [The architect drove the select..] (6:3113-6:3207) (Super)
Codes: [Decision Making System]
The architect drove the selection of the contractor without much participation by the owner.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:57 [Mercy Health Partners and Donl..] (7:513-7:833) (Super)
Codes: [Decision Making System]
Mercy Health Partners and Donley's also did independent reviews and gave their top two recommendations to Array. Array maintained final decision-making power since they were the party contracting directly the selected firm. The owner and contractor agreed with Array's selection of the engineering firm Osborn.
"

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:139 [Early involvement, aligned goa..] (9:4362-9:4501) (Super)
Codes: [Aligned Project Goals] [Early involvement effectiveness] [Financial Transparency]
Early involvement, aligned goals, and transparency were the primary contributing factors in creating an effective collaborative culture.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:85 [a SMART Board, was installed i..] (9:3257-9:3604) (Super)
Codes: [Information Sharing Mechanisms] [Other tools]
a
SMART Board, was installed in a conference room within the hospital but at the time of this study has not yet been put into action. The Implementation Team believes the SMART Board will facilitate remote communication by allowing review and mark-up of photos or drawings that can be shared immediately with the off-site team members.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:145 [A SMART Board is a large-scale..] (11:426-11:642) (Super)
Codes: [Information Sharing Mechanisms]
A SMART Board is a large-scale interactive tool that allows people in distant locations to look and manipulate the same document in real time. There is one located in the "hub," a conference room at the hospital

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:81 [Contract Section 4.6 Recordkee..] (9:1549-9:1717) (Super)
Codes: [Financial Transparency]
Contract Section 4.6 Recordkeeping and Owner Audit Rights requires that all parties maintain detailed accounting records of all finances related to the cost of work.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:139 [Early involvement, aligned goa..] (9:4362-9:4501) (Super)
Codes: [Aligned Project Goals] [Early involvement effectiveness] [Financial Transparency]
Early involvement, aligned goals, and transparency were the primary contributing factors in creating an effective collaborative culture.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:107 [AIA E202 BIM Protocol Exhibit ..] (11:2100-11:2154) (Super)
Codes: [BIM]
AIA E202 BIM Protocol Exhibit was used in this project.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:149 [For each project phase, the E2..] (11:2507-11:3176) (Super)
Codes: [BIM]
For each project phase, the E202 requires the team to assign a five-level progressive scale to determine the Level of Development (LOD) of model elements. The scale moves from LOD 100, which is general massing, up to LOD 500, which requires accurately modeled construction assemblies. The team hoped to achieve LOD 400, which would include fabrication, assembly and detailing information. However, due to the lack of accurate as-builts of the existing facility the team realized the maximum they could achieve would be LOD 300. Therefore, LOD 300 was the highest level they specified in the E202 to be achieved by the Implementation Documents phase.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:65 [The Last Planner System also h..] (8:404-8:484) (Super)
Codes: [Monitor] [Last planner system]
The Last Planner System also helps to monitor the effectiveness of the team.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:130 [Because of conversations with ..] (7:3831-7:4039) (Super)
Codes: [Last Planner System]
Because of conversations with Boldt and others, this project has incorporated Lean Construction techniques, such as the Last Planner System, in the belief that Lean helps to facilitate the IPD process.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:85 [a SMART Board, was installed i..] (9:3257-9:3604) (Super)
Codes: [Information Sharing Mechanisms] [Other tools]
a SMART Board, was installed in a conference room within the hospital but at the time of this study has not yet been put into action. The Implementation Team believes the SMART Board will facilitate remote communication by allowing review and mark-up of photos or drawings that can be shared immediately with the off-site team members.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:19 [Design Complexity was not an i..] (3:2990-3:3233) (Super)
Codes: [Motivator_Technical] [Early involvement Effectiveness]
Design Complexity was not an initial motivator for selecting IPD, but the team has recognized that the collaborative nature of the process coupled with early involvement has been a significant advantage, especially for a hospital remodel.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:90 [The team agreed that early inv..] (9:4733-9:4876) (Super)
Codes: [Early involvement effectiveness]
The team agreed that early involvement was one of the most important IPD strategies for achieving collaborative attitudes across the board.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:139 [Early involvement, aligned goa..] (9:4362-9:4501) (Super)
Codes: [Aligned Project Goals] [Early involvement effectiveness] [Financial Transparency]
Early involvement, aligned goals, and transparency were the primary contributing factors in creating an effective collaborative culture.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:135 [Early involvement helped build..] (8:2166-8:2283) (Super)
Codes: [Trust]
Early involvement helped build trusting and respectful relationships between the designers, engineers and builders.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:99 [Some of the owner's facility m..] (10:2841-10:3006) (Super)
Codes: [Commitment] [remove obstacles]
Some of the owner's facility managers had reservations going into IPD because it was new and required some changes in roles, but they have now fully embraced IPD.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:15 [Schedule Predictability was no..] (3:1527-3:1743) (Super)
Codes: [Motivator_Schedule] [Culture Fit]
Schedule Predictability was not identified as an initial motivator for selecting IPD, but the team discovered the scheduling advantages of having all the team members (owner, architect, contractor) coordinating

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:54 [Shortlisted firms were intervi..] (6:3567-6:3764) (Super)
Codes: [Culture Fit]
Shortlisted firms were interviewed in detail on topics such as: relational aspects of project delivery, budgeting process, and logistical strategies specific to healthcare and IPD environments.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:58 [Qualified sub-contractors were..] (7:1592-7:1791) (Super)
Codes: [Culture Fit]
Qualified sub-contractors were sent a qualifications survey that asked about experience with IPD, experience with other technologies that would be used on the project, and financial background.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:89 [As the owner's representative ..] (9:4503-9:4730) (Super)
Codes: [Commitment] [culture fit]
As the owner's representative said, "The team worked for months without a contract. The team got paid without a contract. The commitment, collaboration and communication were the outstanding pieces of this whole process."As the owner's representative said, "The team worked for months without a contract. The team got paid without a contract. The commitment, collaboration and communication were the outstanding pieces of this whole process."

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:93 [Comments from several team mem..] (10:247-10:415) (Super)
Codes: [Culture Fit]
Comments from several team members emphasize that successful implementation of IPD requires flexibility, adaptability to new roles, and evolution as an organization.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:95 [Another challenge for team mem..] (10:981-10:1334) (Super)
Codes: [Culture Fit]
Another challenge for team members new to IPD was abandoning the "cover your ass(ets)" or CYA mentality. For example in a traditional delivery method, if something comes up such as a change order, all work stops until the order is signed or a construction directive is given, but in this process the team reacts immediately and collaboratively.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:122 [There were also several modifi..] (4:3262-4:3767) (Super)
Codes: [Culture Fit] [Manage]
There were also several modifications that redefined responsibility for particular contract requirements from "Parties" or "Team," in the collective sense, to one party in particular, such as the architect, contractor or owner. These modifications may seem to compromise the collaborative intent of the contract by putting in place traditional, isolated decision-making; however, interviews with the team indicate that these contractual definitions have not negatively affected collaboration.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:127 [Design Consultants Array put t..] (6:4143-7:346) (Super)
Codes: [Culture Fit]
Design Consultants
Array put together an RFQ survey that they sent to a dozen engineering companies. The survey questions related to the firm's experience with and commitment to IPD, Revit/BIM experience, general technological capabilities, and degree of integration in house (i.e. number of disciplines under one roof).

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:128 [In general, team members were ..] (7:2016-7:2245) (Super)
Codes: [Culture Fit]
In general, team members were selected based on their past ability to work collaboratively in a team environment. Individuals who tended to push their point of view without considering others were not selected for the team.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:65 [The Last Planner System also h..] (8:404-8:484) (Super)
Codes: [Monitor] [Last planner system]
The Last Planner System also helps to monitor the effectiveness of the team.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:49 [Team leadership occurs at thre..] (6:1065-6:1186) (Super)
Codes: [Manage]
Team leadership occurs at three levels: Project Executive Team, Project Management Team, and the Implementation Team.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:122 [There were also several modifi..] (4:3262-4:3767) (Super)
Codes: [Culture Fit] [Manage]
There were also several modifications that redefined responsibility for particular contract requirements from “Parties” or “Team,” in the collective sense, to one party in particular, such as the architect, contractor or owner. These modifications may seem to compromise the collaborative intent of the contract by putting in place traditional, isolated decision-making; however, interviews with the team indicate that these contractual definitions have not negatively affected collaboration.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:125 [Champion • Architect • Owner’s..] (6:207-6:367) (Super)
Codes: [Manage]
Champion
- Architect
- Owner’s Representative (IPD Consultant)Team Structure
- Project Executive Team
- Project Management Team
- Implementation Team

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:30 [There were a number of changes..] (4:1387-4:1525) (Super)
Codes: [Negotiate]
There were a number of changes that had to be negotiated to reach consensus; most of these changes were regarding the commercial terms.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:33 [And finally the ownership and ..] (4:2050-4:2190) (Super)
Codes: [Negotiate]
And finally the ownership and use of documents had to be negotiated to reach a compromise that protected both the architect and the owner

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:45 [Any claims permitted under Art..] (5:2781-5:2911) (Super)
Codes: [Negotiate]
Any claims permitted under Article 8, Risk Sharing are required to follow procedures defined under Article 9, Dispute Resolution.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:64 [Team members struggled through..] (7:4042-7:4249) (Super)

Codes: [Commitment to IPD process]
Team members struggled through the early planning process, but felt the tools they invented and lessons learned through conversations with others were good investments preparing for future IPD projects.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:11 ["There have been bigger projec..] (2:2688-2:2843) (Super)
Codes: [Problem Addressed]
"There have been bigger projects, but this one is complex and we are dealing with unforeseen conditions everyday. It is good to have a team approach."

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:155 [According to the owner's IPD c..] (8:485-8:735) (Super)
Codes: [Actual Schedule Growth]
According to the owner's IPD consultant, a University of Pennsylvania study reported that a traditional project delivery approach typically achieves 50% reliability of work completed and that last measurement recorded for this IPD team was 80%.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:115 [Even though from a cost standp..] (3:180-3:538) (Super)
Codes: [Participants Satisfaction]
Even though from a cost standpoint $20 million is not a lot of money, we now realize we took on one of the toughest projects for Integrated Project Delivery [due to the complexity of renovating an older building]. The advantage is that we are learning the most about IPD and had to do it well with this tough project."
– Principal Architect, Array

Negative

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:31 [Limitations on liability were ..] (4:1719-4:1860) (Super)
Codes: [Reward structure liability waiver]
Limitations on liability were agreed to between the A/E and contractor, but the owner did not agree to waive liabilities, (see Liability)

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:32 [The insurance section was also..] (4:1861-4:2048) (Super)
Codes: [Reward structure_insurance]
The insurance section was also edited; the owner wanted to follow a more traditional bond approach with conventional professional liability insurance for the architect and engineers.

P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:46 [In this case, the owner prefer..] (5:4338-5:4644) (Super)
Codes: [Reward structure_insurance]
In this case, the owner preferred to follow a conventional insurance and contractor bond approach and struck the reference above from the agreement. The architect and contractor carry

standard Professional Liability insurance, specifics of which were attached in a detailed schedule of requirements.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:150 [The team has spent a great num..] (11:3181-11:4159) (Super)
Codes: [BIM] [Problem Addressed] [confidence in project management]
The team has spent a great number of hours modeling, but is not confident their efforts will pay off in the end. Many team members concluded that BIM may not be appropriate for complex renovation projects and Revit was the wrong tool for this project. They experienced difficulty accurately inputting complex existing conditions and excess rework due to in situ site discoveries. As the team struggled with BIM, they scaled back their expectations for the model's use. The model will be used for 100% of Detail Design and Implementation Documents as planned but other functions have been dropped. In particular, the contractor's use of the model for scheduling (4D) has become less important and the goal of sharing the model with the entire project team has been scaled back so that it is now only shared between the architect, Array, and engineers at Osborn. The goal of using the model for sub-contractor fabrication, LOD 400, has been abandoned.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:150 [The team has spent a great num..] (11:3181-11:4159) (Super)
Codes: [BIM] [Problem Addressed] [confidence in project management]
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P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:144 [Not co-located - shared worksp..] (10:3775-10:4347) (Super)
Codes: [Co-location]
Not co-located - shared workspace availableThe project team was not co-located. The option was discussed but the team felt they could coordinate effectively through regular team meetings.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:156 [Infusing the IPD mindset throu..] (10:429-10:724) (Super)
Codes: [Culture Fit]
Infusing the IPD mindset throughout the organization was a challenge for the architect. For example, many experienced architects were accustomed to using "defensive detailing because you know in a traditional method, if it is not in the drawings and you go out for bid, you won't get it." Changing this behavior took time and required a shift to the realization that everyone is

part of the same team. The architects also had to learn what level of detail was actually needed to communicate information to the integrated team members.

"P 6: 02 MERCY Facility Master Plan Remodel.pdf - 6:150 [The team has spent a great num..] (11:3181-11:4159) (Super)
Codes: [BIM] [Problem Addressed] [confidence in project management]
The team has spent a great number of hours modeling, but is not confident their efforts will pay off in the end. Many team members concluded that BIM may not be appropriate for complex renovation projects and Revit was the wrong tool for this project. They experienced difficulty accurately inputting complex existing conditions and excess rework due to in situ site discoveries. As the team struggled with BIM, they scaled back their expectations for the model's use. The model will be used for 100% of Detail Design and Implementation Documents as planned but other functions have been dropped. In particular, the contractor's use of the model for scheduling (4D) has become less important and the goal of sharing the model with the entire project team has been scaled back so that it is now only shared between the architect, Array, and engineers at Osborn. The goal of using the model for sub-contractor fabrication, LOD 400, has been abandoned.

Not Given

There is no quotation under this category.

Project 3
General Information

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:68 [Lawrence & Schiller Remodel] (1:184-1:214) (Super)
Codes: [Project Name]
Lawrence & Schiller Remodel

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:2 [Office – Renovation] (2:261-2:279) (Super)
Codes: [Project Type]
Office – Renovation

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:9 [Because this is a delivery pro..] (2:2368-2:2558) (Super)
Codes: [Project Size]
Because this is a delivery process there is no scale limitation [to the size of project appropriate for IPD].
– Interior Designer, Canfield Business Interiors/ Alliance Coordinator, ISG

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:69 [In spring 2010, Lawrence & Sch..] (2:571-2:747) (Super)
Codes: [Project Size]
In spring 2010, Lawrence & Schiller, a marketing firm in Sioux Falls South Dakota, was seeking interior design services for the remodeling of their 7,000 square foot office.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:1 [Sioux Falls, South Dakota] (2:226-2:251) (Super)
Codes: [Location]
Sioux Falls, South Dakota

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:3 [Multiparty - Custom series of ..] (2:293-2:331) (Super)
Codes: [Contract]
Multiparty - Custom series of contracts

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:17 [On this project, in lieu of us..] (3:1698-3:1989) (Super)
Codes: [Contract]
On this project, in lieu of using a standard form agreement, the team developed proposals for each phase of work, broken down into three phases: 1) Feasibility; 2) Design Development; and 3) Construction. The owner signed off on each phase separately as the price became more defined.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:4 [August 2010] (2:532-2:542) (Super)
Codes: [Project Start Time]
August 2010

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:5 [Unknown] (2:562-2:568) (Super)
Codes: [Est. Completion Time]
Unknown

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:6 [Canfield identified the projec..] (2:836-2:976) (Super)
Codes: [Initiation Party] [Previous cooperation experience]
Canfield identified the project as an ideal opportunity to test out an integrated delivery approach with several long-time collaborators.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:29 [Canfield Business Interiors pr..] (4:3030-4:3083) (Super)
Codes: [Initiation Party]
Canfield Business Interiors promoted the idea of IPD.

Positive

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:73 [The team considered education ..] (5:3313-5:3640) (Super)
Codes: [Training]
The team considered education to be critical to prepare for the IPD process. To define expectations of the process and align motivations, all partners of Innovative Solutions Group (ISG) were required to read "The Commercial Real Estate Revolution." Key members of the owner's team were also given a copy of the book.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:74 [To help the team better unders..] (5:3646-5:3973) (Super)
Codes: [Training][Remove obstacles]
To help the team better understand the process and discuss the team's comfort level with the project's shared risk/reward component, they held a round table discussion and brought in an experienced IPD professional for advice. All team members attended this meeting (the owner was invited but was not able to attend).

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:6 [Canfield identified the projec..] (2:836-2:976) (Super)
Codes: [Initiation Party] [Previous cooperation experience]
Canfield identified the project as an ideal opportunity to test out an integrated delivery approach with several long-time collaborators.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:8 [The Lawrence & Schiller remode..] (2:2053-2:2241) (Super)
Codes: [Previous cooperation experience] [Team member IPD experience] [Owner] [Architect][General Contractor]
The Lawrence & Schiller remodel was the first IPD project for all of the parties involved, however they had all been working together for years following primarily design-build delivery

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:32 [ISG parties had been working t..] (5:516-5:688) (Super)
Codes: [Culture Fit] [Previous cooperation experience]
ISG parties had been working together in a collaborative capacity for six years and had done other projects as the entity ISG, primarily following a design-build method.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:33 [Lawrence & Schiller is the mar..] (5:858-5:1007) (Super)
Codes: [Previous cooperation experience]
Lawrence & Schiller is the marketing firm for Canfield, so they were familiar with the business goals of ISG and sympathetic to their philosophy.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:36 [All the partner members had pr..] (5:1667-5:1760) (Super)
Codes: [Previous cooperation experience]
All the partner members had previously established professional and personal relationships.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:65 [Everyone knew each other well ..] (7:1297-7:1418) (Super)
Codes: [Previous cooperation experience]
Everyone knew each other well and were comfortable communicating as needed, often emailing in the middle of the night.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:70 [ISG is a Limited Liability Cor..] (2:1426-2:2048) (Super)
Codes: [Previous cooperation experience]
ISG is a Limited Liability Corporation. Typically in IPD, LLCs are formed to join together the architect, contractor and owner for short durations, or one specific project. In this case the LLC is not project specific but rather a new company, formed and solely owned by the owner of Canfield Business Solutions, Larry Canfield. Lawrence & Schiller, the project owner, contracted with ISG. The integrated team partners included: Canfield Business Interiors (interior designers), RSArchitects, Mark Luke Construction, Electric Supply (electrical contractor), and Midwest Mechanical (mechanical contractor).

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:10 [Market Position was the critic..] (2:2561-2:2703) (Super)
Codes: [Motivator_Market]
Market Position was the critical driver for forming Innovative Solutions Group (ISG) and proposing an Integrated Project Delivery approach.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:11 [Cost Predictability was a huge..] (3:184-3:335) (Super)
Codes: [Motivator_Cost]
Cost Predictability was a huge factor in deciding to try IPD primarily because they needed to reduce the original design estimate of $700k to $500k.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:22 [The proposal broke out each pa..] (4:1133-4:1303) (Super)
Codes: [Reward Structure- Incentive]
The proposal broke out each party's allowable cost (their direct compensation, materials and direct burden costs), and an incentive compensation cost (their profit).

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:16 [The team considered a standard..] (3:1259-3:1693) (Super)
Codes:[Remove Obstacles]
The team considered a standard form IPD contract, but for this scale of project and the clients they work with, all of the currently available standard documents seemed overly complex. According to the contractor, "the existing [AIA] contract is 120 pages long, put that in front of a client and they are going to laugh at you and walk away." The team agreed they are ideally looking for an IPD contract less than 20 pages.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:44 [The contractor also developed ..] (5:3976-5:4228) (Super)
Codes: [Remove Obstacles]
The contractor also developed a cost analysis of IPD vs Design-Build based on their experience over the past 8 years in conceptual estimating. This analysis was used to better understand the potential value of IPD and communicate with the owner.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:74 [To help the team better unders..] (5:3646-5:3973) (Super)
Codes: [Training][Remove obstacles]
To help the team better understand the process and discuss the team's comfort level with the project's shared risk/reward component, they held a round table discussion and brought in an experienced IPD professional for advice. All team members attended this meeting (the owner was invited but was not able to attend).

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:85 [Cost model estimates indicatin..] (6:654-6:994) (Super)
Codes: [Remove Obstacles]
Cost model estimates indicating the integrated process would save 10% over design-build were greeted with skepticism since many felt the design-build delivery was equally collaborative and effective as IPD. But, as savings appeared attributable to earlier involvement of the subs, team members became convinced of the value of IPD.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:77 [The team felt that collaborati..] (6:2252-6:2688) (Super)
Codes: [Decision Making System]
The team felt that collaborative decision-making coupled with early involvement of contractors created the most valuable aspect of the IPD process: instilling buy-in from the team. As the contractor said, "all parties own this project." Most decisions were made during the weekly design meeting. The owner was brought into these meetings on an as needed basis to ensure design decisions aligned with the owner's priorities.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:19 [This programming session inclu..] (3:3561-3:3717) (Super)
Codes: [Aligned Project Goals]
This programming session included the GC and sub-contractors and helped ensure that everyone on the team was aligned with the owner's desired outcomes.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:83 [Tool s • Email • Face-to-face ..] (7:804-7:1113) (Super)
Codes: [Information Sharing Mechanisms]
Tools
- Email
- Face-to-face exchange – weekly meetings
- FTP site

The contractor, Mark Luke Construction, has an ftp site to share plans, but most of the communication and coordination happened through email, phone or in the weekly design meetings.
P 7: 03 Lawrence & Schiller Remodel.pdf - 7:83 (2) [Tool s • Email • Face-to-face ..] (7:804-7:1113) (Super)
Codes: [Information Sharing Mechanisms]
Meeting Frequency
- Weekly design meetings

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:53 [The proposal broke out each pa..] (4:1133-4:1338) (Super)
Codes: [Financial Transparency]
The proposal broke out each party's allowable cost (their direct compensation, materials and direct burden costs), and an incentive compensation cost (their profit). The fee structure was transparent;

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:46 [Early Involvement (early contr..] (6:453-6:572) (Super)
Codes: [Phase of involvement]
Early Involvement (early contribution of expertise)
CM/GC Feasibility/ Programming
Trades Feasibility/ Programming

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:49 [There are several benefits of ..] (6:998-6:1243) (Super)
Codes: [Early involvement effectiveness]
There are several benefits of early sub-contractor involvement that translate to cost savings and better value for the owner. First, bringing the subs in during programming meetings helped them understand the goals of the owner and project.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:72 [At the time this study was con..] (4:1687-4:2268) (Super)

Codes:[Early involvement effectiveness]
At the time this study was conducted, the team attributed cost savings to the transparency gained through early involvement of sub-contractors, who were able to better understand the project and influence design and product/system selection decisions. This allowed cost estimates to be more accurate and product/system selection to be more thoroughly considered in terms of design, installation, and operation. The team expects this will reduce field coordination and construction time that in the end eliminate “headache money” and provide the owner better value.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:81 [Second, during an early progra..] (6:1425-6:1818) (Super)
Codes: [Early involvement effectiveness]
Second, during an early programming meeting with the owner, the subs walked through the space and identified potential issues that may have previously been overlooked without their expertise. This made them able to participate in early design discussions where they asked questions and made suggestions to the designers that led to cost savings in system selection and coordination.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:87 [And third, because the subs, w..] (6:1820-6:1977) (Super)
Codes: [Early involvement effectiveness] [Perceived Schedule Performance]
And third, because the subs, who will be executing the construction, more fully understand the project, they expect to reduce construction time by 20%.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:30 [The owner of Canfield, Larry C..] (4:3084-4:3334) (Super)
Codes: [Commitment]
The owner of Canfield, Larry Canfield, is involved with the collaborative project delivery movement. He provided Rex Miller with input for his book “The Commercial Real Estate Revolution,” which became an influential resource for the ISG team.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:31 [The Innovative Solutions Group..] (5:221-5:512) (Super)
Codes: [Commitment] [culture fit]
The Innovative Solutions Group (ISG) Alliance Manager was responsible for facilitating the IPD process, however all members agreed that it was truly a team effort with everyone fully engaged, they speculated that this was perhaps because they were learning about the process together.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:35 [They selected partners who wer..] (5:1427-5:1665) (Super)
Codes: [Commitment]
They selected partners who were willing to read “The Real Estate Revolution,” embrace the collaborative aspirations of ISG, and were passionate about moving their respective practices in this collaborative and integrated direction.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:62 [Periodically team members had ..] (7:186-7:516) (Super)

Codes: [Commitment]
Periodically team members had to remind their colleagues not to fall back into familiar roles. For example, there were instances when team members had to be prevented from making decisions in their individual silos apart from the team. Overall, the team was very successful at coming to the table and making suggestions.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:80 [First, bringing the subs in du..] (6:1128-6:1423) (Super)
Codes: [Commitment]
First, bringing the subs in during programming meetings helped them understand the goals of the owner and project. This deeper understanding helped them fully engage in the project and motivated them to work hard on reducing costs while still achieving the aesthetic goals of the project.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:31 [The Innovative Solutions Group..] (5:221-5:512) (Super)
Codes: [Commitment] [culture fit]
The Innovative Solutions Group (ISG) Alliance Manager was responsible for facilitating the IPD process, however all members agreed that it was truly a team effort with everyone fully engaged, they speculated that this was perhaps because they were learning about the process together.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:32 [ISG parties had been working t..] (5:516-5:688) (Super)
Codes: [Culture Fit] [Previous cooperation experience]
ISG parties had been working together in a collaborative capacity for six years and had done other projects as the entity ISG, primarily following a design-build method.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:37 [The architect was selected bec..] (5:1774-5:1863) (Super)
Codes: [Culture Fit]
The architect was selected because of an interest and philosophical alignment with IPD.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:82 [One of the most difficult cult..] (6:3396-6:3908) (Super)
Codes: [Culture Fit] [Manage]
One of the most difficult cultural changes was to move away from a hierarchical structure to a distributed structure where experts are utilized to lead the process as needed. There is no dictator, which has been a shift for team members accustomed to having a project manager (PM) in design-build delivery. Normally, the PM would identify conflicts, address complaints, and dictate the course of action. In the integrated approach, the team talks to each other and collectively identifies solutions.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:82 [One of the most difficult cult..] (6:3396-6:3908) (Super)
Codes: [Culture Fit] [Manage]

One of the most difficult cultural changes was to move away from a hierarchical structure to a distributed structure where experts are utilized to lead the process as needed. There is no dictator, which has been a shift for team members accustomed to having a project manager (PM) in design-build delivery. Normally, the PM would identify conflicts, address complaints, and dictate the course of action. In the integrated approach, the team talks to each other and collectively identifies solutions.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:84 [Formally, the team held a 2-ho..] (7:1424-7:2042) (Super)
Codes: [Manage]
Formally, the team held a 2-hour weekly design meeting for the Lawrence & Schiller remodel project. Early on, meetings were formal with the Alliance Manager issuing an agenda and meeting minutes, but this quickly developed into a more casual structure with quick emails to notify the team of topics for which to be prepared. Given the relatively small size of the design and construction community in Sioux Falls, team members often interacted three or four times per week throughout the course of normal business, providing many opportunities to discuss issues in-between the regular meeting time.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:25 [The team anticipates that the ..] (4:2273-4:2512) (Super)
Codes: [Commitment to IPD process]
The team anticipates that the completion of this project will give them a better understanding of the cost savings and value of IPD, which will help ISG better define a risk-reward structure and incentive criteria for future clients.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:86 [To clarify the cost benefits o..] (4:1422-4:1686) (Super)
Codes: [Perceived Cost Performance]
To clarify the cost benefits of this delivery method, the contractor put together a cost analysis that estimated the owner would save 10% using IPD instead of design-build delivery. The contractor planned to validate these estimates as the process unfolds.

Neutral

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:8 [The Lawrence & Schiller remode..] (2:2053-2:2241) (Super)
Codes: [Previous cooperation experience] [Team member IPD experience] [Owner] [Architect][General Contractor]
The Lawrence & Schiller remodel was the first IPD project for all of the parties involved, however they had all been working together for years following primarily design-build delivery

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:8 [The Lawrence & Schiller remode..] (2:2053-2:2241) (Super)
Codes: [Previous cooperation experience] [Team member IPD experience] [Owner] [Architect][General Contractor]
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Codes: [Previous cooperation experience] [Team member IPD experience] [Owner] [Architect][General Contractor]
The Lawrence & Schiller remodel was the first IPD project for all of the parties involved, however they had all been working together for years following primarily design-build delivery

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:39 [Unique to the IPD process, the..] (5:2231-5:2405) (Super)
Codes: [Previous cooperation experience]
Unique to the IPD process, the team selected sub-contractors based on expertise rather than initial pricing. Selection also came down to past working experience and trust.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:18 [The team proposed a shared ris..] (3:2602-3:2782) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool]
The team proposed a shared risk and incentive structure, but this was not well defined in the agreements that had been issued at the date of this case study (see Risk/Reward).

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:18 [The team proposed a shared ris..] (3:2602-3:2782) (Super)
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P 7: 03 Lawrence & Schiller Remodel.pdf - 7:21 [The owner had very little invo..] (4:899-4:1048) (Super)
Codes: [Reward Structure-risk pool]
ISG estimated their direct time and materials cost and put their profits at risk.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:54 [The team operated in a very tr..] (6:2167-6:2232) (Super)
Codes: [Financial Transparency]
The team operated in a very transparent manner, see Risk/Reward.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:67 [The architect used BIM softwar..] (7:2127-7:2289) (Super)
Codes: [BIM]
The architect used BIM software on this project, but primarily for executing work and visual communication with the owner, not as a collaborative working tool.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:47 [The team found that early invo..] (6:575-6:652) (Super)
Codes: [Early involvement effectiveness]
The team found that early involvement by key players created enormous value.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:34 [L&S was a seasoned client, fam..] (5:1008-5:1243) (Super)
Codes: [Commitment]
L&S was a seasoned client, familiar with the design-bid-build delivery. Some of their experiences had been successful and others not, so they were very interested in testing this new approach to better manage cost and schedule.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:38 [Mark Luke Construction was sel..] (5:2043-5:2220) (Super)
Codes: [Commitment]
Mark Luke Construction was selected due to their pre-existing relationship with Canfield Business Interiors and strong interest in pursuing an integrated delivery philosophy.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:40 [The team agreed that selected ..] (5:2857-5:2990) (Super)
Codes: [Commitment]
The team agreed that selected individuals had to have the right attitude – one committed to change and learning from the process.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:60 [The learning curve for the tea..] (6:2885-6:3042) (Super)
Codes: [Culture Fit]
The learning curve for the team was relatively conflict free, however cultural shifts were required to break free of ingrained roles and responsibilities.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:78 [The process was more collabora..] (6:2691-6:2873) (Super)
Codes: [Commitment] [culture fit]
The process was more collaborative within the integrated team, but owner involvement was not significantly different than design-build projects the team had worked on previously.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:27 [Dispute Resolution There was n..] (4:2658-4:2767) (Super)
Codes: [Negotiate]
Dispute Resolution: There was no Alternate Dispute Resolution procedure identified in the custom agreements.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:87 [And third, because the subs, w..] (6:1820-6:1977) (Super)
Codes: [Early involvement effectiveness] [Perceived Schedule Performance]
And third, because the subs, who will be executing the construction, more fully understand the project, they expect to reduce construction time by 20%.

Negative

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:15 [Schedule Predictability was no..] (3:339-3:395) (Super)
Codes: [Motivator_Schedule]
Schedule Predictability was not a critical driver of IPD.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:13 [Risk was not a motivating fact..] (3:689-3:752) (Super)
Codes: [Motivator_Risk]
Risk was not a motivating factor for the owner to agree to IPD.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:14 [Design complexity of the desig..] (3:755-3:846) (Super)
Codes: [Motivator_Technical]
Design complexity of the design, a 7,000 sf interior remodel was not a driving motivator.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:26 [The contracts did not include ..] (4:2526-4:2655) (Super)
Codes: [Reward structure liability waiver]
The contracts did not include a “no sue” clause, however the Phase 3 contract had yet to be developed at the time of this study.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:28 [No unique characteristics, sta..] (4:2781-4:2855) (Super)
Codes: [Reward structure_insurance]
No unique characteristics, standard professional liability products used.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:88 [Implementation Tools No unique..] (3:3126-3:3220) (Super)
Codes: [Lean Construction Tools]
Implementation Tools No unique collaborative tools were referenced in the custom agreements.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:89 [Implementation There were no u..] (6:305-6:412) (Super)
Codes: [Lean Construction Tools]
Implementation: There were no unique IPD tools used in this project to facilitate collaborative behavior.

"P 7: 03 Lawrence & Schiller Remodel.pdf - 7:63 [Not co-located The team was no..] (7:578-7:779) (Super)
Codes: [Co-location]
Not co-located
The team was not co-located. Meetings were primarily held in Canfield Business Interior’s conference room, which could be reached within a 10 minutes drive for all the team members.

P 7: 03 Lawrence & Schiller Remodel.pdf - 7:78 [The process was more collabora..] (6:2691-6:2873) (Super)
Codes: [Commitment] [culture fit]
The process was more collaborative within the integrated team, but owner involvement was not significantly different than design-build projects the team had worked on previously. "

Not Given

There is no quotation under this category.

Project 4
General Information
"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:51 [SpawGlass Austin Regional Offi..] (1:153-1:188) (Super)
Codes: [Project Name]
Spaw Glass Austin Regional Office

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:2 [Office – New Construction] (2:217-2:241) (Super)
Codes: [Project Type]
Office – New Construction

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:53 [The office was planned to be n..] (2:589-2:774) (Super)
Codes: [Project Size]
The office was planned to be new construction and approximately 15,000 sf. SpawGlass Contractors acted as both the general contractor and owner, on behalf of SpawGlass Real Estate.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:1 [Austin, Texas] (2:195-2:207) (Super)
Codes: [Location]
Austin, Texas

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:3 [Single Multi-party Contract – ..] (2:255-2:310) (Super)
Codes: [Contract]
Single Multi-party Contract – ConsensusDOCS 300

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:13 [SpawGlass chose to use the Con..] (3:636-3:987) (Super)
Codes: [Contract]
SpawGlass chose to use the ConsensusDOCS 300, Standard Form of Tri-party Agreement for Collaborative Project Delivery. They considered the AIA multi-party contract, but found the language in ConsensusDOCS more accessible. There was no negotiation or customization of the contract, they went through the form and checked the appropriate boxes.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:4 [April 2010] (2:431-2:440) (Super)
Codes: [Project Start Time]
April 2010

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:5 [Unknown] (2:460-2:466) (Super)
Codes: [Est. Completion Time]
Unknown

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:6 [SpawGlass decided to use the p..] (2:1328-2:1395) (Super)
Codes: [Initiation Party]

SpawGlass decided to use the project as an opportunity to try IPD.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:30 [A local attorney specializing ..] (5:2162-5:2284) (Super)
Codes: [Initiation Party]
A local attorney specializing in IPD introduced the idea of IPD to SpawGlass and helped to spur the initial IPD interest.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:57 [SpawGlass would like to reach ..] (3:2795-3:2888) (Super)
Codes: [LEED Certification Intended]
SpawGlass would like to reach LEED Gold, but LEED Silver was stated as the contractual goal.

Positive

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:79 [The architect did have to inve..] (5:249-5:535) (Super)
Codes: [Respond to complaints] [Training]
The architect did have to invest effort in educating their consultants on IPD. Because of a lack of familiarity with the contract "there was some hesitancy on their part." Ultimately, the architect got them to agree, primarily based on their previously established relationships.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:28 [Austin is a small design and c..] (5:1031-5:1344) (Super)
Codes: [Previous cooperation experience] [culture fit]
Austin is a small design and construction community and all parties assumed collaborative process would be followed regardless of delivery method. As described by the contractor's PM, "In the end it became more of a relationship thing than anything else; a comfort level with someone we had worked with."

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:54 [Market Position was the greate..] (2:2213-2:2575) (Super)
Codes: [Motivator_Market]
Market Position was the greatest motivator for SpawGlass to push for IPD. The contractor desired to be on the cutting edge with the "best tools, equipment and innovation." They saw there weren't many IPD projects being done in the market and decided they should explore the process on their own office building because it was a low risk way to test IPD.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:19 [ConsensusDOC's Article 11 defi..] (4:166-4:371) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool]
ConsensusDOC's Article 11 defined the Incentive and Risk Sharing structure for the project and outlined the process for establishing the budget, cost models and a Project Target Cost Estimate (PTCE).

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:19 [ConsensusDOC's Article 11 defi..] (4:166-4:371) (Super)

Codes: [Reward Structure- Incentive] [Reward Structure-risk pool]
ConsensusDOC's Article 11 defined the Incentive and Risk Sharing structure for the project and outlined the process for establishing the budget, cost models and a Project Target Cost Estimate (PTCE).

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:22 [ConsensusDOCS Article 21, Inde..] (4:2280-4:2696) (Super)
Codes: [Reward structure liability waiver]
ConsensusDOCS Article 21, Indemnity, Insurance, Waivers and Bonds, includes provisions that limit liability, or indemnity, between contracting parties for claims that may arise in connection to the project, but "only to the extent caused by the negligent acts or omissions of the [owner, contractor, and designer] or anyone for whose acts or omissions [the owner, contractor, or designer] may be liable."

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:78 [When the idea of using IPD was..] (5:1599-5:1930) (Super)
Codes: [Respond to complaints]
When the idea of using IPD was introduced, there was some reluctance from the architect's consultants, but eventually everyone accepted this approach. The team held an all-project team member kick-off meeting where they discussed IPD and use of BIM. At that meeting all team members committed to the goals of the project.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:79 [The architect did have to inve..] (5:249-5:535) (Super)
Codes: [Respond to complaints] [Training]
The architect did have to invest effort in educating their consultants on IPD. Because of a lack of familiarity with the contract "there was some hesitancy on their part." Ultimately, the architect got them to agree, primarily based on their previously established relationships.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:70 [Early and ongoing constructabi..] (6:2348-6:2768) (Super)
Codes: [Remove Obstacles]
Early and ongoing constructability reviews between SpawGlass Contractors and BGK Architect provided opportunities for team members to understand each other's processes and hold discussions more detailed than any they had previously experienced. As the contractor's PM stated, "it forces you to go over ever little nook and cranny of what you are looking at to a certain degree and figure things out together."

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:52 ["You never feel like there is ..] (2:1839-2:2210) (Super)
Codes: [Culture Fit] [Exhibits no obstacles]
"You never feel like there is an issue or an adversarial side of this process. Monetary rewards are fine, but at the end of the day, the biggest lesson learned is that we went through this process together. [We can] share the story and take away some ideas on how to communicate, work together and strengthen that [relationship]."Project Manager, SpawGlass

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:43 [Some of the most valuable meet..] (7:713-7:899) (Super)
Codes: [Decision Making System] [information sharing mechanism]
Some of the most valuable meetings were held around the computer screen of the project architect, which allowed the team to review in real time and assist with team design decisions.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:47 [The CPD worked through the dev..] (7:2879-7:3040) (Super)
Codes: [Decision Making System]
The CPD worked through the development of the BIM Execution Plan and collaboratively established responsibilities, protocols, and deliverable requirements.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:49 [At the time this study was con..] (7:3476-7:3679) (Super)
Codes: [Information Sharing Mechanisms] [decision making]
At the time this study was conducted, the team had found the model to be most valuable for project visualization. It improved team communication and ability to make design decisions collaboratively.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:69 [The Management Team met once a..] (6:1593-6:2336) (Super)
Codes: [Decision Making System]
The Management Team met once a week. The team consisted of two managers from SpawGlass, a manager and a principal from BGK architects, and occasionally the Regional President from SpawGlass who also makes decisions on behalf of the owner, SpawGlass Real Estate. During the times when the owner's rep was not available for the weekly meeting, the team reports that their decision making process is slowed. Depending on the issues discussed, other consultants were brought into the weekly meeting as needed. Because the owner and contractor were essentially the same entity, most project decisions could be made between the contractor and architect. SpawGlass had a Board of Directors responsible for approving final costs.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:18 [Some project goals were tied t..] (3:3477-3:3618) (Super)
Codes: [Aligned Project Goals] [incentives]
Some project goals were tied to financial incentives, intending to align the interests of the contracting partners with the Owner's goals.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:41 [Tool s • Email • Conference Ca..] (7:174-7:267) (Super)
Codes: [Information Sharing Mechanisms]
Tool s
- Email
- Conference Calls
- Networked Project Management Site (document sharing)

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:42 [Meeting Frequency • Weekly Tea..] (7:378-7:449) (Super)
Codes: [Information Sharing Mechanisms]
Meeting Frequency
- Weekly Team Meeting
- Topic meetings as required

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:43 [Some of the most valuable meet..] (7:713-7:899) (Super)
Codes: [Decision Making System] [information sharing mechanism]
Some of the most valuable meetings were held around the computer screen of the project architect, which allowed the team to review in real time and assist with team design decisions.

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Codes: [Information Sharing Mechanisms] [decision making]
At the time this study was conducted, the team had found the model to be most valuable for project visualization. It improved team communication and ability to make design decisions collaboratively.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:75 [In the weekly meeting, the tea..] (7:452-7:1327) (Super)
Codes: [Information Sharing Mechanisms]
In this project, similar to conventional projects, documentation of the meetings and distribution of minutes and action items was the responsibility of the architect. The weekly meetings were the most formal means of Collaborative Project Delivery (CPD) team interaction. Other interactions were informally documented and consisted of phone calls and email between all team members including design consultants.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:35 [Contract section 8.2.8 Account..] (6:1306-6:1573) (Super)
Codes: [Financial Transparency]
Contract section 8.2.8 Accounting Records required the contractor and trade contractors to maintain cost accounting for all work performed under unit cost, actual costs for labor and materials. The agreement assured the Management Group access to the records.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:45 [SpawGlass Contractors was iden..] (7:1632-7:2066) (Super)
Codes: [BIM] [Manage]
SpawGlass Contractors was identified as the BIM Information Manager, which made them responsible for regulating access to the model anding together individual models into a Federated Model. Each model provided to SpawGlass by consultants and trades wereed to the base model but each maintained it’s own identity and integrity. Each party was therefore responsible for their individual contributions’ to the Federated Model.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:46 [The CPD team used Revit. SpawG..] (7:2071-7:2339) (Super)
Codes: [BIM]
The CPD team used Revit. SpawGlass had been using Revit in exploratory ways in the 2 years preceding this project; this was the first project that they fully incorporated BIM. BGK Architects had used Revit on two projects before the SpawGlass Regional Office.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:33 [The owner/contractor and archi..] (6:310-6:457) (Super)
Codes: [Phase of involvement]
The owner/contractor and architect worked together from the beginning of the project, with ongoing constructability and cost estimating reviews.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:15 [The agreement required that ea..] (3:1901-3:2174) (Super)
Codes: [Commitment]
The agreement required that each party commit to mutual trust, good faith and fair judgment in their relationships with the other contracting parties. Expectations were that each party cooperates with each other to make decisions in the best interest of the project.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:28 [Austin is a small design and c..] (5:1031-5:1344) (Super)
Codes: [Previous cooperation experience] [culture fit]
Austin is a small design and construction community and all parties assumed collaborative process would be followed regardless of delivery method. As described by the contractor's PM, "In the end it became more of a relationship thing than anything else; a comfort level with someone we had worked with."

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:52 ["You never feel like there is ..] (2:1839-2:2210) (Super)
Codes: [Culture Fit] [Exhibits no obstacles]
"You never feel like there is an issue or an adversarial side of this process. Monetary rewards are fine, but at the end of the day, the biggest lesson learned is that we went through this process together. [We can] share the story and take away some ideas on how to communicate, work together and strengthen that [relationship]."Project Manager, SpawGlass

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:72 [There was no real need for an ..] (4:3568-5:244) (Super)
Codes: [Culture Fit]
There was no real need for an IPD team facilitator or champion of the process as all parties felt their collaborative relationships were already well established. As the contractor's PM stated, "I don't know that there is one directperson that is heading the IPD concept; it is all of us just working through it together."

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:58 [The agreement required that th..] (4:372-4:1233) (Super)

Codes: [Manage] [Monitor]
The agreement required that the owner first establish a Project Budget, based on the Design Budget and Construction Budget as estimated by BGK Architects and SpawGlass Contractors respectively. The team was then required to use “diligent efforts to design the Project so that it may be constructed without exceeding the Construction Budget.” Achieving this required ongoing Target Value Pricing and Cost Modeling by SpawGlass Contractors in collaboration with BGK Architects. Cost models were to be reviewed on an ongoing basis and when the models were not in conformance with the Project budgets, the Management Group was to determine the Collaborative Project Delivery (CPD) team’s course of action. The PTCE was to be established “at such a time as the Management Group determines that the project design is sufficiently complete.”

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:45 [SpawGlass Contractors was iden..] (7:1632-7:2066) (Super)
Codes: [BIM] [Manage]
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P 8: 04 SpawGlass Austin Regional Office.pdf - 8:58 [The agreement required that th..] (4:372-4:1233) (Super)
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Neutral

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:18 [Some project goals were tied t..] (3:3477-3:3618) (Super)
Codes: [Aligned Project Goals] [incentives]
Some project goals were tied to financial incentives, intending to align the interests of the contracting partners with the Owner’s goals.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:64 [At that meeting all team membe..] (5:1857-5:1929) (Super)
Codes: [Aligned Project Goals] [commitment]
At that meeting all team members committed to the goals of the project.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:44 [This project used ConsensusDOC..] (7:1457-7:1629) (Super)
Codes: [BIM]
This project used ConsensusDOCS 301, Building Information Modeling (BIM) Addendum, to allocate BIM responsibilities among the Collaborative Project Delivery (CPD) team.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:77 [The team was not using the mod..] (7:3681-7:4231) (Super)
Codes: [BIM]
The team was not using the model for schedule, quantity take-offs or cost estimating at the time of this study. The CPD team planned to use the model for clash detection.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:77 (2) [The team was not using the mod..] (7:3681-7:4231) (Super)
Codes: [BIM]
SpawGlass was also working to develop propriety building management software to assist in building operation. They intend for this project to be a test case they can use to demonstrate this software to future clients. The software will the BIM model to facility maintenance schedules, energy management, and equipment information to assist in facility management.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:56 [Several process tools and stra..] (3:2199-3:2438) (Super)
Codes: [Last Planner System] [Target Value Design]
Several process tools and strategies are referenced in the contract such as Lean Project Delivery Strategies (Last Planner System) and Target Value Design; however actual implementation of these tools has yet to occur on this project.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:56 [Several process tools and stra..] (3:2199-3:2438) (Super)
Codes: [Last Planner System] [Target Value Design]
Several process tools and strategies are referenced in the contract such as Lean Project Delivery Strategies (Last Planner System) and Target Value Design; however actual implementation of these tools has yet to occur on this project.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:67 [Early Involvement (early contr..] (6:191-6:307) (Super)
Codes: [Phase of involvement]
Early Involvement (early contribution of expertise)
CM/GC Feasibility/Programming
Trades Construction Documents

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:27 [The firm selection process was..] (5:737-5:1029) (Super)
Codes: [Commitment]

The firm selection process was not motivated by IPD. SpawGlass had not decided to use IPD when they issued the RFQ for the project. Although not motivated by IPD, the owner's selection of the architect was relationship-based, factoring their positive past working experience and trust.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:61 [In this case the person advoca..] (4:3422-4:3567) (Super)
Codes: [Commitment]
In this case the person advocating for IPD was the Regional President of SpawGlass Contractors, who was periodically involved in the process.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:64 [At that meeting all team membe..] (5:1857-5:1929) (Super)
Codes: [Aligned Project Goals] [commitment]
At that meeting all team members committed to the goals of the project.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:71 [Though the degree of interacti..] (6:2774-6:2936) (Super)
Codes: [Culture Fit]
Though the degree of interaction was intense, team members agreed that traditional roles remained unchanged compared to teams in conventional delivery methods.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:23 [Article 23, Dispute Resolution..] (4:2719-4:2871) (Super)
Codes: [Negotiate]
Article 23, Dispute Resolution of the contract defines the procedures for resolving disputes or claims that may arise in connection with the project.

Negative

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:26 [The Collaborative Project Deli..] (5:538-5:718) (Super)
Codes: [Commitment] [Training]
The Collaborative Project Delivery (CPD) team members did little to no preparatory research to familiarize themselves with the process, see Early Planning for more information.

P 8: 04 SpawGlass Austin Regional Office.pdf - 8:65 [In general, the Collaborative ..] (5:2493-5:2832) (Super)
Codes: [Training]
In general, the Collaborative Project Delivery (CPD) team did not do any preparatory research to plan for differences in the IPD process as compared to more familiar methods such as design-build or design-bid-build. As one team member stated, "we did not sit down and lay out a plan based on the contract. We all just jumped in."

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:9 [Cost Predictability was import..] (2:2578-2:2662) (Super)
Codes: [Motivator_Cost]
Cost Predictability was important but not a major driver in the decision to try IPD

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:10 [Schedule Predictability was no..] (2:2666-2:2745) (Super)
Codes: [Motivator_Schedule]
Schedule Predictability was not a critical driver for this team to pursue IPD.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:11 [Reduced Risk was not a primary..] (3:153-3:190) (Super)
Codes: [Motivator_Risk]
Reduced Risk was not a primary driver.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:12 [Design Complexity of the desig..] (3:357-3:485) (Super)
Codes: [Motivator_Technical]
Design Complexity of the design, a 15,000 sf single level office building, was not a driving motivator in the selection of IPD.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:14 [No unique characteristics, sta..] (4:3208-4:3282) (Super)
Codes: [Reward structure_insurance]
No unique characteristics, standard professional liability products used.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:21 [Although the contract outlined..] (4:1239-4:1657) (Super)
Codes: [Remove obstacles]
Although the contract outlined a Project Target Cost Estimate, the CPD actually followed more of a Guaranteed Maximum Prices (GMP) costing structure. An unforeseen site condition arose – too much fill on the site required mass amounts of excavation. The team didn’t know how to adjust the PTCE to account for this unforeseen condition and for the sake of expediency, reverted to a more familiar cost model.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:80 [this team has not implemented ..] (5:3439-5:3544) (Super)
Codes: [Lean Construction Tools]
this team has not implemented unique IPD tools in this project to facilitate collaborative behavior.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:68 [The MEP consultants and contra..] (6:712-6:919) (Super)
Codes: Phase of Involvement]
The MEP consultants and contractors were not brought on until construction documentation phase (CD), indicating that in this project their involvement was similar to projects using design-build delivery

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:20 [The contract specified that th..] (4:1778-4:2237) (Super)
Codes: [Early involvement effectiveness]

The contract specified that the contractor should get cost modeling input from the trade contractors in the “Preliminary Cost Model,” “Schematic Design Cost Model” and the “Design Development Cost Model,” however, the trades were not brought onto the CPD team until Construction Documents. This is an indication that the CPD did not take full advantage of early involvement of expertise when feedback could have provided the maximum cost savings.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:74 [The team was not co-located. T..] (6:3016-6:3293) (Super)
Codes: [Co-location]
The team was not co-located. The team used the weekly meeting (see Decisions Making) for face-to-face interaction. Shared BIM viewing was productive but limited by conventional arrangement of individual computer screens and lack of co-location (see Information Sharing).

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:26 [The Collaborative Project Deli..] (5:538-5:718) (Super)
Codes: [Commitment] [Training]
The Collaborative Project Delivery (CPD) team members did little to no preparatory research to familiarize themselves with the process, see Early Planning for more information.

"P 8: 04 SpawGlass Austin Regional Office.pdf - 8:76 [They intend to use the model i..] (7:3120-7:3472) (Super)
Codes: [Problem Addressed]
They intend to use the model in construction for layout and the subs will use the model for production and fabrication. However, according to the contract, the individual model authors are not held to a certain level or accuracy and states that the “model can be used for reference only and all dimensions must be retrieved from the drawings.”

Not Given
There is no quotation under this category.

Project 5
General Information
"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:1 [Edith Green Wendell Wyatt Fede..] (1:216-1:279) (Super)
Codes: [Project Name]
Edith Green Wendell Wyatt Federal Building Modernization

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:3 [Office - Renovation] (2:283-2:301) (Super)
Codes: [Project Type]
Office - Renovation

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:2 [Portland, Oregon] (2:258-2:273) (Super)
Codes: [Location]
Portland, Oregon

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:4 [Multiple independent contracts..] (2:315-2:378) (Super)
Codes: [Contract]
Multiple independent contracts – Custom (modified P-100)
P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:28 [This project did not use a mul..] (4:2277-4:2339) (Super)
Codes: [Contract]
This project did not use a multi-party agreement, see Contract.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:5 [December 2009] (2:506-2:518) (Super)
Codes: [Project Start Time]
December 2009

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:6 [May 2013] (2:538-2:545) (Super)
Codes: [Est. Completion Time]
May 2013

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:135 [GSA recognized they would not ..] (2:1458-2:1701) (Super)
Codes: [Initiation Party]
GSA recognized they would not be able follow their traditional P100 contract process. SERA estimated it would take 27 months to use the P100, but a modified version using integrated delivery processes could achieve the required time frame

Positive

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:117 [Because of the time committed ..] (13:929-13:1148) (Super)
Codes: [Training]
Because of the time committed to team education and relationship building, GSA's leadership methods rubbed off on the entire executive team and create a distributed network of champions throughout the project team.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:27 [Participants overwhelmingly in..] (4:1720-4:2194) (Super)
Codes: [Previous cooperation experience]
Participants overwhelmingly indicated (100%) that their organizations had previous working experience together. This also carried over to individuals, with 63.9% that had previously worked with other team members, although over a third (36.1%) did not have previous experience. This past experience may have been a factor in the organizations' willingness to embark on an integrated, collaborative delivery model, still a very new model with several unknowns.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:8 [Market Position was a primary ..] (2:2620-3:381) (Super)
Codes: [Motivator_Market]
Market Position was a primary driver for GSA to implement IPD on this project. GSA Region 10 is using this project to measure the advantages of the process in order to transition their organization to using IPD exclusively. Their goal is to themselves as long-term leaders of innovation within the industry, helping to ensure that as the owner, they will have their pick of the best teams in the market.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:11 [Cost Predictability was an imp..] (3:1097-3:1176) (Super)
Codes: [Motivator_Cost]
Cost Predictability was an important motivator in general for GSA to use IPD.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:15 [Schedule Predictability was th..] (3:1908-3:1989) (Super)
Codes: [Motivator_Schedule]
Schedule Predictability was the primary motivator to pursue IPD in this project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:16 [Guaranteed Maximum Price (GMP)..] (3:2029-3:2264) (Super)
Codes: [Motivator_Schedule] [Strong motivators]
Guaranteed Maximum Price (GMP) within an 8-month period. Achieving this required early input of expertise, including the CM and trade contractors; this deadline would not have been possible with a tradition GSA delivery approach.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:17 [The architect felt that with t..] (3:2417-3:2612) (Super)
Codes: [Motivator_Schedule] [Strong motivators]

The architect felt that with the accelerated schedule, integrated practices were required to achieve the schedule; the speed of work would not have been possible following business as usual.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:19 [Schedule predictability remain..] (3:2763-3:2937) (Super)
Codes: [Motivator_Schedule]
Schedule predictability remained important for the owner, meeting the schedule meant they fulfilled funding requirements, and could accurately coordinate tenant moves.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:50 [One of the primary drivers for..] (6:1177-6:1311) (Super)
Codes: [Motivator_Schedule]
One of the primary drivers for using IPD was schedule in order to meet the March 2010 GMP deadline to secure funds for the project.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:20 [Risk Management was a primary ..] (3:2940-3:3297) (Super)
Codes: [Motivator_Risk]
Risk Management was a primary motivator in general for GSA to pursue IPD. As a large government system with multiple facilities and building projects, implementing delivery processes that can be applied across multiple projects to reduce their risk exposure in terms of cost, schedule, and subcontractor claims is well worth the investment in IPD.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:21 [All team members agreed there ..] (3:3320-3:3448) (Super)
Codes: [Motivator_Risk]
All team members agreed there are major benefits to managing risk on IPD due to the flexibility and transparency of the team.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:16 [Guaranteed Maximum Price (GMP)..] (3:2029-3:2264) (Super)
Codes: [Motivator_Schedule] [Strong motivators]
Guaranteed Maximum Price (GMP) within an 8-month period. Achieving this required early input of expertise, including the CM and trade contractors; this deadline would not have been possible with a tradition GSA delivery approach.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:17 [The architect felt that with t..] (3:2417-3:2612) (Super)
Codes: [Motivator_Schedule] [Strong motivators]
The architect felt that with the accelerated schedule, integrated practices were required to achieve the schedule; the speed of work would not have been possible following business as usual.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:36 [The CMc’s contract does howeve..] (5:1718-5:1952) (Super)
Codes: [Reward Structure- Incentive]

The CMc's contract does however include financial incentives that would entitle them to a percent of the difference between the Cost of Performance (final sum of cost of the work and fee) and the Guaranteed Maximum Price (GMP).

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:59 [On follow-up with the team, th..] (7:264-7:637) (Super)
Codes: [Reward Structure- Incentive]
Initially, the incentive structure for the CMc included a 1%fee incentive that would be tied to both a base team performancecriteria as well as a percentage of their value added. Teamperformance would be evaluated based on the existing federalreporting criteria. Value added is based on the amount of valueengineering the CMc identifies throughout the process up toa certain cap amount; typically this would be 25% of all valuecreated up to a cap of one million dollars.On follow-up with the team, they reported that the 1% incentive fee was rolled into the CMc's base fee and was not based on the team performance or value added contributions. This was done in recognition of the fact that the CMc absorbed a $1.2 million liability for unforeseen site conditions and other latent defects without any additional funding from the owner

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:33 [GSA issued separate A/E and CM..] (5:844-5:1044) (Super)
Codes: [Remove obstacles]
GSA issued separate A/E and CMc contracts that were adapted from the standard P100 agreement to include some reference to the integrated or collaborative process under the Scope of Work sections.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:76 [There were alignment issues wi..] (8:4752-8:5127) (Super)
Codes: [Culture Fit] [Remove Obstacles]
There were alignment issues with a primary design consultant; they did not understand the owner expectations. The team leadership had to make a decision to keep investing in a weak link or to let them go. The team decided to keep the consultant for the core and shell portion, but shifted the tenant build out scope to the contractor using a design-build contract.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:79 [When team members did not fit ..] (9:856-9:1405) (Super)
Codes: [Culture Fit] [Remove Obstacles][Commitment]
When team members did not fit in with the culture, project leadership made the decision to replace them. GSA characterizes integrated delivery as a dynamic process that is not about solving one problem but rather a series of problems. "When issues arise, the problem may be with scope of the project or could lie within the team composition itself." The leadership was very deliberate in assessing team members and at the time this study was conducted had replaced the electrical designer, mechanical designer and landscape designer.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:86 [One of the challenges for any ..] (10:571-10:1772) (Super)
Codes: [Remove Obstacles]

One of the challenges for any IPD project is budgeting for additional involvement and effort up-front. The IPD process is far more dynamic than GSA's typical projects. The conventional P100 contract lists tasks that the architect estimates hours and price for. GSA then has an impartial reviewer estimate following the same process. The two estimates are compared and price negotiated. IPD tasks and activities did not fit the P100 list and it was unclear how to budget. GSA adjusted their budgeting process by converting the basis of the planning phases to time and materials (T&M) instead of their typical fixed price. This increased the risk to the owner, but since the technical requirements of the program were not completely understood, this was a more equitable way to budget. GSA increased meeting frequency to mitigate the team's performance risk. T&M reduced the team member risk since all their time was compensated. This reduced risk and the detailed Master Scheduling process allowed the team to develop very accurate proposals for the fixed price agreements in the Design Development and Implementation phases, ultimately reducing risk to the owner

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:119 [Constant reminders were requir..] (13:1153-13:1379) (Super)
Codes: [Manage] [Remove obstacles]
Constant reminders were required to eliminate biases formed by past experiences in the design and construction industry. To establish new team norms, the owner create a controlled tension that kept team members off guard.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:137 [To comply with the P100 requir..] (5:4180-5:4408) (Super)
Codes: [Remove Obstacles]
To comply with the P100 requirements, the integrated team developed a "P-100 2009 to CMc+ 6 Deliverable Crosswalk" that line-by-line translated the P100 deliverable requirements to CMc+6 Integrated Delivery Equivalent.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:138 [As noted in the contract secti..] (9:3469-9:3764) (Super)
Codes: [Remove Obstacles]
As noted in the contract section, additional effort was required up front to adapt the P100 process to align with this integrated/collaborative process. This required the team to review line-by-line the contract and identify conflicts in the contract and changes that needed to be made.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:12 [This gives the owner confidenc..] (3:1753-3:1904) (Super)
Codes: [Decision Making System]
Open books also allows the owneraccess to internal contractor conversations related to the project. This gives the owner confidence in the numbers that are reported to him, and allows him to weigh in on cost decisions that affect the project daily.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:89 [The MS was created through a s..] (10:3702-10:3879) (Super)
Codes: [Decision Making System]

The MS was created through a structured decision-making process that documented, sequenced and prioritized all the work and team protocols required to execute the project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:112 [An example is the successful r..] (12:4465-12:4937) (Super)
Codes: [Decision Making System] [Problem addressed]
An example is the successful resolution of an error in the fire system identified by the electrical contractors. Because the issue was brought to the owner immediately, a decision was made in 3 days as opposed to months of debate. Changes only had to be made to the first floor and incorporated in progress work, whereas in a more traditional delivery method, the issue would not have been identified until late and would have required rework to all floors.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:136 [Part of the mMS process that h..] (11:533-11:1105) (Super)
Codes: [Decision Making System]
Part of the mMS process that helped foster a sense of ownership across the entire project team was the assignment an individual team member to certain task items. These individuals were identified as a Subject Matter Expert (SME) and were responsible for resolving their items through whatever means necessary. This created a system for decision-making and responsibility that led to distributed leadership. Creating multiple scales of project ownership ensured that healthy debate could lead to decisions made in the best interest of the overall project.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:49 [GSA took a leadership role in ..] (6:848-6:955) (Super)
Codes: [Aligned Project Goals]
GSA took a leadership role in clearly articulating project goals and aligning team members with the goals.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:105 [Once the team was in place, GS..] (12:942-12:1079) (Super)
Codes: [Aligned Project Goals]
Once the team was in place, GSA’s priority was to align the team’s goals, build relationships and the team’s supporting infrastructure

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:68 [The executive team has several..] (7:3769-8:589) (Super)
Codes: [Manage] [Information sharing mechanisms]
The executive team has several lengthy meetings every week; project managers broke out from those sessions and distributed the message to the integrated team members. The implementation process on this project relied on the Master Schedule (MS) and mini Master Schedule (mMS) (see Implementation) to identify and communicate the priority tasks. The MS process was based on an open source philosophy; everyone on the team had the ability to contribute to the mMS subtask list and take ownership of an item, effectively distributing leadership among the integrated team. These distributed leaders were referred to as Subject Matter Experts (SMEs) and ensured the person most qualified to bring an item to resolution was empowered to do so.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:92 [From the Master Schedule a ser..] (10:4841-10:4979) (Super)
Codes: [Information Sharing Mechanisms]
From the Master Schedule a series of mini Master Schedules (mMS) were developed that detailed out how each task would be accomplished.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:93 [The MS and mMS were so effecti..] (11:409-11:527) (Super)
Codes: [Information Sharing Mechanisms]
The MS and mMS were so effective in recording tasks and responsibilities traditional meeting minutes were not needed.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:98 [Instead of traditional drawing..] (11:1301-11:2637) (Super)
Codes: [Information Sharing Mechanisms]
Instead of traditional drawing packages (50% SD, 100% SD, 50% DD, etc.), drawing packages on this project were called Snap Shots. Snap Shots were taken at specific moments during design when the team literally printed drawing sets from the BIM. One of the most unique aspects of this project was the alignment of the Snap Shots with the CMc's buyout strategy, made possible by the back and forth coordination between the CMc and architect. According to the owner, it was important that the entire team acknowledge the purpose of the technical documents was to validate owner intent and provide the information necessary for the CMc to solicit subcontracts; the documents did not need to be complete. This philosophy allowed the prioritization within the design, delaying non-critical portions of design to later phases; this helped keep the aggressive schedule on track. It also helped focus the entire team on 1 or 2 priorities at a time. Subcontractors embracing this process were awarded design-build contracts so that trades who would build it, designed it. Essentially, this allowed the architect to complete the design through an "active listening process" engaging with the trades; efficient compared to designing without input and later reworking the design after the trades were on board.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:99 [Another tool implemented was a..] (11:2642-11:2902) (Super)
Codes: [Information Sharing Mechanisms]
Another tool implemented was a project diary which helped record information and manage communication. The diary was distributed weekly to the entire team, including all contract parties and all job levels, and highlighted major decisions and progress.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:127 [Tool s • BIM • Face to face ex..] (14:3187-14:3726) (Super)
Codes: [Information Sharing Mechanisms]
Tool s
- BIM
- Face to face exchange – co-location
- Networked document management site
- SmartSheets (cloud based document sharing)
- Living Calendar

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:127 (2) [Tool s • BIM • Face to face ex..] (14:3187-14:3726) (Super)
Codes: [Information Sharing Mechanisms]
Meeting Frequency
- Weekly Coordination Meeting
- Monthly Clash Detection and Energy Model Verification Meetings
- Monthly Project Executive Meeting
- Monthly BIM Review Meetings through Criteria Design
- Daily BIM Meetings from Detail Design into Construction
- Daily Information Coordination Meetings
- Specialty Meetings as needed

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:13 [Open books also allows the own..] (3:1648-3:1749) (Super)
Codes: [Financial Transparency]
Open books also allows the owner access to internal contractor conversations related to the project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:108 [The CMc's contract specified "..] (12:2522-12:2678) (Super)
Codes: [Financial Transparency]
The CMc's contract specified "open book" access to any and all records maintained by the contractor relating to the project, including all subcontracts.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:109 [GSA also followed a "reverse o..] (12:2774-12:3085) (Super)
Codes: [Financial Transparency]
GSA also followed a "reverse open books" strategy. GSA showed their budget and planned allocation to the team. The openness of this communication set an example for the transparency the owner expected from each team member and set a realistic view of where GSA expected the resources to be distributed.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:26 [According to interviews this p..] (4:593-4:739) (Super)
Codes: [BIM]
According to interviews this project implemented BIM to a high degree and used the project to create lessons learned for future implementation,

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:102 [BIM, coupled with co-location,..] (11:3332-11:3473) (Super)
Codes: [BIM] [Co-location]
BIM, coupled with co-location, facilitated design and real time coordination that allowed issues to be resolved within a matter of minutes

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:130 [The model was very effective a..] (15:1487-15:1926) (Super)
Codes: [BIM]
The model was very effective at facilitating coordination between the many disciplines and confirmation from those who will build it. For example, there was a complex change request from the owner to change the ceiling height from 9’ to 9’-6”. The team was able to effectively communicate with all the affected team members and made the change almost instantly. There were major benefits to the owner just given the flexibility;

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:133 [First was learning how to arti..] (15:2486-15:2579) (Super)
Codes: [BIM] [Problem Addressed]
First was learning how to articulate design/model requirements for the different disciplines. The team found that they were being too literal with the requirements for each discipline and phase. They found they couldn’t predict (or expect) that mechanical or electrical follow the same design path as structural or plumbing, and in some cases this was forcing the architecture before the contractor needed it for buyout. To address this and track each design path, the team used what they called Snap Shots, literally taking pictures of design development status, using Revit to print the 2D document set of exactly what they had at certain points in time Implementation. Each Snap Shot was a deliverable package, which looked similar to traditional submissions, that got more specific by discipline or building system as the project evolved to match what HSW needed for procurement and buyout. This process would not have been possible without the intense coordination made possible by co-location and early contributions by the trade contractors.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:71 (2) [In this case, GSA committed to..] (8:1274-8:1987) (Super)
Codes: [Commitment] [Confidence in project management]
Because of the commitment by the owner to support the project through its duration, the CMc was more willing to partner with the architect and engineers to both prioritize work and let some work shift later in the process because they were confident the integrated team would be there “together feeling the day to day pains and rewards,” for the duration of the project

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:44 [First tier subcontractors bein..] (6:532-6:622) (Super)
Codes: [Phase of involvement]
First tier subcontractors being on the team before contract documents are developed

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:104 [The CMc, Howard S Wright (HSW)..] (12:320-12:937) (Super)
Codes: [Early involvement effectiveness][Phase of involvement]
The CMc, Howard S Wright (HSW), was involved in early meetings and followed the progress of the project prior to being contracted. Toward the end of criteria design, HSW, along with five trades, were brought onto the team, which allowed them to participate in detail design and later phases. GSA appreciated the value of involving the contractor early; eliminating the buy out effect of bidding gave GSA better control over performance, cost and schedule risks. They

estimated that by bringing on the subcontractors early, over 60% of the owners cost exposure was known before construction started.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:103 [According to GSA's officer, "o..] (11:4203-11:4594) (Super)
Codes: [Early involvement effectiveness]
According to GSA's officer, "one of the real values of integrated delivery is the ability to get each team member oriented and saturated before we start building. The more we can front load the schedule and the more we can allow team members to influence the project when we are still on paper, the greater impact we get as owners in terms of change control -- cost, budget etc.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:104 [The CMc, Howard S Wright (HSW)..] (12:320-12:937) (Super)
Codes: [Early involvement effectiveness][Phase of involvement]
The CMc, Howard S Wright (HSW), was involved in early meetings and followed the progress of the project prior to being contracted. Toward the end of criteria design, HSW, along with five trades, were brought onto the team, which allowed them to participate in detail design and later phases. GSA appreciated the value of involving the contractor early; eliminating the buy out effect of bidding gave GSA better control over performance, cost and schedule risks. They estimated that by bringing on the subcontractors early, over 60% of the owners cost exposure was known before construction started.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:107 [There were several innovations..] (12:1429-12:2503) (Super)
Codes: [Manage] [Early involvement effectiveness]
There were several innovations attributed to early involvement and the integrated make-up of the team. One example was the idea to design a model unit for the 16 inbound tenant design work. Because of the strong partnerships, the owner was open to this idea, which significantly improved the team's ability to meet the building's energy performance goals. The model unit established a base design concept that optimized the building's energy profile and incorporated cost and constructability input from the CMc. Armed with this information, the architects could explain to the tenants the science behind the design and the cost implications of design changes to the base design. In the end, all the models were modified to meet each tenants' specific program requirements, but in general they followed the basic layout concept because the tenants had a clear understanding of the overall building goals, reasons behind the design, and implications of change. It also eliminated the time consuming and costly cycle of designing and redesigning

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:111 [Owner involvement and early in..] (12:4231-12:4464) (Super)
Codes: [Early involvement effectiveness][Co-location]
Owner involvement and early involvement of expertise coupled with co-location (see Workplace) and clear expectations (see Leadership) were key to quick decision-making and, according to the owner, exponentially reduced latency.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:125 [As the architects worked on th..] (14:1715-14:2047) (Super)
Codes: [Early involvement effectiveness] [Co-location]
As the architects worked on the design, co-location gave the contractor “early line of sight” to what they were working on. Early communication, estimating and budget verification of the architects’ “fat line drawings” kept the team on track, saved man hours in rework and ensured the design was appropriate to the budget.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:80 [co-location enabled them to le..] (9:2295-9:2694) (Super)
Codes: [Co-location]
co-location enabled them to learn from everyone around them and the integration required that younger staff really engage with other disciplines and forced them to ask more questions. As a result they gained experience more quickly than they would on a traditional project, they are in higher demand for other projects within their firms than one might expect for their experience level.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:101 [Co-location of the team provid..] (11:3223-11:3331) (Super)
Codes: [Co-location]
Co-location of the team provided significant coordination benefit, enabling informal daily interactions.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:102 [BIM, coupled with co-location,..] (11:3332-11:3473) (Super)
Codes: [BIM] [Co-location]
BIM, coupled with co-location, facilitated design and real time coordination that allowed issues to be resolved within a matter of minutes

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:111 [Owner involvement and early in..] (12:4231-12:4464) (Super)
Codes: [Early involvement effectiveness][Co-location]
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P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:121 [During design, the integrated ..] (13:2159-13:2299) (Super)
Codes: [Co-location]
During design, the integrated team was co-located on the project site, in existing offices of the federal building they were modernizing.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:122 [Results from the first survey ..] (13:2617-13:3531) (Super)
Codes: [Co-location] [Culture Fit]

Results from the first survey showed very positive evaluations of co-location in terms of professional development, team spirit, and the use of BIM. The majority of the team felt innovation and improvement was equivalent to non co-located experiences, though only 2% felt it was worse while 17% felt co-location improved innovation. Productivity had the least consensus, with 14% of team members ranking productivity in the co-located office worse than non co-located experiences, 28% felt productivity was the same, and 18% felt it was better. Consistently scoring low was the physical work environment itself. The survey process also revealed that certain individuals consistently evaluated their experience as worse. GSA speculated that age and those coming from private office cultures might have been factors indicating that some personnel do not thrive in a co-located environment.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:123 [In general, the integrated tea..] (13:3536-13:3699) (Super)
Codes: [Co-location]
In general, the integrated team benefited from co-location, however the team identified some nuances that need to be considered regarding the co-located space.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:124 [The team felt that co-location..] (14:1630-14:1713) (Super)
Codes: [Co-location] [Change orders]
The team felt that co-location was a significant factor in avoiding change orders.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:125 [As the architects worked on th..] (14:1715-14:2047) (Super)
Codes: [Early involvement effectiveness] [Co-location]
As the architects worked on the design, co-location gave the contractor “early line of sight” to what they were working on. Early communication, estimating and budget verification of the architects’ “fat line drawings” kept the team on track, saved man hours in rework and ensured the design was appropriate to the budget.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:126 [Co-location also played a sign..] (14:2050-14:3163) (Super)
Codes: [Co-location] [Culture fit] [Adequate Progress]
Co-location also played a significant role in reducing latency on the project and helped eliminate rework, see Decision Making. The owner commented, “by the end of the job, there are thousands of decisions that need to be made, they need to be made every week to continue progress.” The owner described an experience on another job where the architect did not co-locate, “one day a superintendent threw down his notebook in a meeting and said, ‘I’m not in the position to schedule my problems’ and walked out of the room.” The owner felt this illustrated the value of co-location well, because you can never predict all the issues that will arise and not having the experts you need in the room can be frustrating and slow down the ability of others to perform. Co-location provides context and nuance to the project and relationships. It helps each party understand how their actions affect the other members of the team; it allows them to read between the lines. The team felt the dependency and trust established by co-location yields significant payback in latency reduction.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:71 (2) [In this case, GSA committed to..] (8:1274-8:1987) (Super)
Codes: [Commitment] [Confidence in project management]
Because of the commitment by the owner to support the project through it's duration, the CMc was more willing to partner with the architect and engineers to both prioritize work and let some work shift later in the process because they were confident the integrated team would be there "together feeling the day to day pains and rewards," for the duration of the project

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:74 [SERA with Cutler Anderson Arch..] (8:2795-8:2995) (Super)
Codes: [Commitment]
SERA with Cutler Anderson Architects was selected because they had already done the initial design for GSA, had performed well and were committed to GSA's Integrated/Collaborative Delivery goals.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:79 [When team members did not fit ..] (9:856-9:1405) (Super)
Codes: [Culture Fit] [Remove Obstacles][Commitment]
When team members did not fit in with the culture, project leadership made the decision to replace them. GSA characterizes integrated delivery as a dynamic process that is not about solving one problem but rather a series of problems. "When issues arise, the problem may be with scope of the project or could lie within the team composition itself." The leadership was very deliberate in assessing team members and at the time this study was conducted had replaced the electrical designer, mechanical designer and landscape designer.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:88 [To best support integrated del..] (10:2233-10:2426) (Super)
Codes: [Commitment]
To best support integrated delivery and new technologies (like BIM), investment in full time staffing for the duration of the project was identified as a key shift required in the industry.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:18 [For the contractor, IPD change..] (3:2614-3:2761) (Super)
Codes: [Culture Fit]
For the contractor, IPD changed the workplace culture; instead of pushing people out of the way to meet schedule, everyone moved along together.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:79 [When team members did not fit ..] (9:856-9:1405) (Super)
Codes: [Culture Fit] [Remove Obstacles][Commitment]
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P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:81 [GSA Region 10 (R10) has been m..] (9:2899-9:3179) (Super)
Codes: [Culture Fit] [manage]
GSA Region 10 (R10) has been maturing collaborative processes for the past 10 years with much of the philosophy and strategies rooted in process-based management, which focuses on designing outcomes, making tradeoffs to optimize time, and uses statistical quality control.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:110 [GSA followed the philosophy of..] (12:3434-12:4226) (Super)
Codes: [Manage][Culture fit]
GSA followed the philosophy of "intentional maturation" of the team. Team members who came on board with different expectations based on the way they've done it previously had to adapt and adjust to others; it required team calibration. It was particularly difficult for those team members who have been in the project management role, or sole decision maker, because the integrated team was all about distributed decision making and exploited multiple areas of expertise. Distribution of leadership was facilitated by the Master Schedule process; team members best suited for a particular task item or issue were assigned as Subject Matter Experts (SMEs) and were responsible for bringing the item to resolution and closure, see more in Leadership and Implementation.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:115 [the team believed that the IPD..] (13:242-13:504) (Super)
Codes: [Culture Fit]
the team believed that the IPD process reinvented how they thought of the work and redefined their relationships to create a team synergy. They concluded the goal and value of IPD is innovation, which invigorated their team and kept the energy level high.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:116 [The team commented that the be..] (13:510-13:927) (Super)
Codes: [Manage] [Culture Fit] [Commitment]
The team commented that the best value comes out of IPD when team members free themselves from their traditional roles and responsibilities. To do this, the team requires at least one member to bring energy and passion, breaking others out of old routines and preventing them from slipping back in to traditional roles. In this project, the owner filled that role, acting as a champion for the IPD process.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:120 [GSA representatives understood..] (13:1382-13:1865) (Super)
Codes: [Culture Fit]
GSA representatives understood that this way of working required significantly more senior and highly qualified people than would typically be used on a traditional project. These staffing decisions did not lead to a scripted top-down project but created an atmosphere where the team scripted the project throughout the whole process. To facilitate the scripting process, expertise needed to be gained incrementally, allowing the members to evolve alongside the process

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:126 [Co-location also played a sign..] (14:2050-14:3163) (Super)
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"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:22 [Compared to traditional delive..] (3:3450-3:3620) (Super)
Codes: [monitor]
Compared to traditional delivery, the owner was more informed and aware of claims and change order risk at all levels, from the prime contractor to the sub-contractor.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:56 [Standard GSA contracts require..] (6:3340-6:3568) (Super)
Codes: [Monitor]
Standard GSA contracts require quarterly performance evaluation reports that assess approximately fifty elements of effort. Coupling the performance evaluation with contract administration allows GSA to monetize performance

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:82 [For this project, GSA R10 also..] (9:3184-9:3466) (Super)
Codes: [Manage] [Monitor]
For this project, GSA R10 also incorporated IPD practices based on lessons from AIA and Sutter as well as inviting informal peer review. DLR and Mortenson were asked to review the team's practices and project execution, which infused the project team with new process ideas.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:55 [Because GSA Region 10 would li..] (6:2775-6:3073) (Super)
Codes: [Monitor]
Because GSA Region 10 would like to move away from the P100 conventional methodology to an integrated delivery process, specific measures were developed to track throughout the process including: schedule, cost, constructability, document accuracy and reduction of design overwork and rework"

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:14 [This allows the owner to ident..] (3:1510-3:1647) (Super)

Codes: [Manage]
This allows the owner to identify where they are under-optimizing expensive resources, so adjustments can be made to meet cost goals.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:25 [The contractor felt integratio..] (3:4210-3:4748) (Super)
Codes: [Manage] [Problem Addressed]
The contractor felt integration made the most significant difference on time sensitive issues. A major issue arose due to ice concerns on the "reeds," an important design feature on the west façade of the building. The team had to redesign the west façade in 7 weeks, and they accomplished it because all team members were equally vested in the project and had to work together, the owner supported them. The team felt strongly that the outcome would have been much different (less successful) on a non-integrated project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:40 [The primary collaborative stra..] (5:3080-5:3317) (Super)
Codes: [Manage]
The primary collaborative strategies referred to included early involvement of constructor (sub-consultants and sub-contractors) and collaboration with constructor to review cost, schedule, constructability and material selection.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:42 [The CMc Contract, issued 7 mon..] (5:3461-5:3948) (Super)
Codes: [Manage]
The CMc Contract, issued 7 months after the A/E contract, has more specific language describing tasks and commitments required, such as: attending bi-weekly design review meetings, ongoing constructability reviews, input on resolving issues identified through constructability reviews, advanced determination of procurement packages, ongoing value engineering, assistance with LEED certification, and development of shared project team management processes and protocols.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:46 [Key first tier subcontractors ..] (6:628-6:714) (Super)
Codes: [Manage]
Key first tier subcontractors were selected as part of the CMc solicitation process

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:48 [Integrated document developmen..] (6:720-6:784) (Super)
Codes: [Manage]
Integrated document development
Shared collocation facilities

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:68 [The executive team has several..] (7:3769-8:589) (Super)
Codes: [Manage] [Information sharing mechanisms]

The executive team has several lengthy meetings every week; project managers broke out from those sessions and distributed the message to the integrated team members. The implementation process on this project relied on the Master Schedule (MS) and mini Master Schedule (mMS) (see Implementation) to identify and communicate the priority tasks. The MS process was based on an open source philosophy; everyone on the team had the ability to contribute to the mMS subtask list and take ownership of an item, effectively distributing leadership among the integrated team. These distributed leaders were referred to as Subject Matter Experts (SMEs) and ensured the person most qualified to bring an item to resolution was empowered to do so.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:69 [Integrated representatives fro..] (8:905-8:1122) (Super)
Codes: [Manage]
Integrated representatives from all the primary contract parties as well as relevant trades attended each meeting and a point person was assigned to each topic so that first lines of communication were clear.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:77 [Because of the integrated team..] (8:5129-9:338) (Super)
Codes: [Manage]
Because of the integrated team, the relationships and technical support were in place to make this major change without delaying or otherwise negatively impacting the project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:81 [GSA Region 10 (R10) has been m..] (9:2899-9:3179) (Super)
Codes: [Culture Fit] [manage]
GSA Region 10 (R10) has been maturing collaborative processes for the past 10 years with much of the philosophy and strategies rooted in process-based management, which focuses on designing outcomes, making tradeoffs to optimize time, and uses statistical quality control.

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Codes: [Manage] [Monitor]
For this project, GSA R10 also incorporated IPD practices based on lessons from AIA and Sutter as well as inviting informal peer review. DLR and Mortenson were asked to review the team's practices and project execution, which infused the project team with new process ideas.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:87 [GSA increased meeting frequenc..] (10:1383-10:1773) (Super)
Codes: [Manage] [Remove Obstacles]
GSA increased meeting frequency to mitigate the team's performance risk. T&M reduced the team member risk since all their time was compensated. This reduced risk and the detailed Master Scheduling process allowed the team to develop very accurate proposals for the fixed price agreements in the Design Development and Implementation phases, ultimately reducing risk to the owner.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:90 [Developing the MS also functio..] (10:3880-10:4332) (Super)
Codes: [Manage] [Trust]
Developing the MS also functioned as a team-building tool. Working through MS items, the team learned to cooperate with each other and gain a clear understanding of the team dynamic the owner required. This additional planning period provided the team the opportunity to work closely with the owner and each other, developing enough confidence and trust in the relationship to speak candidly about what was really important to the project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:91 [Through bi-weekly review at th..] (10:4701-10:4838) (Super)
Codes: [manage]
Through bi-weekly review at the executive level, this tool helped the owner identify items in which they were willing to "disinvest."

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:95 [Part of the mMS process that h..] (11:533-11:699) (Super)
Codes: [Commitment] [manage]
Part of the mMS process that helped foster a sense of ownership across the entire project team was the assignment an individual team member to certain task items.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:100 [. The architect managed the di..] (11:2901-11:3129) (Super)
Codes: [Manage]
The architect managed the diary, but the CMc and owner also contributed content each week. Development of this tool was partly in response to rumor control, see Workplace; the purpose was to keep everyone on the same page

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:106 [GSA facilitated the orientatio..] (12:1154-12:1415) (Super)
Codes: [Manage]
GSA facilitated the orientation and relationship building of the entire team by using several strategies, many of which are rooted in process-based management such as: designing outcomes, eliminating waste and making the system as efficient as possible.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:107 [There were several innovations..] (12:1429-12:2503) (Super)
Codes: [Manage] [Early involvement effectiveness]
There were several innovations attributed to early involvement and the integrated make-up of the team. One example was the idea to design a model unit for the 16 inbound tenant design work. Because of the strong partnerships, the owner was open to this idea, which significantly improved the team's ability to meet the building's energy performance goals. The model unit established a base design concept that optimized the building's energy profile and incorporated cost and constructability input from the CMc. Armed with this information, the architects could explain to the tenants the science behind the design and the cost implications of design changes to the base design. In the end, all the models were modified to meet each tenants' specific

program requirements, but in general they followed the basic layout concept because the tenants had a clear understanding of the overall building goals, reasons behind the design, and implications of change. It also eliminated the time consuming and costly cycle of designing and redesigning

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GSA followed the philosophy of "intentional maturation" of the team. Team members who came on board with different expectations based on the way they've done it previously had to adapt and adjust to others; it required team calibration. It was particularly difficult for those team members who have been in the project management role, or sole decision maker, because the integrated team was all about distributed decision making and exploited multiple areas of expertise. Distribution of leadership was facilitated by the Master Schedule process; team members best suited for a particular task item or issue were assigned as Subject Matter Experts (SMEs) and were responsible for bringing the item to resolution and closure, see more in Leadership and Implementation.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:113 [Important to note, utilizing t..] (12:4939-12:5104) (Super)
Codes: [Manage]
Important to note, utilizing the integrated team for quick and effective decision-making is dependent on the ability of every team member to influence the outcome
P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:114 [This behavior and willingness ..] (12:5107-12:5268) (Super)
Codes: [Manage] [Commitment]
This behavior and willingness to engage was strongly influenced by clear communication by the owner; everyone was expected to take ownership of the project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:116 [The team commented that the be..] (13:510-13:927) (Super)
Codes: [Manage] [Culture Fit] [Commitment]
The team commented that the best value comes out of IPD when team members free themselves from their traditional roles and responsibilities. To do this, the team requires at least one member to bring energy and passion, breaking others out of old routines and preventing them from slipping back in to traditional roles. In this project, the owner filled that role, acting as a champion for the IPD process.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:119 [Constant reminders were requir..] (13:1153-13:1379) (Super)
Codes: [Manage] [Remove obstacles]
Constant reminders were required to eliminate biases formed by past experiences in the design and construction industry. To establish new team norms, the owner create a controlled tension that kept team members off guard.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:25 [The contractor felt integratio..] (3:4210-3:4748) (Super)
Codes: [Manage] [Problem Addressed]
The contractor felt integration made the most significant difference on time sensitive issues. A major issue arose due to ice concerns on the "reeds," an important design feature on the west façade of the building. The team had to redesign the west façade in 7 weeks, and they accomplished it because all team members were equally vested in the project and had to work together, the owner supported them. The team felt strongly that the outcome would have been much different (less successful) on a non-integrated project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:112 [An example is the successful r..] (12:4465-12:4937) (Super)
Codes: [Decision Making System] [Problem addressed]
An example is the successful resolution of an error in the fire system identified by the electrical contractors. Because the issue was brought to the owner immediately, a decision was made in 3 days as opposed to months of debate. Changes only had to be made to the first floor and incorporated in progress work, whereas in a more traditional delivery method, the issue would not have been identified until late and would have required rework to all floors.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:133 [First was learning how to arti..] (15:2486-15:2579) (Super)
Codes: [BIM] [Problem Addressed]
First was learning how to articulate design/model requirements for the different disciplines. The team found that they were being too literal with the requirements for each discipline and phase. They found they couldn't predict (or expect) that mechanical or electrical follow the same design path as structural or plumbing, and in some cases this was forcing the architecture before the contractor needed it for buyout. To address this and track each design path, the team used what they called Snap Shots, literally taking pictures of design development status, using Revit to print the 2D document set of exactly what they had at certain points in time Implementation. Each Snap Shot was a deliverable package, which looked similar to traditional submissions, that got more specific by discipline or building system as the project evolved to match what HSW needed for procurement and buyout. This process would not have been possible without the intense coordination made possible by co-location and early contributions by the trade contractors.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:126 [Co-location also played a sign..] (14:2050-14:3163) (Super)
Codes: [Co-location] [Culture fit] [Adequate Progress]
Co-location also played a significant role in reducing latency on the project and helped eliminate rework, see Decision Making. The owner commented, "by the end of the job, there are thousands of decisions that need to be made, they need to be made every week to continue progress." The owner described an experience on another job where the architect did not co-locate, "one day a superintendent threw down his notebook in a meeting and said, 'I'm not in the position to schedule my problems' and walked out of the room." The owner felt this illustrated the value of co-location well, because you can never predict all the issues that will arise and not having the experts you need in the room can be frustrating and slow down the ability of others to perform. Co-location provides context and nuance to the project and relationships. It helps each party

understand how their actions affect the other members of the team; it allows them to read between the lines. The team felt the dependency and trust established by co-location yields significant payback in latency reduction.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:139 [As a federal organization, one..] (6:1823-6:2267) (Super)
Codes: [Actual Cost Growth]
As a federal organization, one of GSA's public policy goals is to engage small businesses that include small disadvantaged, women-owned, HUBZone, veteran, and service-disabled veteran-owned small businesses, at both the prime and subcontracting levels. Integrated delivery allowed them to not only exceed their baseline goal of $22 million in contracts by $11 million, but also improved those agreements through strong partnership.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:54 [Congress funded the project ba..] (6:2405-6:2645) (Super)
Codes: [Change oder]
Congress funded the project based on 9% change orders and 5% contingency costs. Late in the project, the owner was confident they would come in almost 5% below those estimates, which results in significant funds returned to the owner

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:124 [The team felt that co-location..] (14:1630-14:1713) (Super)
Codes: [Co-location] [Change orders]
The team felt that co-location was a significant factor in avoiding change orders.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:52 [The primary building performan..] (6:1508-6:1820) (Super)
Codes: [Sustainability]
The primary building performance goal was to address the High Performance Green Building design principles. This goal was clearly communicated during a two day High Performance Building Workshop. Attendees included the A/E team, GSA and interested contractors (workshop was held prior to CMc selection).

Neutral

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:84 [GSA's officer found it challen..] (9:3894-9:4210) (Super)
Codes: [Training]
GSA's officer found it challenging to get the team members (contractor, architect and consultants) to slow down and build the team before beginning the work. The team-building step was facilitated by the Master Schedule process, (see Implementation), which began shortly after SERA's contract was reinstated

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:23 [Technical Complexity was a fac..] (3:3624-3:3689) (Super)
Codes: [Motivator_Technical]
Technical Complexity was a factor but not the primary motivator.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:24 [As a modernization (renovation..] (3:3691-3:3941) (Super)
Codes: [Motivator_Technical]
As a modernization (renovation) of an existing building, the additional coordination between designers and trade contractors provided by IPD is considered a significant advantage and helps address unknown field conditions before construction. "

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:29 [This team had incentives tied ..] (4:2362-4:2482) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool]
This team had incentives tied to the CMc, but did not have a shared risk/reward pool on this project, see Risk/Reward.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:60 [Other incentive strategies com..] (7:849-7:962) (Super)
Codes: [Reward Structure- Incentive]
Other incentive strategies common on GSA projects include award term incentives and “Best in Class” recognition.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:61 [Additionally, GSA is currently..] (7:1217-7:1419) (Super)
Codes: [Monitor] [Reward Structure- Incentive]
Additionally, GSA is currently developing a “Best in Class” sub-contractor process to evaluate and catalog sub-contractors that work over a hundred hours on the project and meet performance goals.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:41 [The contract also defines deci..] (5:3319-5:3456) (Super)
Codes: [Decision Making System] [manage]
The contract also defines decision-making criteria to be in the “best interest of the project” and outlines tools for task management.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:31 [This project was fiscally tran..] (4:3277-4:3339) (Super)
Codes: [Financial Transparency]
This project was fiscally transparent between contract parties,

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:47 [Optimized building information..] (6:790-6:828) (Super)
Codes: [BIM]
Optimized building information modeling

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:128 [GSA would like to push the use..] (14:3861-14:4194) (Super)
Codes: [BIM]

GSA would like to push the use of Building Information Modeling (BIM) to its fullest extent but actual implementation lags behind expectations. The architect and contractor worked to add the schedule dimension (4D) to BIM, however incorporating knowledge from trades prefabrication schedule to cost models proved difficult.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:129 [This project used the BIM mode..] (15:921-15:1482) (Super)
Codes: [BIM]
This project used the BIM model for coordination, clash detection, constructability reviews and scheduling. To advance the use of the model in design and construction, GSA pushed SERA to use it for tenant communication and virtualization and HSW to use the model for layouts. Although more scheduling power could be harnessed, this is the first project for GSA R10 to achieve 4D with BIM. Eventually, GSA would like HSW to conduct cost estimates (5D) with the model and bill material outputs to each subcontractor using it as a calibration tool.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:134 [Second was determining the del..] (15:3573-15:3628) (Super)
Codes: [BIM]
Second was determining the deliverables for the project.Traditionally they would be providing GSA with a marked upprint; however in this case they are delivering a model that willembed a great deal of information including construction photosand digital survey information. Part of the problem is they are“still making the sausage” and aren’t exactly sure what it will looklike in the end.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:90 [Developing the MS also functio..] (10:3880-10:4332) (Super)
Codes: [Manage] [Trust]
Developing the MS also functioned as a team-building tool. Working through MS items, the team learned to cooperate with each other and gain a clear understanding of the team dynamic the owner required. This additional planning period provided the team the opportunity to work closely with the owner and each other, developing enough confidence and trust in the relationship to speak candidly about what was really important to the project.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:65 [To be an active manager of the..] (7:2855-7:3082) (Super)
Codes: [Commitment]
To be an active manager of the process, GSA R10 in particular, believes the owner needs to be onsite, engaged in the integrative process and forming relationships, as opposed to hiring agents to be owner’s representatives. Often this is a challenge, especially on the institution side where owners are operating in large bureaucracies who by nature are often risk adverse. GSA’s officer was officially only half time with this project although spent closer to 75% time on site. He believes IPD should require the owner to be on-site full time due to the resource intensive nature of IPD. Investing in IPD is a strategic decision and the owner needs to be prepared to provide the resources around it.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:73 [GSA is in the process of writi..] (8:2464-8:2780) (Super)
Codes: [Commitment]
GSA is in the process of writing criteria for successful team selection; they have identified a few they think are critical to IPD. One is familiarity with each other and an instinctual dynamic. Another is passion, a real desire and commitment to work together, learn and innovate for the good of the project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:85 [GSA's officer found it challen..] (9:3894-10:316) (Super)
Codes: [Culture Fit] [Commitment]
GSA's officer found it challenging to get the team members (contractor, architect and consultants) to slow down and build the team before beginning the work. The team-building step was facilitated by the Master Schedule process, (see Implementation), which began shortly after SERA's contract was reinstated. The MS process continued for 4 months before the contractors were on board and 2 more months while the contractors went through the orientation phase. The six months of planning, identifying problems, analyzing issues and clarifying the goals was "excruciating" for some members of the team who wanted to begin designing sooner. However, most agreed that the longer process allowed right person to come in and be exceptionally effective at the right time, reducing wasted effort.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:95 [Part of the mMS process that h..] (11:533-11:699) (Super)
Codes: [Commitment] [manage]
Part of the mMS process that helped foster a sense of ownership across the entire project team was the assignment an individual team member to certain task items.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:114 [This behavior and willingness ..] (12:5107-12:5268) (Super)
Codes: [Manage] [Commitment]
This behavior and willingness to engage was strongly influenced by clear communication by the owner; everyone was expected to take ownership of the project.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:116 [The team commented that the be..] (13:510-13:927) (Super)
Codes: [Manage] [Culture Fit] [Commitment]
The team commented that the best value comes out of IPD when team members free themselves from their traditional roles and responsibilities. To do this, the team requires at least one member to bring energy and passion, breaking others out of old routines and preventing them from slipping back in to traditional roles. In this project, the owner filled that role, acting as a champion for the IPD process."

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:38 [The A/E contract contains some..] (5:2480-5:2820) (Super)
Codes: [Culture fit]

The A/E contract contains some softer language about the collaborative philosophy and behavior expectations. The contract describes the integrated process as relationship based as opposed to transactional (paper) based and also explains the dynamic nature of IPD, expecting parties to "redefine and reinvent the way work is done."

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:75 [The integrated delivery proces..] (8:3693-8:3860) (Super)
Codes: [Culture fit]
The integrated delivery process was a key topic in the Early Exchange meetings; it was made clear all applicants had to strongly support a collaborative approach.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:85 [GSA's officer found it challen..] (9:3894-10:316) (Super)
Codes: [Culture Fit] [Commitment]
GSA's officer found it challenging to get the team members (contractor, architect and consultants) to slow down and build the team before beginning the work. The team-building step was facilitated by the Master Schedule process, (see Implementation), which began shortly after SERA's contract was reinstated. The MS process continued for 4 months before the contractors were on board and 2 more months while the contractors went through the orientation phase. The six months of planning, identifying problems, analyzing issues and clarifying the goals was "excruciating" for some members of the team who wanted to begin designing sooner. However, most agreed that the longer process allowed right person to come in and be exceptionally effective at the right time, reducing wasted effort.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:122 [Results from the first survey ..] (13:2617-13:3531) (Super)
Codes: [Co-location] [Culture Fit]
Results from the first survey showed very positive evaluations of co-location in terms of professional development, team spirit, and the use of BIM. The majority of the team felt innovation and improvement was equivalent to non co-located experiences, though only 2% felt it was worse while 17% felt co-location improved innovation. Productivity had the least consensus, with 14% of team members ranking productivity in the co-located office worse than non co-located experiences, 28% felt productivity was the same, and 18% felt it was better. Consistently scoring low was the physical work environment itself. The survey process also revealed that certain individuals consistently evaluated their experience as worse. GSA speculated that age and those coming from private office cultures might have been factors indicating that some personnel do not thrive in a co-located environment.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:78 [For the architects, selected t..] (9:661-9:851) (Super)
Codes: [Culture Fit]
For the architects, selected team members met two important criteria beyond the designated skill set: an ability to take input from multiple sources and individuals with an open mind.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:41 [The contract also defines deci..] (5:3319-5:3456) (Super)

Codes: [Decision Making System] [manage]
The contract also defines decision-making criteria to be in the “best interest of the project” and outlines tools for task management.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:45 [GSA providing on-site manageme..] (6:495-6:526) (Super)
Codes: [Manage]
GSA providing on-site management

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:67 [Team Structure • Executive Tea..] (7:2381-7:2484) (Super)
Codes: [Manage]
Team Structure
- Executive Team (core team)
- Integrated Team
- Subject Matter Experts (SME

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:69 [Integrated representatives fro..] (8:905-8:1122) (Super)
Codes: [Manage]
Integrated representatives from all the primary contract parties as well as relevant trades attended each meeting and a point person was assigned to each topic so that first lines of communication were clear.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:63 [Both the A/E and CMc contract ..] (7:1804-7:1889) (Super)
Codes: [Negotiate]
Both the A/E and CMc contract specify use of Alternate Dispute Resolution practices;

Negative

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:35 [The A/E’s contract does not in..] (5:1532-5:1717) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool] [Reward structure liability waiver] [Reward structure_insurance]
The A/E’s contract does not include any of the collaborative commercial terms common to IPD projects such as shared risk/reward, limited liability or special insurance requirements.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:57 [GSA clarified that if they cou..] (6:3740-6:3883) (Super)
Codes: [Reward Structure- Incentive]
The A/E team did not have any financial incentives tied to project metrics because the original design work was completed under the conventional P100 process. GSA clarified that if they could start this project from scratch they would have negotiated a fixed fee reduction with matched risk reward. For example, if the architect typically proposes a 15% fee, the owner would accept7%, with 8% at risk. Incentive payments would be determined by mutually determined performance goals, tracked and measured throughout the delivery process.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:29 [This team had incentives tied ..] (4:2362-4:2482) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool]
This team had incentives tied to the CMc, but did not have a shared risk/reward pool on this project, see Risk/Reward.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:35 [The A/E's contract does not in..] (5:1532-5:1717) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool] [Reward structure liability waiver] [Reward structure_insurance]
The A/E's contract does not include any of the collaborative commercial terms common to IPD projects such as shared risk/reward, limited liability or special insurance requirements.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:30 [Based on interviews and review..] (4:3145-4:3252) (Super)
Codes: [Reward structure liability waiver] Based on interviews and review of the contract, this team did not have waivers on liability, see Liability

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:35 [The A/E's contract does not in..] (5:1532-5:1717) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool] [Reward structure liability waiver] [Reward structure_insurance]
The A/E's contract does not include any of the collaborative commercial terms common to IPD projects such as shared risk/reward, limited liability or special insurance requirements.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:62 [There is no specific limit on ..] (7:1703-7:1780) (Super)
Codes: [Reward structure liability waiver]
There is no specific limit on liability or "no-sue" clause in the contracts.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:35 [The A/E's contract does not in..] (5:1532-5:1717) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool] [Reward structure liability waiver] [Reward structure_insurance]
The A/E's contract does not include any of the collaborative commercial terms common to IPD projects such as shared risk/reward, limited liability or special insurance requirements.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:64 [No unique characteristics, sta..] (7:2228-7:2302) (Super)
Codes: [Reward structure_insurance]
No unique characteristics, standard professional liability products used.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:9 [The contractor reports a conti..] (3:556-3:783) (Super)
Codes: [Commitment] [Confidence in Project Management]

The contractor reports a continued lack of owners willing to pay for IPD, and expects that the situation is unlikely to change in the current market where some contractors are bidding well under the actual cost of work.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:9 [The contractor reports a conti..] (3:556-3:783) (Super)
Codes: [Commitment] [Confidence in Project Management]
The contractor reports a continued lack of owners willing to pay for IPD, and expects that the situation is unlikely to change in the current market where some contractors are bidding well under the actual cost of work.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:71 [In this case, GSA committed to..] (8:1274-8:1987) (Super)
Codes: [Commitment]
In this case, GSA committed to keep a team in place for the duration of the project. On the majority of the CMc's other work, the architect and consultants disappear from the project during the construction phase, spending only part time responding to field issues. This set up causes major latency risk for the contractor.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:10 [The owner felt that, as an age..] (3:785-3:877) (Super)
Codes: [Culture Fit]
The owner felt that, as an agency, GSA is not capitalizing on the value proposition of IPD.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:34 [GSA's Contracting Officer feel..] (5:1065-5:1314) (Super)
Codes: [Culture fit]
GSA's Contracting Officer feels strongly that tri-party arrangements are not necessary for Integrated Project Delivery, especially for public projects, which would require a change in legislation to move away from existing contract structures. He felt multi-party agreements are too much of a "quantum change" and that the financial incentives recommended for IPD can be done with existing contract forms by using award term and milestone payments.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:37 [The owner believed that the se..] (5:1985-5:2452) (Super)
Codes: [Manage] [Culture fit]
The owner believed that the separation of architect and contractor in this project provided a major benefit over design-build contract because of the collaborative tension between the architect and contractor. As separate entities, both the architect and contractor can passionately explain their position on certain decisions; this gave the owner the luxury of being the final arbiter and overall a better understanding of the consequences of decisions.

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:39 [The CMc contract contains no r..] (5:2825-5:2930) (Super)
Codes: [Culture fit]

The CMc contract contains no reference to relational terms or the dynamic nature of the delivery process

P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:76 [There were alignment issues wi..] (8:4752-8:5127) (Super)
Codes: [Culture Fit] [Remove Obstacles]
There were alignment issues with a primary design consultant; they did not understand the owner expectations. The team leadership had to make a decision to keep investing in a weak link or to let them go. The team decided to keep the consultant for the core and shell portion, but shifted the tenant build out scope to the contractor using a design-build contract.

"P 9: 05 Edith Green Wendell Wyatt Federal Building Modernization.pdf - 9:37 [The owner believed that the se..] (5:1985-5:2452) (Super)
Codes: [Manage] [Culture fit]
The owner believed that the separation of architect and contractor in this project provided a major benefit over design-build contract because of the collaborative tension between the architect and contractor. As separate entities, both the architect and contractor can passionately explain their position on certain decisions; this gave the owner the luxury of being the final arbiter and overall a better understanding of the consequences of decisions.

Not Given
There is no quotation under this category.

Project 6
General Information
"P10: 06 Autodesk Inc..pdf - 10:1 [Autodesk Inc.] (1:134-1:146) (Super)
Codes: [Project Name]
Autodesk Inc.

"P10: 06 Autodesk Inc..pdf - 10:2 [Waltham, Massachusetts] (2:176-2:197) (Super)
Codes: [Location]
Waltham, Massachusetts

"P10: 06 Autodesk Inc..pdf - 10:3 [Multi-party contract] (2:248-2:267) (Super)
Codes: [Contract]
Multi-party contract

P10: 06 Autodesk Inc..pdf - 10:14 [Contract Type • Integrated Pro..] (3:1499-3:1562) (Super)
Codes: [Contract]
Contract Type
- Integrated Project Delivery Agreement (IPDA)

P10: 06 Autodesk Inc..pdf - 10:17 [Major subcontractors (mechanic..] (3:2370-3:2539) (Super)
Codes: [Contract]
Major subcontractors (mechanical/fire protection, electrical, and drywall) were also brought in to the agreement, worked at cost, and shared in the incentive program.

"P10: 06 Autodesk Inc..pdf - 10:4 [May 2008] (2:372-2:379) (Super)
Codes: [Project Start Time]
May 2008

"P10: 06 Autodesk Inc..pdf - 10:5 [January 2009] (2:398-2:409) (Super)
Codes: [Est. Completion Time]
January 2009

"P10: 06 Autodesk Inc..pdf - 10:7 [Autodesk Inc., a company that ..] (2:412-2:777) (Super)
Codes: [Initiation Party]
Autodesk Inc., a company that creates design software for the AEC industry, wanted to highlight ways in which its own technology could support Integrated Project Delivery (IPD), Building Information Modeling (BIM), design-to-fabrication, sustainability, and building performance analysis. The company decided to put those goals forward with its own project

"P10: 06 Autodesk Inc..pdf - 10:6 [Requirements of the project in..] (2:1282-2:1394) (Super)
Codes: [LEED certification intended]
Requirements of the project included very high sustainability goals (LEED Platinum for Commercial Interiors.)

Positive
"P10: 06 Autodesk Inc..pdf - 10:8 [Autodesk’s first experiment wi..] (2:1631-2:1798) (Super)

Codes: [Team member IPD experience] [Owner]
Autodesk’s first experiment with IPD was a 16,500 square foot customer briefing center and 29,300 square foot office tenant improvement in downtown San Francisco."

"P10: 06 Autodesk Inc..pdf - 10:9 [Market Position Autodesk was m..] (2:2532-2:2786) (Super)
Codes: [Motivator_Market]
Market Position Autodesk was motivated for unique reasons. As the primary developer of software for the AEC industry, Autodesk was motivated to select IPD as the delivery method to showcase how their products support this emerging delivery method.

"P10: 06 Autodesk Inc..pdf - 10:11 [Schedule Predictability Meetin..] (3:134-3:294) (Super)
Codes: [Motivator_Schedule]
Schedule PredictabilityMeeting the schedule was particularly important to the owner because they had to vacate their existing facilities by a certain date.

"P10: 06 Autodesk Inc..pdf - 10:12 [Risk Management Autodesk is ex..] (3:554-3:858) (Super)
Codes: [Motivator_Risk] [Strong Motivator]
Risk Management Autodesk is experienced with office build-outs and typically followed either design-bid-build or CM at Risk delivery methods. Given the aggressive schedule and demanding sustainable design goals, they determined the only way to deliver the project in was to use an IPD approach.

"P10: 06 Autodesk Inc..pdf - 10:12 [Risk Management Autodesk is ex..] (3:554-3:858) (Super)
Codes: [Motivator_Risk] [Strong Motivator]
Risk Management Autodesk is experienced with office build-outs and typically followed either design-bid-build or CM at Risk delivery methods. Given the aggressive schedule and demanding sustainable design goals, they determined the only way to deliver the project in was to use an IPD approach.

"P10: 06 Autodesk Inc..pdf - 10:19 [The contract establishes an In..] (4:147-4:1137) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool]
The contract establishes an Incentive Compensation Layer (ICL) in which the architects’ and builders’ anticipated profit is put at risk. If specific goals are met, designers and builders receive their normal profit, but jointly, not separately. If they are exceeded in measurable ways the firms are eligible for additional compensation. The ICL could adjust plus or minus 20% depending on whether project goals (see Goals) were met or exceeded and was structured as follows:
- If the project cost is under budget, 60 percent of the saving is added to the ICL.
- If the project is over budget, the excess comes out of the ICL until it is exhausted.
- If the project runs over schedule, an amount per day is deducted from the ICL.
- There was no bonus for beating the schedule since this was of no value to the owner.
- The third-party quality assessment process balanced cost and time considerations with design goals.

"P10: 06 Autodesk Inc..pdf - 10:19 [The contract establishes an In..] (4:147-4:1137) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool]

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- There was no bonus for beating the schedule since this was of no value to the owner.
- The third-party quality assessment process balanced cost and time considerations with design goals.

"P10: 06 Autodesk Inc..pdf - 10:20 [The parties waived all claims ..] (4:2640-4:2761) (Super)
Codes: [Reward structure liability waiver]
The parties waived all claims against each other except those arising from fraud, willful misconduct or gross negligence

"P10: 06 Autodesk Inc..pdf - 10:34 [Another strategy to provide ne..] (5:4152-6:390) (Super)
Codes: [Information sharing mechanism]
Another strategy to provide needed information to the building team in a timely manner was the creation of a Building Advisory Team that was assembled early on to provide programming input from building users. There was a bit of struggle between Autodesk's software engineers, who wanted maximum privacy, and the goal of LEED Platinum, which can only be achieved by allowing natural light to deeply penetrate the space.

"P10: 06 Autodesk Inc..pdf - 10:36 [Project finances were very tra..] (6:1814-6:2029) (Super)
Codes: [Financial Transparency]
Project finances were very transparent, which helped enable the team to make innovative design and construction de-cisions that improved design quality and saved time and money, see Decision Making for detail.

P10: 06 Autodesk Inc..pdf - 10:37 [The design and build team was ..] (6:2049-6:2621) (Super)
Codes: [Financial Transparency] [Manage] [actual cost growth]
The design and build team was held to an overall budget, but was completely free to move money among line items. Money could be taken from carpeting and added to design fees, for example. The ability of the team to move money between line items also meant that savings could be achieved by pooling resources. For example, one lift could be used by multiple trades. Cleanup could be done by lower wage workers at night rather than by highly paid tradesmen during the work day. Savings from one line item could be placed back into the project in another area.

"P10: 06 Autodesk Inc..pdf - 10:40 [At-risk subcontractors were al..] (7:547-7:707) (Super)
Codes: [BIM]
At-risk subcontractors were all BIM-enabled. They provided detailed unit costs up front and Tocci assumed responsibility for taking quantities off the model.

P10: 06 Autodesk Inc..pdf - 10:43 [Design-to-fabrication was used..] (7:996-7:1094) (Super)
Codes: [BIM]
Design-to-fabrication was used for the customer-briefing center's distinctive wood panel ceiling;

P10: 06 Autodesk Inc..pdf - 10:44 [KlingStubbins learned that clo..] (7:1416-7:1712) (Super)
Codes: [BIM] [Manage]
KlingStubbins learned that close collaboration with builders (see Early Involvement) made redundant detailing unnecessary. The process also freed architects to spend more time on site and much less time reviewing RFIs and submittals. In many cases shop drawings were eliminated altogether.

"P10: 06 Autodesk Inc..pdf - 10:30 [One major advantage of IPD for..] (5:2794-5:3180) (Super)
Codes: [Early involvement effectiveness]
One major advantage of IPD for the builder is the ability to enable early procurement of time- and cost-variable materials and services. Jack Short, Tocci's Director of Project Planning, estimates that 55% of the project value was added by lean, cost-plus subcontractors within the incentive compensation layer agreement (see Risk/Reward) and 45% was traditionally procured.

P10: 06 Autodesk Inc..pdf - 10:31 [Another benefit of Tocci's ear..] (5:3183-5:3506) (Super)
Codes: [Early involvement effectiveness]
Another benefit of Tocci's early involvement in planning and local knowledge of the Waltham area made it possible to call on relationships with building officials to insure that permitting and inspections would not impede the schedule. Plan reviews that typically took 4-5 weeks after submission were done in three.

P10: 06 Autodesk Inc..pdf - 10:35 [One of the major benefits of e..] (6:395-6:1797) (Super)
Codes: [Early involvement effectiveness]
One of the major benefits of early and integrated partnering was the flexibility it provided the owner. Scope changes, totaling about 30% of the original budget, were added by the owner over the course of the project. One was the build-out of 5,000 square feet of shell space to accommodate personnel from a small company Autodesk had just acquired as well as an upgrade to the shell building's mechanical systems. Another scope change was purely design driven. Phil Bernstein, Autodesk's Vice President for Industry Strategy and Relations, and himself an architect, decided that the design lacked a distinctive feature that would show the company's commitment to good design. He wanted to create a dramatic gesture by cutting a three-story atrium though the space. The decision had to be made quickly so as not to upend the schedule. KlingStubbins began modeling three alternatives and concurrently Tocci studied the impact on cost and schedule. Within a week the team presented the options, using BIM to allow the owner to virtually "walk through" and get a feeling for the space. Thus, the integrated team was able to quickly and comprehensively address an owner request and provide enough information to make an informed decision. It was decided that Autodesk's business objectives were better served with the atrium and the team was instructed to proceed.

"P10: 06 Autodesk Inc..pdf - 10:27 [The RFP clearly stated the own..] (5:409-5:708) (Super)
Codes: [Commitment]

The RFP clearly stated the owner's direction in terms of scope, budget, sustainability goals and the mandated form of agreement. At first, another team was the front-runner but their corporate leadership asked for fundamental changes in the proposed IPD arrangement, which Autodesk declined.

"P10: 06 Autodesk Inc..pdf - 10:24 [By contract, three levels of c..] (4:3300-4:4007) (Super)
Codes: [Manage]
By contract, three levels of collaborative teams were established to manage the project. A Project Implementation Team (PIT) was set up to handle the day-to-day issues of the project. The composition of the PIT included project participants whose work at any given time could impact the project's outcome. A Project Management Team (PMT) with representation of the owner, architect, and builder, was established to manage the project and make decisions by consensus (see Decision Making). If issues arose that could not be resolved by the PMT they were taken to a higher level for final resolution: a Senior Management Team, (SMT) again with representation of the three principal parties.

P10: 06 Autodesk Inc..pdf - 10:37 [The design and build team was ..] (6:2049-6:2621) (Super)
Codes: [Financial Transparency] [Manage] [actual cost growth]
The design and build team was held to an overall budget, but was completely free to move money among line items. Money could be taken from carpeting and added to design fees, for example. The ability of the team to move money between line items also meant that savings could be achieved by pooling resources. For example, one lift could be used by multiple trades. Cleanup could be done by lower wage workers at night rather than by highly paid tradesmen during the work day. Savings from one line item could be placed back into the project in another area.

P10: 06 Autodesk Inc..pdf - 10:44 [KlingStubbins learned that clo..] (7:1416-7:1712) (Super)
Codes: [BIM] [Manage]
KlingStubbins learned that close collaboration with builders (see Early Involvement) made redundant detailing unnecessary. The process also freed architects to spend more time on site and much less time reviewing RFIs and submittals. In many cases shop drawings were eliminated altogether.

"P10: 06 Autodesk Inc..pdf - 10:37 [The design and build team was ..] (6:2049-6:2621) (Super)
Codes: [Financial Transparency] [Manage] [actual cost growth]
The design and build team was held to an overall budget, but was completely free to move money among line items. Money could be taken from carpeting and added to design fees, for example. The ability of the team to move money between line items also meant that savings could be achieved by pooling resources. For example, one lift could be used by multiple trades. Cleanup could be done by lower wage workers at night rather than by highly paid tradesmen during the work day. Savings from one line item could be placed back into the project in another area.

Neutral

"P10: 06 Autodesk Inc..pdf - 10:10 [Cost Predictability As with an..] (2:2790-2:2936) (Super)
Codes: [Motivator_Cost]

Cost PredictabilityAs with any project, cost predictability is important, but in this case schedule and quality design were the driving forces.

"P10: 06 Autodesk Inc..pdf - 10:22 [Each party was required to mai..] (4:2855-4:3127) (Super)
Codes: [Reward structure_insurance]
Each party was required to maintain typical insurance but with the provision that policies be amended so that no right of subrogation (the ability to gain the rights belonging to one party against a third party who caused a loss) existed against the other partners.

"P10: 06 Autodesk Inc..pdf - 10:39 [ool s • BIM • Face to face exc..] (6:3266-6:3366) (Super)
Codes: [Information Sharing Mechanisms]
Tool s
- BIM
- Face to face exchange (part time co-locating for key project participants)

"P10: 06 Autodesk Inc..pdf - 10:32 [There was a BIM execution plan..] (5:3571-5:3657) (Super)
Codes: [BIM]
There was a BIM execution plan that defined roles and responsibilities for the model.

P10: 06 Autodesk Inc..pdf - 10:41 [Model Manager • Shared: Archit..] (6:3374-6:3534) (Super)
Codes: [BIM] [Manage]
Model Manager
- Shared: Architect (KlingStubbins) during design phases and CM (Tocci) during implementation documents and construction phases.

P10: 06 Autodesk Inc..pdf - 10:42 [Although all the major players..] (7:713-7:801) (Super)
Codes: [BIM]
Although all the major players used BIM, “interoperability of systems was a challenge,” said Chris Leary, KlingStubbins’ principal in charge, “because the mechanical, plumbing, and millwork subcontractors used specialized design-to-fabrication software rather than Revit.”

P10: 06 Autodesk Inc..pdf - 10:45 [Part of the promise of IPD is ..] (7:1715-7:1854) (Super)
Codes: [BIM]
Part of the promise of IPD is to deliver to the owner, at the end of the project, a comprehensive building model for use in operations.

"P10: 06 Autodesk Inc..pdf - 10:33 [Autodesk required in the RFP t..] (5:3760-5:4147) (Super)
Codes: [Phase of involvement]
Autodesk required in the RFP that the architect and contractor “self-select,” therefore KlingStubbins and Tocci Building Companies worked together from the very start of the project. Additionally, several major subcontractors (mechanical/fire protection, electrical, and drywall) were brought in to the agreement early on, worked at cost, and shared in the incentive program.

"P10: 06 Autodesk Inc..pdf - 10:38 [During design, Laura Handler, ..] (6:2914-6:3241) (Super)
Codes: [Co-location]

During design, Laura Handler, Tocci's Virtual Construction Manager, spent two days a week at KlingStubbins' Cambridge office. When the design reached the implementation phase the model was moved from KlingStubbins' to Tocci's servers and Sarah Vekasy, KlingStubbins' project architect, moved to the construction site.

"P10: 06 Autodesk Inc..pdf - 10:16 [Within KlingStubbins there was..] (3:1956-3:2148) (Super)
Codes: [Commitment]
Within KlingStubbins there was initial hesitation by partners at the head office about using an untested IPD agreement, but the desire to try something new and exciting overcame the doubts.

P10: 06 Autodesk Inc..pdf - 10:25 [They conducted a selection pro..] (5:288-5:402) (Super)
Codes: [Commitment]
They conducted a selection process to find an architect/builder team willing to try Integrated Project Delivery

P10: 06 Autodesk Inc..pdf - 10:28 [In the end, KlingStubbins and ..] (5:711-5:912) (Super)
Codes: [Commitment]
In the end, KlingStubbins and Tocci were chosen because of their qualifications, familiarity with the local market, BIM and LEED sophistication, and willingness to abide by a "true" IPD agreement.

"P10: 06 Autodesk Inc..pdf - 10:26 [Autodesk management wanted the..] (5:150-5:287) (Super)
Codes: [Previous cooperation experience] [culture fit]
Autodesk management wanted the design and build team to self-select; they did not want to "mix and match" architects with builders.

P10: 06 Autodesk Inc..pdf - 10:29 ["one of the lessons learned is..] (5:2080-5:2236) (Super)
Codes: [Culture fit]
"one of the lessons learned is that with IPD it's crucial to select your architect and builder as a team. There's a synergy that's just got to be there."

"P10: 06 Autodesk Inc..pdf - 10:23 [Champion • Owner Team Structur..] (4:3142-4:3297) (Super)
Codes: [Manage]
Champion
- Owner

Team Structure
- Senior Management Team (SMT),
- Project Management Team (PMT),
- Project Implementation Team (PIT)

P10: 06 Autodesk Inc..pdf - 10:41 [Model Manager • Shared: Archit..] (6:3374-6:3534) (Super)
Codes: [BIM] [Manage]
Model Manager
- Shared: Architect (KlingStubbins) during design phases and CM (Tocci) during implementation documents and construction phases.

"P10: 06 Autodesk Inc..pdf - 10:21 [Disputes were to be resolved b..] (4:2766-4:2841) (Super)
Codes: [Negotiate]
Disputes were to be resolved by mediation or, if necessary, arbitration.

Negative
"P10: 06 Autodesk Inc..pdf - 10:15 [The project was the first IPD ..] (3:1569-3:1648) (Super)
Codes: [Team member IPD experience] [Architect] [Contractor]
The project was the first IPD experience for the design and construction team.

"P10: 06 Autodesk Inc..pdf - 10:15 [The project was the first IPD ..] (3:1569-3:1648) (Super)
Codes: [Team member IPD experience] [Architect] [Contractor]
The project was the first IPD experience for the design and construction team.

"P10: 06 Autodesk Inc..pdf - 10:13 [Technical Complexity As an int..] (3:861-3:944) (Super)
Codes: [Motivator_Technical]
Technical Complexity: As an interior office build-out, this project was not complex;

Not Given
There is no quotation under this category.

Project 7
General Information
"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:1 [Sutter Health Fairfield Medica..] (1:160-1:212) (Super)
Codes: [Project Name]
Sutter Health Fairfield Medical Office Building

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:3 [Healthcare - MOB] (2:232-2:247) (Super)
Codes: [Project Type]
Healthcare - MOB

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:7 [70,000 square foot medical off..] (2:652-2:695) (Super)
Codes: [Project Size]
70,000 square foot medical office building

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:8 [$19.4 million] (2:1063-2:1076) (Super)
Codes: [Project Cost]
$19.4 million

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:2 [Fairfield, California] (2:202-2:222) (Super)
Codes: [Location]
Fairfield, California

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:4 [Sutter IFOA] (2:261-2:271) (Super)
Codes: [Contract]
Sutter IFOA

P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:15 [IFOA (Integrated Form of Agree..] (3:1757-3:1791) (Super)
Codes: [Contract]
IFOA (Integrated Form of Agreement)

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:5 [2005] (2:365-2:368) (Super)
Codes: [Project Start Time]
2005

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:6 [2007] (2:387-2:390) (Super)
Codes: [Est. Completion Time]
2007

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:9 [It was a relatively small proj..] (2:1243-2:1655) (Super)
Codes: [Initiation Party]
It was a relatively small project for Sutter and as such, gave them the opportunity to test out a new process of collaboratively designing and building facilities. Sutter worked with the Lean Construction Institute to develop this new collaborative delivery method and with attorney Will Lichtig, whose Sacramento firm has represented Sutter for 50 years, to draft the integrated, tri-party contract. as such, gave them the opportunity to test out a new process of collaboratively designing and building facilities. Sutter worked with the Lean Construction Institute to develop this new collaborative delivery method and with attorney Will Lichtig, whose Sacramento firm has represented Sutter for 50 years, to draft the integrated, tri-party contract.

Positive

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:23 [Sutter issued an RFQ to select..] (5:852-5:1210) (Super)
Codes: [Previous cooperation experience]
Sutter issued an RFQ to select an architect in the Spring of 2005. HGA interviewed and won the job, in part because of a successful prior relationship with Sutter. Subsequently, Sutter asked HGA to meet with Boldt to see if the firms' cultures aligned. The firms had previously worked together on traditional design-bid-build projects in the Midwest

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:11 [Cost Predictability Reducing a..] (3:160-3:351) (Super)
Codes: [Motivator_Cost]
Cost Predictability Reducing and managing costs while improving value was a primary motivation for Sutter to use an integrated project delivery method on this project and future projects.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:12 [Schedule Predictability Schedu..] (3:355-3:513) (Super)
Codes: [Motivator_Schedule]
Schedule Predictability: Schedule management was a primary motivation for Sutter to invest in and test the IFOA contract and collaborative delivery method.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:13 [Risk Management One of the pri..] (3:774-3:950) (Super)
Codes: [Motivator_Risk]
Risk Management: One of the primary reason Sutter developed an integrated project delivery system was to reduce their exposure to unforeseen risk and number of disputations.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:31 [Implementation tools, such as ..] (6:419-6:945) (Super)
Codes: [Decision Making System]

Implementation tools, such as lean construction process, helped provide a framework for the team to collaborate and make decisions, (see Implementation) . Room data sheets and narratives were used to guide the team's decision making to achieve the detailed requirements for each room including equipment needs, finishes, utilities and other special requirements. This approach was used to document and preserve decisions made by stakeholders during programming and ensure that the final product met stated needs.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:35 [Boldt's project web site becam..] (6:2842-6:3077) (Super)
Codes: [Information Sharing Patterns]
Boldt's project web site became the repository of project information and the place where submittals were made and processed electronically. The architect was able to process over 50% of the submittals without paper documentation.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:36 [BIM enabled the group to ident..] (7:315-7:979) (Super)
Codes: [BIM]
BIM enabled the group to identify over 400 systems clashes during design, providing increased accuracy and planning ability for fieldwork and significant cost and schedule savings. During construction, BIM was used with GPS measurement to drop ductwork hangers into the metal decking before concrete was placed. Layout that normally would have taken 2-3 weeks was accomplished with greater accuracy in 2-3 days. The more accurate hanger placement allowed for much larger sections of prefabricated ductwork and less field labor. For casework, much less detailing effort was needed from the architect – with no loss of design and quality control.

P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:29 [An example of the benefits of ..] (5:3799-6:306) (Super)
Codes: [BIM] [Early involvement] [Early involvement Effectiveness]
An example of the benefits of early involvement in conjuncture with Building Information Modeling (BIM) is evident from the number of issues identified before construction.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:25 [One tool implemented on this p..] (5:2841-5:3114) (Super)
Codes: [Other Tools]
One tool implemented on this project that helped document and preserve programming decisions were "room data sheets," (see also Decision Making). This tool helped identify special requirements and verify the final outcomes met the needs identified during programming

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:28 [The initial project team consi..] (5:3138-5:3464) (Super)
Codes: [Early involvement] [Early involvement Effectiveness]
The initial project team consisted of Sutter Health (the overall corporate entity), Sutter Regional Medical Foundation (the local Sutter affiliate,) HGA and Boldt. This group, or Core Team, together selected and brought on the main design-build subcontractors very early in the design process, see Project Planning.

P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:29 [An example of the benefits of ..] (5:3799-6:306) (Super)
Codes: [BIM] [Early involvement] [Early involvement Effectiveness]
An example of the benefits of early involvement in conjuncture with Building Information Modeling (BIM) is evident from the number of issues identified before construction.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:34 [Participants reported a feelin..] (6:2509-6:2780) (Super)
Codes: [Culture Fit]
Participants reported a feeling of being respected as equal partners in a collaborative process in which everyone's opinion was valued. In addition to the efficiencies gained from such a process, there was a sense of goodwill, trust and professional satisfaction.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:22 [The project team was organized..] (4:4457-5:833) (Super)
Codes: [Manage]
The project team was organized into three leadership levels. An Integrated Project Team (IPT) composed of project manager level representatives of Sutter, HGA, Boldt, and the major subcontractors, Rosendin Electric and Southland Industries, met weekly throughout design and construction; representatives of other trade contractors and stakeholders augmented the committee when appropriate. A higher-level Core Team, consisting of a senior representative each of Sutter, Boldt, and HGA met monthly to resolve issues passed up from the IPT. Any decisions that could not be unanimously agreed at this level could be referred to an Executive Level committee with higher-level representation from the three partners.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:38 [Boldt's first estimate was $22..] (3:3634-3:3918) (Super)
Codes: [Actual Cost Growth]
Boldt's first estimate was $22,250,000. After an intense validation effort, a guaranteed maximum price (GMP) of $19,573,000 was agreed by the three parties. The final construction cost was $19,437,600, which included $836,500 of value-added, owner initiated scope additions.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:32 [Consideration of change orders..] (6:949-6:1949) (Super)
Codes: [Change order] [Manage]
Consideration of change orders was limited to the following categories:
1. Owner generated–requested by owner, owner's suppliers or consultants.
2. Unknown conditions–items that could not be anticipated during design or which builder could not have anticipated during pre-construction.
3. Design refinement–added value to the owner. Owner would have paid for work if included in bid documents.
4. Construction revision–no added value to the owner. Something had to be added, removed or reworked once it was installed as a result of design error or omission.
5. Governing agency generated–the result of unforeseen agency code interpretations, newly enacted codes or policies being enforced which could not have been anticipated during design or bidding.

6. Builder generated–the result of corrective work requiring documentation to record the change, owner accepted nonconforming work or builder-requested changes.By the end of the project there were no change order.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:17 [Overall, Sutter was very pleas..] (4:389-4:457) (Super)
Codes: [Participants Satisfaction]
Overall, Sutter was very pleased with the building and the process.

Neutral

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:10 [Market Position As an organiza..] (2:2060-2:2275) (Super)
Codes: [Motivator_Market]
Market Position
As an organization that builds and owns multiple large and complex facilities, Sutter Health had both short and long term incentives to improve the delivery process and create better buildings.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:21 [The owner, architect and build..] (4:3564-4:3758) (Super)
Codes: [Reward structure_insurance]
The owner, architect and builder agreed to indemnify each other and to provide typical insurance, including architects' professional liability insurance, at limits established in the IFOA.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:30 [All books in regard to the pro..] (6:323-6:399) (Super)
Codes: [Financial Transparency]
All books in regard to the project are open. Also see Information Sharing.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:26 [Several lean construction tech..] (5:2526-5:2684) (Super)
Codes: [Daily Huddle] [Last Planner System]
Several lean construction techniques such as, "Last planner," "reliable promises," "pull scheduling," and end-of-day "huddles" were employed with success.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:26 [Several lean construction tech..] (5:2526-5:2684) (Super)
Codes: [Daily Huddle] [Last Planner System]
Several lean construction techniques such as, "Last planner," "reliable promises," "pull scheduling," and end-of-day "huddles" were employed with success.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:27 [Subcontractors found that more..] (5:2049-5:2234) (Super)
Codes: [Early involvement] [Early involvement Effectiveness]
Subcontractors found that more intense effort is required up front than in negotiated or design-assist projects, but the payback comes later with rework almost completely eliminated.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:24 [Participants, when asked if IP..] (5:1701-5:1904) (Super)
Codes: [Commitment]
Participants, when asked if IPD was applicable to all projects, felt that it is ideal for larger-scaled, complex projects and perhaps does not have proportionate value in smaller, simpler projects.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:39 [Sutter needed the building del..] (4:182-4:387) (Super)
Codes: [Actual Schedule Growth]
Sutter needed the building delivered in 25 months and that was accomplished under budget despite a three-month delay for reprogramming at the start of the project and with the addition of extra scope.

Negative
"P10: 07 Sutter Health Fairfield Medical Office Building.pdf - 10:37 [This project was the, or close..] (2:393-2:473) (Super)
Codes: [Architect] [General Contractor] [Owner] [Team member IPD experience]
This project was the, or close to the, first “true” IPD project in the country.

"P10: 07 Sutter Health Fairfield Medical Office Building.pdf - 10:37 [This project was the, or close..] (2:393-2:473) (Super)
Codes: [Architect] [General Contractor] [Owner] [Team member IPD experience]
This project was the, or close to the, first “true” IPD project in the country.

"P10: 07 Sutter Health Fairfield Medical Office Building.pdf - 10:37 [This project was the, or close..] (2:393-2:473) (Super)
Codes: [Architect] [General Contractor] [Owner] [Team member IPD experience]
This project was the, or close to the, first “true” IPD project in the country.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:14 [Technical Complexity This proj..] (3:1106-3:1430) (Super)
Codes: [Motivator_Technical]
Technical Complexity This project was small and simple compared to other healthcare projects undertaken by the parties involved and therefore did not require any special coordination to achieve the design and technical goals. This project was selected to test this delivery method because of its relative simplicity.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:19 [The early version of IFOA used..] (4:1041-4:1283) (Super)
Codes: [Reward Structure- Incentive]
The early version of IFOA used for this project allowed for a financial incentive plan but the participants elected not to implement it. “It was all so new,” said Bonnie Walker of HGA, “We were still in the mindset of business as usual.”

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:33 [In this case, during construct..] (6:2097-6:2280) (Super)

Codes: [Commitment] [manage]
In this case, during construction the owner’s project manager was distracted with another, more troublesome project and the team felt that this might have slowed decision-making.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:37 [In this project, a few of the ..] (7:1103-7:1218) (Super)
Codes: [Culture Fit]
In this project, a few of the subcontractors did not want their foremen attending the group scheduling meetings.

"P11: 07 Sutter Health Fairfield Medical Office Building.pdf - 11:33 [In this case, during construct..] (6:2097-6:2280) (Super)
Codes: [Commitment] [manage]
In this case, during construction the owner’s project manager was distracted with another, more troublesome project and the team felt that this might have slowed decision-making.

Not Given
There is no quotation under this category.

Project 8
General Information
"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:1 [Cardinal Glennon Children's Ho..] (1:156-1:209) (Super)
Codes: [Project Name]
Cardinal Glennon Children's Hospital Expansion

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:3 [Healthcare] (2:226-2:235) (Super)
Codes: [Project Type]
Healthcare

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:7 [SSM Healthcare assembled a tea..] (2:439-2:652) (Super)
Codes: [Project Cost] [Project Size]
SSM Healthcare assembled a team including the architect Christner Inc., MEP engineer McGrath Inc., and builder Alberici to design and build a 138,000 square foot, $45.5 million children's hospital expansion.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:7 [SSM Healthcare assembled a tea..] (2:439-2:652) (Super)
Codes: [Project Cost] [Project Size]
SSM Healthcare assembled a team including the architect Christner Inc., MEP engineer McGrath Inc., and builder Alberici to design and build a 138,000 square foot, $45.5 million children's hospital expansion.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:2 [St. Louis, Missouri] (2:198-2:216) (Super)
Codes: [Location]
St. Louis, Missouri

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:4 [Multi-party contract] (2:249-2:268) (Super)
Codes: [Contract]
Multi-party contract

P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:15 [Custom contract based on Sutte..] (3:1102-3:1178) (Super)
Codes: [Contract]
Custom contract based on Sutter's Integrated Form of Agreement (IFOA)

P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:16 [The contract also ties prime t..] (3:1450-3:1604) (Super)
Codes: [Contract] [Reward Structure-risk pool]

The contract also ties prime trade contractors, including the ceiling framing and finish, and fire protection, using a “Lean Pool” or risk/reward pool.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:5 [2004] (2:376-2:379) (Super)
Codes: [Project Start Time]
2004

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:6 [2007] (2:398-2:401) (Super)
Codes: [Est. Completion Time]
2007

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:8 [SSM Healthcare’s Executive Dir..] (2:851-2:1056) (Super)
Codes: [Initiation Party]
SSM Healthcare’s Executive Director of Design and Construction, Donald E. Wojtkowski, who first learned of IPD and lean construction by attending the Sutter Lean Summit in 2004, initiated this event.

Positive

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:28 [Christner , McGrath and Alberi..] (4:1849-4:2074) (Super)
Codes: [Previous cooperation experience]
Christner , McGrath and Alberici had prior working relationships with SSM and with each other. Christner had designed the Phase I bed tower for the hospital. Structural engineering was provided by Christner’s consultant.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:13 [Risk Management This was one o..] (3:316-3:609) (Super)
Codes: [Motivator_Risk]
Risk Management: This was one of the primary motivations for SSM Healthcare to more towards a collaborative delivery method. They felt strongly that traditional design-bid-build models too often result in risk shifting between contracting parties and felt IPD would help eliminate this.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:14 [Technical Complexity This proj..] (3:613-3:775) (Super)
Codes: [Motivator_Technical]
Technical Complexity: This project had a high level of technical complexity. All parties seemed to agree that IPD is well suited for large, complex projects.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:21 [With respect to incentive pool..] (3:3035-3:3481) (Super)
Codes: [Reward Structure- Incentive]

With respect to incentive pools, attorney Will Lichtig observes, “There will always be carrots and sticks in the way we deliver projects. We can’t always be smart enough to know that what we offer as a carrot or a stick will not have unintended consequences. We want to make sure that whatever economic system we put in place will not prevent a person from always doing what is best for the project and not any individual participant.”

P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:20 [“Lean Partners” (parties insid..] (3:2756-3:3015) (Super)
Codes: [Reward Structure-risk pool]
“Lean Partners” (parties inside the risk pool) included the architect and contractor, but also extended to included MEP, wall and ceiling framing and finish, and fire protection subcontractors. Smaller pieces of the work were bid out with fixed prices.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:32 [The team structure and decisio..] (5:448-5:690) (Super)
Codes: [Decision Making System] [Trust]
The team structure and decision making process was set up to be collaborative and transparent between the primary project participants, which provided a great deal of flexibility while working towards the best decisions for the project.

P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:35 [One major challenge that arose..] (5:1536-5:2419) (Super)
Codes: [Decision Making System] [Manage] [Problem Addressed]
One major challenge that arose during construction was effectively managed by leveraging the flexibility provided by open, transparent, and cooperative management. After the first elevated floor deck was in place, the field crew discovered a serious conflict between rebar in the flat slab and plumbing sleeves that needed to penetrate the slab to serve the NICU rooms. In the course of a “huddle” aimed at finding a solution it was realized that the conflict could be avoided by shifting the entire plan 3 ½” with respect to the column grid. “How likely are architects and engineers going to volunteer to make that kind of design change in the middle of construction?” asks Tom Van Landingham. But because the designers were incentivized to be part of the larger team they were able to make the necessary design and coordination changes in just three days.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:25 [The IFOA established an IPD Fi..] (4:429-4:1275) (Super)
Codes: [Manage]
The IFOA established an IPD Field team and a Core Team to manage the project. The Field Team brought together a rolling cast of mid-level project participants at frequent intervals to resolve routine issues. The Core Team, made up of the owner, architect, engineer, and builder, plus the ”lean partners” who had a stake in the incentive pool, met weekly to resolve issues and make most decisions, (also see Decision Making). Above the Core Team level, however, decisions were made by the owner’s management team at their discretion, albeit infrequently and with great restraint. Christner’s Tom Van Landingham felt that the Core Team was highly motivated to find the optimum solution for the project. “We supported each other and looked out for each other. ‘I win-you lose’ was not an acceptable outcome for this project.”

P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:35 [One major challenge that arose..] (5:1536-5:2419) (Super)
Codes: [Decision Making System] [Manage] [Problem Addressed]
One major challenge that arose during construction was effectively managed by leveraging the flexibility provided by open, transparent, and cooperative management. After the first elevated floor deck was in place, the field crew discovered a serious conflict between rebar in the flat slab and plumbing sleeves that needed to penetrate the slab to serve the NICU rooms. In the course of a "huddle" aimed at finding a solution it was realized that the conflict could be avoided by shifting the entire plan 3 ½" with respect to the column grid. "How likely are architects and engineers going to volunteer to make that kind of design change in the middle of construction?" asks Tom Van Landingham. But because the designers were incentivized to be part of the larger team they were able to make the necessary design and coordination changes in just three days.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:33 [An example of how this collabo..] (5:695-5:1531) (Super)
Codes: [Decision Making System] [Negotiate]
An example of how this collaborative decision making process worked came up during concrete placement. The builder proposed that concrete maturity testing (CMT) be used to measure strength as opposed to the traditional method of successively testing cylinder samples. With CMT, sensors are embedded in the concrete and data is read from the outside. The advantage is that forms can be stripped earlier and time saved. Although this technique has long been used for pavement testing, it was a relatively new concept in structural concrete. Owner, architect, structural engineer, and builder discussed it, weighed the benefits and risks and ultimately decided against it. As Tim Gunn of Alberici said, "With this process, it's important to reach consensus. You just can't push people beyond their comfort level."

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:35 [One major challenge that arose..] (5:1536-5:2419) (Super)
Codes: [Decision Making System] [Manage] [Problem Addressed]
One major challenge that arose during construction was effectively managed by leveraging the flexibility provided by open, transparent, and cooperative management. After the first elevated floor deck was in place, the field crew discovered a serious conflict between rebar in the flat slab and plumbing sleeves that needed to penetrate the slab to serve the NICU rooms. In the course of a "huddle" aimed at finding a solution it was realized that the conflict could be avoided by shifting the entire plan 3 ½" with respect to the column grid. "How likely are architects and engineers going to volunteer to make that kind of design change in the middle of construction?" asks Tom Van Landingham. But because the designers were incentivized to be part of the larger team they were able to make the necessary design and coordination changes in just three days.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:38 [In the end, the project was oc..] (5:2420-5:2489) (Super)
Codes: [Actual Schedule Growth]
In the end, the project was occupied six weeks earlier than planned.

Neutral

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:29 [Lean processes were applied an..] (4:3052-4:3195) (Super)
Codes: [Training]
Lean processes were applied and the Lean Construction Institute (LCI) institute participated in a 2 day planning event early in the project.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:10 [Market Position SSM Healthcare..] (2:1985-2:2474) (Super)
Codes: [Motivator_Market]
Market PositionSSM Healthcare develops, owns, and operates many large-scale facilities and therefore had a short and long term incentive to improve the delivery process in their region. SSM Healthcare's Executive Director of Design and Construction, Donald E. Wojtkowski, who first learned of IPD and lean by attending the Sutter Lean Summit in 2004, brought the lessons back to their region and began educating their local industry partners to improve their market options.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:16 [The contract also ties prime t..] (3:1450-3:1604) (Super)
Codes: [Contract] [Reward Structure-risk pool]
The contract also ties prime trade contractors, including the ceiling framing and finish, and fire protection, using a "Lean Pool" or risk/reward pool.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:26 [Above the Core Team level, how..] (4:867-4:1023) (Super)
Codes: [Decision Making System]
The Core Team, made up of the owner, architect, engineer, and builder, plus the "lean partners" who had a stake in the incentive pool, met weekly to resolve issues and make most decisions, (also see Decision Making).Above the Core Team level, however, decisions were made by the owner's management team at their discretion, albeit infrequently and with great restraint.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:31 [All books with regard to the p..] (5:382-5:427) (Super)
Codes: [Financial Transparency]
All books with regard to the project were open

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:30 [This project started using a t..] (5:175-5:363) (Super)
Codes: [Early involvement] [Early involvement Effectiveness]
This project started using a traditional delivery method, however all of the major players had previous working relationships and the primary contractor was selected early in design.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:24 [Champion • Owner – SSM Healthc..] (4:312-4:426) (Super)
Codes: [Manage]
Champion

- Owner – SSM HealthcareTeam Structure
- Owner's Management Team
- Core Team
- IPD Field Team

Negative

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:27 [This was the first IPD experie..] (4:1647-4:1731) (Super)
Codes: [Owner] [General Contractor] [Architect]
This was the first IPD experience for owner, architect, MEP engineer and builder.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:27 [This was the first IPD experie..] (4:1647-4:1731) (Super)
Codes: [Owner] [General Contractor] [Architect]
This was the first IPD experience for owner, architect, MEP engineer and builder.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:27 [This was the first IPD experie..] (4:1647-4:1731) (Super)
Codes: [Owner] [General Contractor] [Architect]
This was the first IPD experience for owner, architect, MEP engineer and builder.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:11 [Cost Predictability IPD was im..] (2:2478-2:2629) (Super)
Codes: [Motivator_Cost]
Cost Predictability
IPD was implemented after the budget was set and therefore this was not a primary motivator for SSM to implement IPD and Lean.

P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:12 [Schedule Predictability IPD wa..] (3:156-3:313) (Super)
Codes: [Motivator_Schedule]
Schedule PredictabilityIPD was implemented after the schedule was set and therefore this was not a primary motivator for SSM to implement IPD and Lean.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:22 [There was not a "no-sue" claus..] (4:167-4:209) (Super)
Codes: [Reward structure liability waiver]
There was not a "no-sue" clause in the IFOA

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:23 [Insurance Each party carried t..] (4:213-4:297) (Super)
Codes: [Reward structure_insurance]
Insurance Each party carried typical general and professional liability insurance.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:19 [Goals The budget and scope had..] (3:2514-3:2739) (Super)

Codes: [Aligned Project Goals]
Goals
The budget and scope had been established by the same project team as part of an earlier campus master plan. Since IPD was implemented after the project was well into design, this criterion does not strictly apply

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:37 [BIM was not used extensively i..] (5:2856-5:2894) (Super)
Codes: [BIM]
BIM was not used extensively in design.

"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:17 [The owner felt that “relationa..] (3:2169-3:2462) (Super)
Codes: [Commitment]
The owner felt that “relational” contracts based on the Sutter model try too hard to dictate behavior. SSM felt that similar results could be achieved through the use of standard contracts but with addendums spelling out expectations with regard to collaboration and lean methodologies.

Not Given
"P12: 08 Cardinal Glennon Childrens Hospital Expansion.pdf - 12:36 [Information Sharing No informa..] (5:2803-5:2848) (Super)
Codes: [Information Sharing Patterns]
Information Sharing: No information available.

Project 9
General Information
"P13: 09 St. Clare Health Center.pdf - 13:1 [St. Clare Health Center] (1:119-1:143)   (Super)
Codes: [Project Name]
St. Clare Health Center

"P13: 09 St. Clare Health Center.pdf - 13:3 [Healthcare] (2:186-2:195)   (Super)
Codes: [Project Type]
Healthcare

"P13: 09 St. Clare Health Center.pdf - 13:10 [The project is comprised of a ..] (2:1686-2:1871) (Super)
Codes: [Project Size]
The project is comprised of a 430,000 square foot six-story, 154-bed inpatient tower, an 85,000 square foot medical office building, and a 75,000 square foot ambulatory care center.

"P13: 09 St. Clare Health Center.pdf - 13:6 [In 2005, SSM Healthcare assemb..] (2:334-2:573) (Super)
Codes: [Project Cost]
In 2005, SSM Healthcare assembled a team of architect, HGA, and contractor, Alberici, to implement IPD and lean construction on their St. Clare Health Center in Fenton, Missouri; a $157 million replacement hospital and medical campus.

"P13: 09 St. Clare Health Center.pdf - 13:2 [Fenton, Missouri] (2:161-2:176)   (Super)
Codes: [Location]
Fenton, Missouri

"P13: 09 St. Clare Health Center.pdf - 13:17 [Contract Type • Custom tri-par..] (3:1996-3:2045) (Super)
Codes: [Contract]
Contract Type
- Custom tri-party based on IFOA

P13: 09 St. Clare Health Center.pdf - 13:18 [By contract, each party is hel..] (3:2274-3:2632) (Super)
Codes: [Contract]
By contract, each party is held accountable to the others as equal partners. Architect and builder combine their contingencies and are jointly responsible for construction errors and design omissions. “Lean partners,” i.e. subcontractors within the shared risk/reward circle, included MEP, wall and ceiling framing and finish, and fire protection.

"P13: 09 St. Clare Health Center.pdf - 13:4 [2005] (2:306-2:309)   (Super)
Codes: [Project Start Time]
2005

"P13: 09 St. Clare Health Center.pdf - 13:5 [2009] (2:328-2:331)   (Super)

Codes: [Est. Completion Time]
2009

"P13: 09 St. Clare Health Center.pdf - 13:44 [After having some success with..] (2:1077-2:1245) (Super)
Codes: [Initiation Party]
After having some success with IPD and Lean on the Cardinal Glennon project, SSM decided to implement IPD and lean construction from the beginning with St. Clare.

Positive
"P13: 09 St. Clare Health Center.pdf - 13:7 [This project just followed the..] (2:575-2:849) (Super)
Codes: [General Contractor] [Owner] [Team member IPD experience]
This project just followed the completion of SSM's Cardinal Glennon Children's Hospital, on which SSM and Alberici tested the implementation of IPD and lean strategies, albeit late into the project (see Cardinal Glennon Children's Hospital Case Study for details.)

P13: 09 St. Clare Health Center.pdf - 13:8 [This was SSM's and Alberici's ..] (2:1403-2:1587) (Super)
Codes: [Architect] [General Contractor] [Owner] [Team member IPD experience]
This was SSM's and Alberici's first IPD project from conception. HGA had prior IPD experience with Sutter Health in California, but the process was new to HGA's Milwaukee office."

"P13: 09 St. Clare Health Center.pdf - 13:7 [This project just followed the..] (2:575-2:849) (Super)
Codes: [General Contractor] [Owner] [Team member IPD experience]
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P13: 09 St. Clare Health Center.pdf - 13:8 [This was SSM's and Alberici's ..] (2:1403-2:1587) (Super)
Codes: [Architect] [General Contractor] [Owner] [Team member IPD experience]
This was SSM's and Alberici's first IPD project from conception. HGA had prior IPD experience with Sutter Health in California, but the process was new to HGA's Milwaukee office.

"P13: 09 St. Clare Health Center.pdf - 13:12 [SSM Healthcare's Executive Dir..] (3:235-3:533) (Super)
Codes: [Training]
SSM Healthcare's Executive Director of Design and Construction, Donald E. Wojtkowski, who first learned of IPD and lean by attending the Sutter Lean Summit in 2004, brought the lessons back to their region and began educating their local industry partners to improve their market options.

P13: 09 St. Clare Health Center.pdf - 13:31 [The Lean Construction Institut..] (5:1132-5:1313) (Super)
Codes: [Training]
The Lean Construction Institute (LCI) played a significant role in implementing lean construction tools, such as the Last Planner System, on the project from the very beginning.

"P13: 09 St. Clare Health Center.pdf - 13:11 [Market Position SSM Healthcare..] (2:2606-3:234) (Super)
Codes: [Motivator_Market]
Market PositionSSM Healthcare develops, owns, and operates many large-scale facilities and therefore had both short and long term incentives to improve the delivery process in their region.

"P13: 09 St. Clare Health Center.pdf - 13:15 [Risk Management This was one o..] (3:1069-3:1363) (Super)
Codes: [Motivator_Risk] [Strong motivators]
Risk Management: This was one of the primary motivations for SSM Healthcare to move towards a collaborative delivery method. They felt strongly that traditional design-bid-build models too often result in risk shifting between contracting parties and felt IPD would help eliminate this.

"P13: 09 St. Clare Health Center.pdf - 13:16 [Technical Complexity This was ..] (3:1366-3:1689) (Super)
Codes: [Motivator_Technical]
Technical Complexity: This was one of SSM's primary motivations for moving towards IPD. They prioritized incentives that would shift the team's behavior and optimize team performance in order to achieve high quality in a complex project. All parties seem to agree that IPD is best suited for large, complex projects.

"P13: 09 St. Clare Health Center.pdf - 13:15 [Risk Management This was one o..] (3:1069-3:1363) (Super)
Codes: [Motivator_Risk] [Strong motivators]
Risk Management: This was one of the primary motivations for SSM Healthcare to move towards a collaborative delivery method. They felt strongly that traditional design-bid-build models too often result in risk shifting between contracting parties and felt IPD would help eliminate this.

"P13: 09 St. Clare Health Center.pdf - 13:34 [The core team of SSM, Alberici..] (5:1335-5:2262) (Super)
Codes: [Negotiate] [Remove Obstacles]
The core team of SSM, Alberici, and HGA was in place at the start of the project. At the same time, a program manager was also engaged. The program manager, who was not familiar with IPD, advised SSM to establish a guaranteed maximum price (GMP) as soon as possible, and push the risk of cost overruns on to the builder and architect. He advocated using standard, separate design and construction contracts but with addendums mandating a lean construction process. HGA objected. Based on the experience in California, IPD had to be implemented in full for the process to work. "You could not cherry-pick some items and leave out others," said

Kurt Spiering, HGA's principal in charge, "we're either going to use the whole agreement or none of the agreement." Alberici seconded the motion, and SSM subsequently agreed to move forward with an integrated form of agreement and without a program manager.

P13: 09 St. Clare Health Center.pdf - 13:45 [At the beginning, SSM felt tha..] (4:269-4:1134) (Super)
Codes: [Remove Obstacles]
At the beginning, SSM felt that this project, with its significant scope, had to have an enforceable GMP. As noted in the goals section, the budget for the project had been set by a program manager prior to the engagement of HGA and Alberici. When the architect and builder began their work it quickly became clear that the budget did not match SSM's aspirations for the project. The owner was willing to defer the setting of GMP until the design was substantially complete and subcontractors were comfortable enough with their prices that they could eliminate most contingencies. But when all the subtrades' GMPs were totaled, the sum exceeded the overall budget. In the end no GMP was set, the architects and builders worked collaboratively to hold down costs but were not required to hold to a fixed price and were paid cost plus a fee.

"P13: 09 St. Clare Health Center.pdf - 13:29 [A tiered decision making struc..] (4:2161-4:2747) (Super)
Codes: [Decision Making System]
A tiered decision making structure was established by the IFOA. The IPD Field Team, which included all participants active at a given time, met daily to review routine matters. The Core Team, with senior representation of the owner, architect, engineers, and builder, met weekly to collaboratively discuss issues and make the more difficult decisions. A senior Leadership Team convened monthly to resolve issues when consensus could not be reached in the Core Team. The Leadership Team included representatives of the interested parties - including SSM, Alberici and HGA.

"P13: 09 St. Clare Health Center.pdf - 13:42 [This project utilized BIM (3D ..] (6:2789-6:2929) (Super)
Codes: [Information Sharing Mechanisms]
This project utilized BIM (3D Architectural Desktop), a web enabled project management site, and a "Big Room." See also Workplace and BIM

"P13: 09 St. Clare Health Center.pdf - 13:43 [BIM was used extensively, not ..] (6:2938-6:4053) (Super)
Codes: [BIM]
BIM was used extensively, not only to detect clashes between systems but also to increase the proportion of prefabricated assemblies with their greater tolerances and lower requirement for field labor.
Utilizing the "Big Room" and early involvement of trade contractors improved the efficiency and accuracy of the design process. Kevin Kerschbaum, HGA's project manager said "We could have drawn it all but we wouldn't have known if there needed to be a joint here or a piece of unistrut there. You have a much higher degree of certainty that things will fit when the actual fabricator is doing the modeling. Everything should be drawn and detailed by the right person at the right time and then put together into the overall model." Virtually all systems including

power, low voltage, lighting, mechanical and fire protection were modeled in detail. The owner felt that it was unnecessary to model every pipe and conduit, and that in the future, modeling should be limited to major systems. But he did acknowledge that he was left with “one heck of a good set of as-builts.”

"P13: 09 St. Clare Health Center.pdf - 13:33 [The core team of SSM, Alberici..] (5:1335-5:1417) (Super)
Codes: [Phase of involvement]
The core team of SSM, Alberici, and HGA was in place at the start of the project.

P13: 09 St. Clare Health Center.pdf - 13:35 [The mechanical, electrical, an..] (5:2264-5:2419) (Super)
Codes: [Phase of involvement]
The mechanical, electrical, and fire protection subcontractors were contracted to Alberici and signed joining agreements prior to the start of design.

"P13: 09 St. Clare Health Center.pdf - 13:32 [Kevin Kerschbaum of HGA, who h..] (5:451-5:1113) (Super)
Codes: [Early involvement effectiveness]
Kevin Kerschbaum of HGA, who has now worked on several IPD projects, feels that architectural work hours can be taken from the construction administration phase and shifted to schematic design. “There is an intense amount of work required of the designers at the beginning of the process but the time needed during construction to review RFIs, submittals, and substitutions is greatly reduced.” There is no longer a defined “bidding/negotiation phase” so that time gets pulled forward as well. Kerschbaum learned that during construction more time is freed to actually spend on the job site and much less “busy work” is required in the office.

"P13: 09 St. Clare Health Center.pdf - 13:39 [One of the issues in hospital ..] (5:3932-6:867) (Super)
Codes: [Manage] [Problem Addressed]
One of the issues in hospital design is that, although designers and builders want owners to make decisions and stick with them, hospital operators always want their buildings to have the very latest in equipment and reflect the most up to date thinking in hospital operations and patient care. “There’s always the desire to defer those decisions in case the next generation of cath lab or MRI or articulated arm in the operating room is coming down the road,” said Wojtkowski.
At St. Clare, the owner decided to switch from back-to-back patient rooms to same-handed rooms even as structural steel was being erected. This decision came from studies showing that same-handed rooms promote operational efficiency and reduce the likelihood of medication errors. It was decided to make the change even though it increased cost. Such a major change so late in the process would have been extremely difficult for a traditional, fragmented design and construction team to handle efficiently, but the integrated team (see Early Involvement) was able to meet the owner’s wishes because of its inherent flexibility. The change was made without a major impact on cost or schedule. Tim Gunn of Alberici said “We like the ability to let the owner wait until the last responsible minute to make a decision, and sometimes even beyond that.”

"P13: 09 St. Clare Health Center.pdf - 13:34 [The core team of SSM, Alberici..] (5:1335-5:2262) (Super)
Codes: [Negotiate] [Remove Obstacles]
The core team of SSM, Alberici, and HGA was in place at the start of the project. At the same time, a program manager was also engaged. The program manager, who was not familiar with IPD, advised SSM to establish a guaranteed maximum price (GMP) as soon as possible, and push the risk of cost overruns on to the builder and architect. He advocated using standard, separate design and construction contracts but with addendums mandating a lean construction process. HGA objected. Based on the experience in California, IPD had to be implemented in full for the process to work. "You could not cherry-pick some items and leave out others," said Kurt Spiering, HGA's principal in charge, "we're either going to use the whole agreement or none of the agreement." Alberici seconded the motion, and SSM subsequently agreed to move forward with an integrated form of agreement and without a program manager.

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Codes: [Manage] [Problem Addressed]
One of the issues in hospital design is that, although designers and builders want owners to make decisions and stick with them, hospital operators always want their buildings to have the very latest in equipment and reflect the most up to date thinking in hospital operations and patient care. "There's always the desire to defer those decisions in case the next generation of cath lab or MRI or articulated arm in the operating room is coming down the road," said Wojtkowski.
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Neutral

"P13: 09 St. Clare Health Center.pdf - 13:24 [In the end no GMP was set, the..] (4:954-4:1263) (Super)
Codes: [Reward Structure- Incentive]
In the end no GMP was set, the architects and builders worked collaboratively to hold down costs but were not required to hold to a fixed price and were paid cost plus a fee. Because the builders' risk was thereby almost eliminated, financial incentives were not deemed by the owner to be necessary.

P13: 09 St. Clare Health Center.pdf - 13:25 [The owner learned from an earl..] (4:1268-4:1903) (Super)
Codes: [Reward Structure- Incentive]
The owner learned from an earlier project, Cardinal Glennon, that a release from GMP was preferred by the builders over financial incentives. Donald E. Wojtkowski, SSM Healthcare's

Executive Director of Design and Construction, said “The only way you’re going to get the complex design and construction resources needed for a project like St. Clare, to get them to change their behavior, is to remove financial risk. Whenever you have a GMP or stipulated sum, if you need to deviate from the schedule for the good of the project, you’re going to get a change order and be arguing about it for the rest of the project.”

"P13: 09 St. Clare Health Center.pdf - 13:21 [Besides schedule and budget, p..] (3:3336-3:3556) (Super)
Codes: [Aligned Project Goals]
Besides schedule and budget, project goals included improved operational productivity. Specific metrics were not set, but the team was tasked with improving efficiency through design to the greatest extent possible.

"P13: 09 St. Clare Health Center.pdf - 13:38 [Transparency Books were open a..] (5:3871-5:3912) (Super)
Codes: [Financial Transparency]
Transparency Books were open and audited.

"P13: 09 St. Clare Health Center.pdf - 13:30 [Advisors were brought in to he..] (5:292-5:446) (Super)
Codes: [Last Planner System]
Advisors were brought in to help implement the Last Planner system, a construction planning methodology developed by the Lean Construction Institute.

"P13: 09 St. Clare Health Center.pdf - 13:41 [Each contracting party did the..] (6:1491-6:2764) (Super)
Codes: [Co-location]
Each contracting party did their work in their respective offices and would be brought together periodically in a co-located room, or “Big Room,” for coordination and detailing in 3D.
The process worked like this; a local MEP consulting engineering firm, KJWW, working under the direction of HGA, developed 2D single line diagrams showing duct sizes and locations as well as performance specs. At the same time HGA was developing architectural and structural designs in their Milwaukee office with early input from the builders. Then all of this material was taken to the “Big Room” where the architects and engineers could collaborate with the design-build MEP detailers to model the design in real time and in 3D using Architectural Desktop.
The “Big Room” was a triple-wide trailer set up on the site and was augmented with a project management web site used to share design progress with team members who could not physically be present. Tim Gunn, Alberici’s Project Director said, “it was the first time for everyone with this kind of a process. Some things went more smoothly than others. But all the time spent up front in the ‘Big Room’ was more than paid back later with substantially fewer coordination errors and RFIs.”

"P13: 09 St. Clare Health Center.pdf - 13:9 [HGA had prior IPD experience w..] (2:1470-2:1683) (Super)
Codes: [Culture Fit]

Over time, however, the Milwaukee office became more comfortable with this new way of working.

"P13: 09 St. Clare Health Center.pdf - 13:28 [Champion • Owner-SSM Healthcar..] (4:2052-4:2158) (Super)
Codes: [Manage]
Champion
• Owner-SSM Healthcare
Team Structure
• Senior Leadership Team, Core Team, IPD Field Team

"P13: 09 St. Clare Health Center.pdf - 13:23 [The owner thought the process ..] (3:3794-4:252) (Super)
Codes: [Commitment to IPD process]
The owner thought the process works very well for large and complex projects but is perhaps not needed for smaller (under $5 million) projects, in part because SSM tends to assign those projects to smaller builders, new firms, or firms without broad experience in healthcare

Negative
"P13: 09 St. Clare Health Center.pdf - 13:8 [This was SSM's and Alberici's ..] (2:1403-2:1587) (Super)
Codes: [Architect] [General Contractor] [Owner] [Team member IPD experience]
This was SSM's and Alberici's first IPD project from conception. HGA had prior IPD experience with Sutter Health in California, but the process was new to HGA's Milwaukee office.

"P13: 09 St. Clare Health Center.pdf - 13:13 [Cost Predictability The budget..] (3:536-3:697) (Super)
Codes: [Motivator_Cost]
Cost Predictability: The budget appeared to be flexible and therefore cost predictability was not the primary reason for selecting IPD as the delivery method.

"P13: 09 St. Clare Health Center.pdf - 13:20 [In this case the initial budge..] (3:3051-3:3331) (Super)
Codes: [Aligned Project Goals]
In this case the initial budget was established by a program manager without the involvement of architect and builder. Because this initial budget was not jointly validated, the owner had to supplement it with additional funds to satisfy programmatic goals for the project.

P13: 09 St. Clare Health Center.pdf - 13:22 [Had the budget and program bee..] (3:3559-3:3792) (Super)
Codes: [Aligned Project Goals]
Had the budget and program been collaboratively set between owner, architect, and builder at the beginning, it would likely have not been necessary to go "back to the well" for additional funds to square the budget with program.

"P13: 09 St. Clare Health Center.pdf - 13:19 [The owner felt that “relationa..] (3:2726-3:2830) (Super)
Codes: [Culture fit]
The owner felt that “relational” contracts based on the Sutter model try too hard to dictate behavior.

P13: 09 St. Clare Health Center.pdf - 13:40 [Most of our problems came from..] (6:880-6:1444) (Super)
Codes: [Culture Fit]
Most of our problems came from design-build subcontractors not having the patience to deal with the iterative nature of design. They want all the answers way too early,” says Wojkowski. In this project the consulting engineers were essentially in design assist mode to the subcontractors instead of the other way around. The owner felt this was backward. In addition, according to Tim Gunn, “Our MEP/FP subcontractors struggled at times with conceptual estimating. They sometimes fell back to the old counting light fixtures, counting toilets mode.”

Not Given

"P13: 09 St. Clare Health Center.pdf - 13:14 [Schedule Predictability No spe..] (3:989-3:1066) (Super)
Codes: [Motivator_Schedule]
Schedule Predictability: No specific information available for interpretation.

"P13: 09 St. Clare Health Center.pdf - 13:26 [Insurance No information avail..] (4:2002-4:2037) (Super)
Codes: [Reward structure_insurance]
Insurance: No information available.

Project 10
General Information
"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:1 [Encircle Health Ambulatory Car..] (1:114-1:155) (Super)
Codes: [Project Name]
Encircle Health Ambulatory Care Center

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:3 [Healthcare] (2:184-2:193) (Super)
Codes: [Project Type]
Healthcare

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:9 [The Encircle Health project is..] (2:1360-2:1641) (Super)
Codes: [Project Size]
The Encircle Health project is a three-story, 156,000 square foot ambulatory care center combining physician practices with ancillary diagnostic services, including imaging, radiology, endoscopy, pharmacy, and testing labs, each of which own an equity stake in the building.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:6 [In 2006, Encircle Health selec..] (2:311-2:470) (Super)
Codes: [Project Cost]
In 2006, Encircle Health selected architect, HGA, and contractor, Boldt, to design and build a $38.6 million ambulatory care center in Appleton, Wisconsin.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:2 [Appleton, Wisconsin] (2:156-2:174) (Super)
Codes: [Location]
Appleton, Wisconsin

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:11 [Contract Type • Custom Multi-P..] (2:2408-2:2488) (Super)
Codes: [Contract]
Contract Type
- Custom Multi-Party Agreement based on Sutter Health IFOA

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:12 [An integrated form of agreemen..] (2:2491-2:2835) (Super)
Codes: [Contract]
An integrated form of agreement (IFOA) based on the Sutter Health model was signed by owner, architect, and builder. Prior to the start of schematic design, four of the major subtrades--mechanical, electrical, plumbing/fire protection and exterior glazing--signed joining agreements and participated in the financial incentives scheme.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:4 [2006] (2:283-2:286) (Super)
Codes: [Project Start Time]

2006

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:5 [2009] (2:305-2:308) (Super)
Codes: [Est. Completion Time]
2009

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:7 [Encircle Health is somewhat un..]
(2:471-2:981) (Super)
Codes: [Initiation Party]
Encircle Health is somewhat unique in that they are an LLC, composed primarily of ThedaCare in addition to several independent physician groups. ThedaCare, the largest tenant, is a regional healthcare organization with considerable construction experience and a focus on lean operations and therefore took the primary role in managing the project. They decided before selecting the design and construction team to follow an integrated form of agreement based on the Sutter Health contract model.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:13 [Project goals, developed colla..]
(3:356-3:563) (Super)
Codes: [Aligned Project Goals] [LEED Certification Intended]
Project goals, developed collaboratively by the core team, included budget, schedule, and a requirement to attain LEED Silver or higher, as mandated by ThedaCare's system wide sustainability initiative.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:14 [At the time of this study the ..]
(3:565-3:686) (Super)
Codes: [Sustainability] [LEED certification intended]
At the time of this study the LEED evaluation was not yet complete, but the team was confident of achieving LEED Gold.

Positive

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:29 [The west coast offices of the ..]
(3:3796-3:3955) (Super)
Codes: [Architect] [General Contractor] [Team member IPD experience]
The west coast offices of the architect HGA, and builder, Boldt Construction, had prior IPD experience working together with Sutter Health in California.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:29 [The west coast offices of the ..]
(3:3796-3:3955) (Super)
Codes: [Architect] [General Contractor] [Team member IPD experience]
The west coast offices of the architect HGA, and builder, Boldt Construction, had prior IPD experience working together with Sutter Health in California.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:8 [ThedaCare, HGA and Boldt all h..]
(2:983-2:1155) (Super)
Codes: [Previous cooperation experience]

ThedaCare, HGA and Boldt all had worked together previously on projects in the Midwest, which was a major factor when selecting the team for this new delivery method.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:30 [The three principal partners h..] (3:3956-3:4129) (Super)
Codes: [Previous cooperation experience]
The three principal partners had worked together previously, as did most of the major subtrades, a factor that everyone believed contributed to the project's success.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:32 [Mechanical, electrical, plumbi..] (4:1051-4:1396) (Super)
Codes: [Previous cooperation experience]
Mechanical, electrical, plumbing/fire protection, and glazing subcontractors were selected collaboratively by the core team from a short list of three candidate firms in each category. Selection was based on fee proposals and qualifications of committed personnel. All of the firms considered had previous working experience with Boldt.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:22 [A scaling factor was used wher..] (3:1958-3:2093) (Super)
Codes: [Reward Structure- Incentive]
A scaling factor was used wherein the more that was saved, the higher the percentage of compensation to the non-owner participants.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:21 [Architect and builder worked o..] (3:1588-3:1761) (Super)
Codes: [Reward Structure-risk pool]
Architect and builder worked on a time-and-materials basis at a reduced billing rate, with a portion of anticipated profits placed at risk depending on project outcomes.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:24 [Recent iterations of the Sutte..] (3:2750-3:3355) (Super)
Codes: [Reward Structure-risk pool]
Recent iterations of the Sutter model contract use "fee pooling," in which participants' costs are separated from their anticipated profit. Planned profits are placed in the "risk pool" for those inside the IPD agreement. That way, everyone's individual success hinges on the project's success. Profits are protected even when work (done at cost) is increased or decreased. Therefore no one is hurt if work is shifted from one party to another for overall project benefit. If a $1 increase in framing cost allows a $2 savings in HVAC, no one loses the incentive to put the project first.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:41 [RFIs were essentially limited ..] (5:2667-5:2965) (Super)
Codes: [Decision Making System]
RFIs were essentially limited to documentation of decisions already reached in the field. This freed the architect to be more hands-on during construction because much of the tedious

paperwork and tracking was eliminated. Representatives in the field were empowered to make decisions quickly

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:13 [Project goals, developed colla..] (3:356-3:563) (Super)
Codes: [Aligned Project Goals] [LEED Certification Intended]
Project goals, developed collaboratively by the core team, included budget, schedule, and a requirement to attain LEED Silver or higher, as mandated by ThedaCare's system wide sustainability initiative.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:45 [In addition to BIM, Boldt main..] (6:174-6:281) (Super)
Codes: [Information Sharing Mechanisms]
In addition to BIM, Boldt maintained a project web site for information exchange open to all participants.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:37 [The project team operated in a..] (5:623-5:820) (Super)
Codes: [Financial Transparency]
The project team operated in a very transparent manner with cost information available for designers to make better design decisions early on, (see also Early Involvement and Decision Making).

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:46 [The primary computer model was..] (6:289-6:1271) (Super)
Codes: [BIM]
The primary computer model was held by Boldt. Each systems subcontractor used its own preferred software platform, which in the case of the sheet metal subcontractor, was used to directly drive CNC fabrication equipment. Navisworks was used extensively and interactively to detect clashes between systems. By modeling everything, there was a much higher assurance that things would fit and therefore tighter tolerances were possible. Instead of a laborious shop drawing review process, the subcontractors were able to model their own work and build it. Trent Jezwinski , Boldt's project manager said "The money spent on building and maintaining the BIM was more than offset by less rework caused by coordination errors."
In some cases, the scheduling of trades such as fire protection had to be adjusted because things were happening so much faster than usual. Boldt has indicated that it will adjust its scheduling practices to suit this new process.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:20 [The harsh weather affected the..] (3:1108-3:1393) (Super)
Codes: [Other Tools] [Culture Fit]
The harsh weather affected the typical sequencing of trades, but due to the just-in-time design process and close collaboration between architect and builder, the architects could fluidly shift effort to provide the design information needed in the field (see Decision Making).

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:33 [Just-in-time design meant some..] (4:2018-4:2525) (Super)
Codes: [Other Tools]
Just-in-time design meant some aspects of the project were still in sketch mode while others were already under construction. There was no traditional SD-DD-CD issuance of design packages. Delivery of design documents was continuous and directed at what the team felt most needed attention at a particular moment in the process. In addition, the severe weather during much of construction meant that the usual sequence of sub trades couldn't be followed and the designers were able to adjust.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:34 [Prior to the start of schemati..] (4:2873-4:3097) (Super)
Codes: [Phase of involvement][Reward Structure- Incentive]
Prior to the start of schematic design, four of the major sub trades--mechanical, electrical, plumbing/fire protection and exterior glazing--signed joining agreements and participated in the financial incentives scheme.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:17 [Furthermore, IPD leveraged the..] (3:1396-3:1572) (Super)
Codes: [Early involvement effectiveness]
Furthermore, IPD leveraged the early involvement of trades to more efficiently design the building systems, almost eliminating duplication of work (see Early Involvement).

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:36 [The shop drawing process becam..] (4:4007-5:606) (Super)
Codes: [Early involvement effectiveness]
The shop drawing process became concurrent with design, saving time and duplication of effort. Kevin Kerschbaum, HGA's project manager said, "We drew 30% fewer window details, for example, because the curtain wall subcontractor was involved from the get-go and their input was incorporated in the design drawings." Shop drawings were used for installation purposes only. A similar situation occurred with millwork. The architect, with the fabricator by his side, drew what was needed without having to extensively detail. In that sense, the architect could focus purely on design while allowing the fabricators to detail exactly what they were going to build.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:38 [During design the architects w..] (5:1095-5:1500) (Super)
Codes: [Early involvement effectiveness]
During design the architects were given a detailed spreadsheet of unit costs. They had the freedom to design knowing the real cost of tradeoffs between, for example, using one material over another in a particular space. Because cost information was provided early, architects could make design decisions based on reliable information and did not have to redesign later for value engineering.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:40 [RFIs were essentially limited ..] (5:2667-5:2893) (Super)

Codes: [Early involvement effectiveness]
RFIs were essentially limited to documentation of decisions already reached in the field. This freed the architect to be more hands-on during construction because much of the tedious paperwork and tracking was eliminated.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:23 [There was a general consensus ..] (3:2167-3:2582) (Super)
Codes: [Negotiate] [Trust]
There was a general consensus that a more precise method of distinguishing design refinements from scope changes from contingency items was needed. Participants reported several instances in which there was disagreement about which bucket should pay for a particular item. But in the spirit of collaboration and feeling of trust that prevailed these were resolved with frank discussion and give-and-take.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:20 [The harsh weather affected the..] (3:1108-3:1393) (Super)
Codes: [Other Tools] [Culture Fit]
The harsh weather affected the typical sequencing of trades, but due to the just-in-time design process and close collaboration between architect and builder, the architects could fluidly shift effort to provide the design information needed in the field (see Decision Making).

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:18 [The overall schedule, as it wa..] (3:691-3:867) (Super)
Codes: [Manage]
The overall schedule, as it was jointly prepared, did not change during the project, although it was constantly and interactively adjusted in detail during weekly meetings.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:31 [A Core Team met weekly to reso..] (4:116-4:823) (Super)
Codes: [Manage] [Negotiation]
A Core Team met weekly to resolve routine issues. The composition of this team varied, sometimes including one or two of the owner/physicians, sometimes including administrators, but always with the owner, architect and builder represented. Under the direction of the Core Team were specialized component teams including building enclosure, MEP, interior fit-out, and LEED compliance. The Core Team would resolve issues that arose between the component teams on a continuing basis. Above the Core Team was the Board of Directors of the LLC, but very few issues were passed to that level. The ability to perform to such a tight schedule required that decisions be made and not revisited.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:35 [The design process was highly ..] (4:3586-4:3993) (Super)
Codes: [Manage]
The design process was highly collaborative between designers and builders. The design-build specialty subcontractors provided design services and acted as the engineers-of-record for their respective disciplines. HGA and its consultants designed systems as single line diagrams plus

performance criteria, which the subcontractors used as a basis for their designs. All systems were modeled in 3D

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:42 [At a defined point in the proc..] (5:1503-5:2114) (Super)
Codes: [Manage]
At a defined point in the process it was agreed that design was finished. All parties and all stakeholders had been consulted and signed off. After that point any significant design adjustment was considered a scope change with an impact on the target cost. Most costs were well predicted during design, but when the inevitable small surprises happened, as materials and smaller trades were bid, the team could easily adjust without adding to the overall cost. Only in the rare cases when items had to be subtracted from the performance contingency did it require a decision from the Core Team.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:39 [That inspired some out-of the-..] (5:2305-5:2388) (Super)
Codes: [Challenge]
That inspired some out-of the-box thinking for the benefit of the overall project.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:43 [Participants at all levels ten..] (5:2979-5:3290) (Super)
Codes: [Challenge]
Participants at all levels tended to ask questions with a range of possible solutions in mind. It wasn't "your design doesn't work, fix it." The process tended to flatten the hierarchy and put everyone on an equal footing, which was empowering for all and a good stimulus toward creative problem-solving.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:23 [There was a general consensus ..] (3:2167-3:2582) (Super)
Codes: [Negotiate] [Trust]
There was a general consensus that a more precise method of distinguishing design refinements from scope changes from contingency items was needed. Participants reported several instances in which there was disagreement about which bucket should pay for a particular item. But in the spirit of collaboration and feeling of trust that prevailed these were resolved with frank discussion and give-and-take.

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:31 [A Core Team met weekly to reso..] (4:116-4:823) (Super)
Codes: [Manage] [Negotiation]
A Core Team met weekly to resolve routine issues. The composition of this team varied, sometimes including one or two of the owner/physicians, sometimes including administrators, but always with the owner, architect and builder represented. Under the direction of the Core Team were specialized component teams including building enclosure, MEP, interior fit-out, and LEED compliance. The Core Team would resolve issues that arose between the component teams on a continuing basis. Above the Core Team was the Board of Directors of the LLC, but

very few issues were passed to that level. The ability to perform to such a tight schedule required that decisions be made and not revisited.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:15 [The project was completed from..] (3:868-3:1393) (Super)
Codes: [Problem Addressed]
The project was completed from start to move-in in 18 months, including 13 months of construction. During five of those months, the coldest winter in recent memory, compounded the difficulty of achieving such a compressed schedule. The harsh weather affected the typical sequencing of trades, but due to the just-in-time design process and close collaboration between architect and builder, the architects could fluidly shift effort to provide the design information needed in the field (see Decision Making).

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:48 [The overall schedule, as it wa..] (3:691-3:1393) (Super)
Codes: [Perceived Schedule Performance]
The overall schedule, as it was jointly prepared, did not change during the project, although it was constantly and interactively adjusted in detail during weekly meetings. The project was completed from start to move-in in 18 months, including 13 months of construction. During five of those months, the coldest winter in recent memory, compounded the difficulty of achieving such a compressed schedule. The harsh weather affected the typical sequencing of trades, but due to the just-in-time design process and close collaboration between architect and builder, the architects could fluidly shift effort to provide the design information needed in the field (see Decision Making).

P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:49 [In some cases, the scheduling ..] (6:1036-6:1271) (Super)
Codes: [Perceived Schedule Performance]
In some cases, the scheduling of trades such as fire protection had to be adjusted because things were happening so much faster than usual. Boldt has indicated that it will adjust its scheduling practices to suit this new process.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:44 [Several of the participants di..] (5:3585-5:4782) (Super)
Codes: [Commitment] [Culture Fit] [Participants Satisfaction]
Several of the participants did comment that they wished the major field foremen had been more completely integrated into the process. As a rule these field workers were the most skeptical of the new process. But according to Jezwinski, this project ran significantly different than his past experience thanks to the implementation of IPD culture and the Last Planner Process in the field: “I’ve never had a job run this smooth in 23 years. There wasn’t any of that silo mentality – and to be able to move that feeling into the construction site is huge. I’ve never seen a project work as a team like this one did, from the top down and including the installers and guys in the field. When you have a hand in establishing the schedule and see how your trade fits into the whole process, you tend to believe in it and act accordingly. Slack is greatly reduced. The interactive scheduling process showed you the logic of where everything had to go – you trusted it and had

ownership over it, and if you didn't fulfill your promises you felt you had let down the team. If you have partners who are willing to change culturally then this process could work anywhere."

Neutral

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:34 [Prior to the start of schemati..] (4:2873-4:3097) (Super)
Codes: [Phase of involvement][Reward Structure- Incentive]
Prior to the start of schematic design, four of the major sub trades--mechanical, electrical, plumbing/fire protection and exterior glazing--signed joining agreements and participated in the financial incentives scheme.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:25 [Liability The contract did not..] (3:3358-3:3591) (Super)
Codes: [Reward structure liability waiver]
Liability: The contract did not contain a no-sue clause. It did contain a limitation on total liability and consequential damages for the architect and a mutual waiver of consequential damages between the owner and the builder. "

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:44 [Several of the participants di..] (5:3585-5:4782) (Super)
Codes: [Commitment] [Culture Fit] [Participants Satisfaction]
Several of the participants did comment that they wished the major field foremen had been more completely integrated into the process. As a rule these field workers were the most skeptical of the new process. But according to Jezwinski, this project ran significantly different than his past experience thanks to the implementation of IPD culture and the Last Planner Process in the field: "I've never had a job run this smooth in 23 years. There wasn't any of that silo mentality – and to be able to move that feeling into the construction site is huge. I've never seen a project work as a team like this one did, from the top down and including the installers and guys in the field. When you have a hand in establishing the schedule and see how your trade fits into the whole process, you tend to believe in it and act accordingly. Slack is greatly reduced. The interactive scheduling process showed you the logic of where everything had to go – you trusted it and had ownership over it, and if you didn't fulfill your promises you felt you had let down the team. If you have partners who are willing to change culturally then this process could work anywhere."

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Several of the participants did comment that they wished the major field foremen had been more completely integrated into the process. As a rule these field workers were the most skeptical of the new process. But according to Jezwinski, this project ran significantly different than his past experience thanks to the implementation of IPD culture and the Last Planner Process in the field: "I've never had a job run this smooth in 23 years. There wasn't any of that silo mentality – and to be able to move that feeling into the construction site is huge. I've never seen a project work as a team like this one did, from the top down and including the installers and guys in the field. When you have a hand in establishing the schedule and see how your trade fits into the whole process, you tend to believe in it and act accordingly. Slack is greatly reduced. The interactive

scheduling process showed you the logic of where everything had to go – you trusted it and had ownership over it, and if you didn't fulfill your promises you felt you had let down the team. If you have partners who are willing to change culturally then this process could work anywhere."

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:27 [Team Structure • LLC Board of ..] (3:3660-3:3747) (Super)
Codes: [Manage]
Team Structure
• LLC Board of Directors, Core Team, Specialized Component Teams

Negative
"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:28 [This was the first IPD project..] (3:3750-3:3794) (Super)
Codes: [Owner] [Team member IPD experience]
This was the first IPD project for ThedaCare.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:26 [Insurance Each entity maintain..] (3:3594-3:3645) (Super)
Codes: [Reward structure_insurance]
Insurance: Each entity maintained typical insurance."

Not Given
"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:10 [IPD Profile No information ava..] (2:1962-2:2101) (Super)
Codes: [Motivator_Cost] [Motivator_Market] [Motivator_Risk] [Motivator_Schedule] [Motivator_Technical] [Strong motivators]
IPD Profile: No information available on the LLC's motivation to select IPD. There was no mention of particular limitations or challenges.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:10 [IPD Profile No information ava..] (2:1962-2:2101) (Super)
Codes: [Motivator_Cost] [Motivator_Market] [Motivator_Risk] [Motivator_Schedule] [Motivator_Technical] [Strong motivators]
IPD Profile: No information available on the LLC's motivation to select IPD. There was no mention of particular limitations or challenges.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:10 [IPD Profile No information ava..] (2:1962-2:2101) (Super)
Codes: [Motivator_Cost] [Motivator_Market] [Motivator_Risk] [Motivator_Schedule] [Motivator_Technical] [Strong motivators]
IPD Profile: No information available on the LLC's motivation to select IPD. There was no mention of particular limitations or challenges.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:10 [IPD Profile No information ava..] (2:1962-2:2101) (Super)

Codes: [Motivator_Cost] [Motivator_Market] [Motivator_Risk] [Motivator_Schedule] [Motivator_Technical] [Strong motivators]
IPD Profile: No information available on the LLC’s motivation to select IPD. There was no mention of particular limitations or challenges.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:10 [IPD Profile No information ava..] (2:1962-2:2101) (Super)
Codes: [Motivator_Cost] [Motivator_Market] [Motivator_Risk] [Motivator_Schedule] [Motivator_Technical] [Strong motivators]
IPD Profile: No information available on the LLC’s motivation to select IPD. There was no mention of particular limitations or challenges.

"P14: 10 Encircle Health Ambulatory Care Center.pdf - 14:10 [IPD Profile No information ava..] (2:1962-2:2101) (Super)
Codes: [Motivator_Cost] [Motivator_Market] [Motivator_Risk] [Motivator_Schedule] [Motivator_Technical] [Strong motivators]
IPD Profile: No information available on the LLC’s motivation to select IPD. There was no mention of particular limitations or challenges.

Project 11
General Information
"P15: 11 Walter Cronkite School of Journalism.pdf - 15:1 [Walter Cronkite School of Jour..] (1:158-1:199) (Super)
Codes: [Project Name]
Walter Cronkite School of Journalism

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:3 [Higher Education] (2:225-2:240) (Super)
Codes: [Project Type]
Higher Education

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:2 [Phoenix, Arizona] (2:200-2:215) (Super)
Codes: [Location]
Phoenix, Arizona

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:8 [Although the team could not en..] (2:2730-2:3055) (Super)
Codes: [Contract]
Although the team could not enter into a pure tri-party IPD contract and were not able to make changes to the City's standard contract, the team agreed to follow IPD principles for managing the project delivery, including strategies such as early involvement of key participants, open books, and partial co-location.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:14 [Contract Contract Type • Desig..] (3:2604-3:2645) (Super)
Codes: [Contract]
Contract Type: Design/build

P15: 11 Walter Cronkite School of Journalism.pdf - 15:15 [The contract was a two-way own..] (3:2648-3:2872) (Super)
Codes: [Contract]
The contract was a two-way owner/designer-builder contract as prescribed by City procurement regulations; the contract was so inflexible that even misspellings could not be corrected without action by the city council.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:16 [Commercial Terms As a public p..] (3:2875-3:3108) (Super)
Codes: [Contract]
Commercial Terms: As a public project, the team was not able to make changes to the contract and so the contract did not include IPD specific language. Nevertheless, many IPD features were implemented on a non-contractual basis.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:4 [2006] (2:374-2:377) (Super)
Codes: [Project Start Time]

2006

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:5 [2008] (2:396-2:399)   (Super)
Codes: [Est. Completion Time]
2008

Positive

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:10 [Cost Predictability The projec..]
(3:916-3:1167)   (Super)
Codes: [Motivator_Cost]
Cost Predictability: The project costs were tightly fixed due to the bond funding mechanism. The promise of flexibility offered by IPD was a major factor in choosing this delivery method to achieve the desired project within the budget constraint

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:7 [Plans based on another downtow..]
(2:848-2:1530)   (Super)
Codes: [Strong motivators] [Motivator-schedule]
Plans based on another downtown site had fallen through, leaving ASU and the City with only 24 months to complete the project on a new site. The primary issue forcing an extremely tight schedule was the “drop-dead” date for move-in prescribed by the bond measure that financed project, which also limited the budget. The Cronkite School was expected to set a high standard of design quality given its significance to developing ASU downtown campus and prominence within the city. Finding an alternative project delivery method was essential to achieve the design goals within the schedule and budget constraints; there was no time for a design-bid-build scenario.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:11 [Schedule Predictability The bo..]
(3:1171-3:1568)   (Super)
Codes: [Motivator_Schedule] [Strong motivators]
Schedule PredictabilityThe bond funding mechanism prescribed the project drop-dead date for move-in, which created an inflexible and challenging project schedule for the level of design quality required. Schedule predictability was therefore a primary motivation for the team to follow IPD principles, as early involvement of key trades was one of the only ways to achieve the schedule.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:12 [Risk Management With the sched..]
(3:1571-3:1870)   (Super)
Codes: [Motivator_Risk]
Risk Management: With the schedule and budget constraints as well as the expectations for high quality design, the team had an uphill battle with many potential risks. IPD was seen as an opportunity to reduce these risks due to the collaborative nature and transparency of the IPD philosophy.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:13 [Technical Complexity This proj..]
(3:1874-3:2307)   (Super)
Codes: [Motivator_Technical] [Strong motivators]

Technical Complexity: This project was critical component of ASU's new downtown campus. As a signature project, there were high expectations for design and program for the building, adding another challenge to the tight budget and schedule requirements. Given this complexity, the team felt IPD was the only way to get the right people in the rooms when decisions needed to be made to achieve the design and program goals.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:7 [Plans based on another downtow..] (2:848-2:1530) (Super)
Codes: [Strong motivators] [Motivator-schedule]
Plans based on another downtown site had fallen through, leaving ASU and the City with only 24 months to complete the project on a new site. The primary issue forcing an extremely tight schedule was the "drop-dead" date for move-in prescribed by the bond measure that financed project, which also limited the budget. The Cronkite School was expected to set a high standard of design quality given its significance to developing ASU downtown campus and prominence within the city. Finding an alternative project delivery method was essential to achieve the design goals within the schedule and budget constraints; there was no time for a design-bid-build scenario.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:11 [Schedule Predictability The bo..] (3:1171-3:1568) (Super)
Codes: [Motivator_Schedule] [Strong motivators]
Schedule Predictability: The bond funding mechanism prescribed the project drop-dead date for move-in, which created an inflexible and challenging project schedule for the level of design quality required. Schedule predictability was therefore a primary motivation for the team to follow IPD principles, as early involvement of key trades was one of the only ways to achieve the schedule.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:13 [Technical Complexity This proj..] (3:1874-3:2307) (Super)
Codes: [Motivator_Technical] [Strong motivators]
Technical Complexity: This project was critical component of ASU's new downtown campus. As a signature project, there were high expectations for design and program for the building, adding another challenge to the tight budget and schedule requirements. Given this complexity, the team felt IPD was the only way to get the right people in the rooms when decisions needed to be made to achieve the design and program goals.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:19 [The City and ASU challenged th..] (4:705-4:954) (Super)
Codes: [Aligned Project Goals] [Decision Making System]
The City and ASU challenged the team to give them the most they could get for the money. A prioritized list of add-ons was agreed to. Owner, architects, and builder were able to collaboratively decide how to spend the funds for maximum gain.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:37 [Decisions were arrived by cons..] (5:3039-5:3276) (Super)
Codes: [Decision making system]

Decisions were arrived by consensus and very rarely did issues have to go to a higher authority for resolution. This kind of collaborative, quick, and final decision-making process was key to achieving such an aggressive schedule.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:39 [Thanks to the flexibility prov..] (5:3365-6:367) (Super)
Codes: [Decision Making System] [Early involvement effectiveness]
Thanks to the flexibility provided by early involvement, transparency and collaborative decision-making, several design decisions were made to optimize the project within the schedule and budget constraints. For example, a structural and foundation system was designed that could flexibly accommodate ongoing design refinement. The foundation may have been a bit overdesigned, but early design enabled optimization of larger project goals. Flat, post-tensioned slabs were used to maximize flexibility as the detailed design proceeded.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:19 [The City and ASU challenged th..] (4:705-4:954) (Super)
Codes: [Aligned Project Goals] [Decision Making System]
The City and ASU challenged the team to give them the most they could get for the money. A prioritized list of add-ons was agreed to. Owner, architects, and builder were able to collaboratively decide how to spend the funds for maximum gain.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:38 [Information Sharing Every Mond..] (6:2201-6:2313) (Super)
Codes: [Information Sharing Mechanisms]
Information Sharing: Every Monday the latest design ideas were published as a set of 20 or more 11”x17” sheets.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:36 [The project operated very tran..] (5:2591-5:2861) (Super)
Codes: [Financial Transparency]
The project operated very transparently with open books. Even subcontractors were required to keep open book accounting of costs. The project participants believed that their risk was reduced due to the completely transparent way in which the project was managed.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:40 [Mathew Chaney of Ehrlich Archi..] (6:845-6:1361) (Super)
Codes: [Trust] [BIM]
Mathew Chaney of Ehrlich Architects pointed out they do not provide quantity take-offs on design-bid-build projects, “but in this project it was a daily occurrence. Because of the trust established we weren’t afraid to get involved. We were constantly using the BIM model to test the cost of different design ideas.” Jackson concluded, “The reality is when you’re willing to take responsibility and provide the builder with those materials quantities the end result is the risk goes down for everybody.”

P15: 11 Walter Cronkite School of Journalism.pdf - 15:45 [BIM was used extensively throu..] (6:2321-6:2793) (Super)

Codes: [BIM]
BIM was used extensively through programming, design and construction, but there was no standardization of software platforms. Ehrlich had extensive experience with Revit, and discovered in the process of program validation that it was also useful as an interactive 3D programming tool in live user group meetings.
Ehrlich Architects began rapidly testing alternative schemes, always working in 3D, and always with the full participation of the builders.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:46 [Navisworks was used to stitch ..] (6:3542-6:3685) (Super)
Codes: [BIM]
Navisworks was used to stitch together models created in various software packages. The mechanical engineer led the clash-detection process.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:35 [All of the disciplines needed ..] (5:1767-5:2055) (Super)
Codes: [Phase of involvement]
All of the disciplines needed for a complete design were on board as the design process began. The architect and contractor were selected as one team. Engineers and critical trades were also brought on board immediately and participated in the design process, (see Firm Selection).

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:39 [Thanks to the flexibility prov..] (5:3365-6:367) (Super)
Codes: [Decision Making System] [Early involvement effectiveness]
Thanks to the flexibility provided by early involvement, transparency and collaborative decision-making, several design decisions were made to optimize the project within the schedule and budget constraints. For example, a structural and foundation system was designed that could flexibly accommodate ongoing design refinement. The foundation may have been a bit overdesigned, but early design enabled optimization of larger project goals. Flat, post-tensioned slabs were used to maximize flexibility as the detailed design proceeded.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:42 [A “Big Room” was set up at HDR..] (6:1375-6:1937) (Super)
Codes: [Co-location]
A “Big Room” was set up at HDR’s office. Howard Shugar, HDR’s project manager said “If you didn’t have the right people in the room you couldn’t make the decisions when they needed to be made.” The co-location of team members helped leverage the benefits of BIM, (see BIM)
Michael Jackson, HDR principal in charge said, “Co-location works because when you work that closely together you naturally develop a relationship of trust. When everyone is in their own office and using email and staying at arms’ length it doesn’t allow that to happen.”

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:40 [Mathew Chaney of Ehrlich Archi..] (6:845-6:1361) (Super)
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established we weren't afraid to get involved. We were constantly using the BIM model to test the cost of different design ideas." Jackson concluded, "The reality is when you're willing to take responsibility and provide the builder with those materials quantities the end result is the risk goes down for everybody."

P15: 11 Walter Cronkite School of Journalism.pdf - 15:43 [Michael Jackson, HDR principal..] (6:1659-6:1937) (Super)
Codes: [Trust]
Michael Jackson, HDR principal in charge said, "Co-location works because when you work that closely together you naturally develop a relationship of trust. When everyone is in their own office and using email and staying at arms' length it doesn't allow that to happen."

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:26 [HDR and Ehrlich applied togeth..] (4:2969-4:3112) (Super)
Codes: [Culture Fit]
HDR and Ehrlich applied together as a design team. They felt that their combined talents and experience would be a good fit for the project.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:41 ["In order to be successful we ..] (6:379-6:1359) (Super)
Codes: [Culture Fit]
"In order to be successful we had to change the behaviors we were used to," said Sundt's Terry Abair. "If everyone had fallen back on their normal behavior we never would have gotten there." Compromises had to be made to accommodate the aggressive schedule. According to Michael Jackson of HDR, "in the old fashioned relationships we're always thinking 'How can I shift that risk to the other two parties' but it's just pushing the shells around." Mathew Chaney of Ehrlich Architects pointed out they do not provide quantity take-offs on design-bid-build projects, "but in this project it was a daily occurrence. Because of the trust established we weren't afraid to get involved. We were constantly using the BIM model to test the cost of different design ideas." Jackson concluded, "The reality is when you're willing to take responsibility and provide the builder with those materials quantities the end result is the risk goes down for everybody

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:23 [An Executive Committee that co..] (4:1701-4:1961) (Super)
Codes: [Manage]
An Executive Committee that consisted of high-level representation of all participants and stakeholders managed project oversight. This executive team met every other week through the life of the project, even frequently including the Dean of Journalism.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:47 [HDR's engineers developed sing..] (6:3189-6:3540) (Super)
Codes: [Manage]
HDR's engineers developed single-line diagrams of systems, which were turned over to subcontractors for detailed modeling. The transition from consulting engineers to design-build subcontractors was almost completely seamless. The two sets of engineers sat across from each other in the Big Room and designed collaboratively, (see Workplace).

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:44 [As a result of the success of ..] (6:2081-6:2198) (Super)
Codes: [Commitment to IPD process]
As a result of the success of this project HDR has built out a new space in its office specifically for co-location.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:51 [In the end, efficiencies achie..] (4:957-4:1141) (Super)
Codes: [Actual Cost Growth]
In the end, efficiencies achieved during construction and buyout, allowed the entire program to be achieved and all the space to be finished without touching the extra $2 million.

Neutral

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:6 [The two firms had previously p..] (2:2216-2:2371) (Super)
Codes: [Previous cooperation experience]
The two firms had previously pursued work together but never landed a job, although key individuals at HDR and Sundt had prior working relationships.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:21 [Liability The standard City of..] (4:1394-4:1543) (Super)
Codes: [Reward structure liability waiver]
Liability: The standard City of Phoenix contract contained a limitation of consequential damages provision but there was not a “no-sue” clause.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:50 [Most participants felt that so..] (5:1509-5:1744) (Super)
Codes: [Remove Obstacles] [Lean Construction Tools]
Most participants felt that some of the lean construction thinking is doctrinaire and inflexible. While this indicates that lean processes were used, there is no specific information as to exactly what or how this was implemented.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:25 [Teams were selected on the bas..] (4:2804-4:2964) (Super)
Codes: [Culture Fit]
Teams were selected on the basis of familiarity with the project type, experience working with public agencies, and the prospect of working well together.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:28 [Sundt chose its subcontractors..] (5:217-5:348) (Super)
Codes: [Culture Fit]
Sundt chose its subcontractors in a qualifications-based process, agreeing to fixed fees but with open book accounting of costs.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:32 [Participants felt that design-..] (5:1175-5:1490) (Super)
Codes: [Culture Fit]
Participants felt that design-build subcontractors are typically uncomfortable with the uncertainty and sometimes chaotic nature of early design and the iterative process that designers must follow to arrive at an appropriate solution. All felt this could be overcome with additional training and experience.

Negative

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:33 [The team felt that although a ..] (5:897-5:1490) (Super)
Codes: [Training]
The team felt that although a hurry-up schedule can often be a productivity advantage, in this case another month would have been very useful. There was not enough time up front to engage in the kind of team-building that is needed in such an intense collaboration.
Participants felt that design-build subcontractors are typically uncomfortable with the uncertainty and sometimes chaotic nature of early design and the iterative process that designers must follow to arrive at an appropriate solution. All felt this could be overcome with additional training and experience.

P15: 11 Walter Cronkite School of Journalism.pdf - 15:48 [When design began, Ehrlich was..] (6:3705-6:4076) (Super)
Codes: [Training]
When design began, Ehrlich was working in Revit. HDR, which at the time was still using Architectural Desktop, determined that there was insufficient time to train their personnel on new software. Translating the models back and forth turned out to be a cumbersome and problematic process and a major inefficiency. HDR has since transitioned completely to Revit.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:9 [Market Position This was not a..] (3:437-3:509) (Super)
Codes: [Motivator_Market]
Market Position: This was not a primary motivation for ASU and the City.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:20 [Risk/Reward The project was ob..] (4:1144-4:1391) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool]
Risk/Reward: The project was obliged to follow the standard City of Phoenix design-build contract, which did not allow for a shared “pain and gain” mechanism. Money saved through efficiencies was put back into the project for value-add items.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:20 [Risk/Reward The project was ob..] (4:1144-4:1391) (Super)
Codes: [Reward Structure- Incentive] [Reward Structure-risk pool]
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"P15: 11 Walter Cronkite School of Journalism.pdf - 15:50 [Most participants felt that so..] (5:1509-5:1744) (Super)
Codes: [Remove Obstacles] [Lean Construction Tools]
Most participants felt that some of the lean construction thinking is doctrinaire and inflexible. While this indicates that lean processes were used, there is no specific information as to exactly what or how this was implemented.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:49 [Building erection had to begin..] (6:4081-6:4451) (Super)
Codes: [Manage] [BIM]
Building erection had to begin before all systems were fully designed. Full BIM coordination was not possible until the 3rd floor was in place, and because old-fashioned paper-based coordination had to be used some rework on lower floors was necessary. Sundt now requires its major subcontractors to model their systems in 3D as a condition of working together.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:24 [According to Michael Jackson o..] (4:2190-4:2412) (Super)
Codes: [Commitment]
According to Michael Jackson of HDR, “owners are not used to the level of commitment of taking responsibility equally with architects and builders and accepting some risk themselves. The owner has to be at the table.”

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:49 [Building erection had to begin..] (6:4081-6:4451) (Super)
Codes: [Manage] [BIM]
Building erection had to begin before all systems were fully designed. Full BIM coordination was not possible until the 3rd floor was in place, and because old-fashioned paper-based coordination had to be used some rework on lower floors was necessary. Sundt now requires its major subcontractors to model their systems in 3D as a condition of working together.

Not Given

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:30 [it is unclear if any of the en..] (5:801-5:877) (Super)
Codes: [Team member IPD experience]
it is unclear if any of the entities involved had previous IPD experience.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:30 [it is unclear if any of the en..] (5:801-5:877) (Super)
Codes: [Team member IPD experience]
it is unclear if any of the entities involved had previous IPD experience.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:30 [it is unclear if any of the en..] (5:801-5:877) (Super)
Codes: [Team member IPD experience]

it is unclear if any of the entities involved had previous IPD experience.

"P15: 11 Walter Cronkite School of Journalism.pdf - 15:22 [Insurance No information avail..] (4:1546-4:1581) (Super)
Codes: [Reward structure_insurance]
Insurance: No information available.

Project 12
General Information
"P16: 12 USCF Mission Bay Medical Center.pdf - 16:1 [USCF Mission Bay Medical Cente..] (1:166-1:200) (Super)
Codes: [Project Name]
USCF Mission Bay Medical Center

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:3 [Hospital] (2:234-2:241) (Super)
Codes: [Project Type]
Hospital

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:7 [At $1.5 billion there are thre..] (2:646-2:757) (Super)
Codes: [Project Cost]
At $1.5 billion there are three buildings: the main hospital, an outpatient building, and an energy center.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:2 [San Francisco, CA] (2:208-2:224) (Super)
Codes: [Location]
San Francisco, CA

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:4 [Multiple Independent Contracts..] (2:255-2:284) (Super)
Codes: [Contract]
Multiple Independent Contracts

P16: 12 USCF Mission Bay Medical Center.pdf - 16:19 [Contract Type • Multiple indep..] (3:3208-3:3573) (Super)
Codes: [Contract]
Contract Type
- Multiple independent contractsContract Issued
- Architect – Standard Architectural contract, issued January 2007
- Prime – GMP Phase 1-Preconstruction Services Contract, issued August 2008
- Design Assist Subs – DA services, issued March 2009 under the CM
- Construction contract-GMP Phase 2- awarded late 2011

P16: 12 USCF Mission Bay Medical Center.pdf - 16:20 [The UC system has not adopted ..] (3:3576-3:4425) (Super)
Codes: [Contract]
The UC system has not adopted multi-party agreements and so this project uses a traditional contract structure. The architects were contracted with UCSF using their standard contract providing design services.
The Contractor was under a GMP contract with the owner. This contract referenced collaborative behavior, but did not extensively define those expectations. Contracted under the Contractor were several major subs including MEP, concrete, and drywall. They were brought on shortly

after the Contractor was contracted to provide design assist (DA) services. The DA contracts included detailed descriptions of collaborative working expectations. None of the DA contracts were directly tied to UCSF, however the owner reviewed them. UCSF also had separate contracts with equipment planners and third party reviewers

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:5 [January 2007] (2:419-2:430) (Super)
Codes: [Project Start Time]
January 2007

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:6 [August 2014] (2:451-2:461) (Super)
Codes: [Est. Completion Time]
August 2014

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:8 [UC was able to adopt a collabo..]
(2:1077-2:1211) (Super)
Codes: [Initiation Party]
The project began by following a traditional design process, even as concurrently the UCSF Director of Design and Construction was working to pursue an integrated and collaborative delivery model. UC was able to adopt a collaborative delivery process however contracts and contractual relationships remained fairly traditional.

Positive

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:24 [The first, and possibly most s..]
(4:2196-4:2772) (Super)
Codes: [Training] [Manage] [Aligned Project Goals]
The first, and possibly most significant strategy, was to contract the Center for Integrated Facility Engineering (CIFE) and an independent team facilitator to work with, educate, and build the team (see Project Planning). To reinforce and share those lessons, project leadership continue to hold alignment meetings to discuss how the team should work together to deliver the best project possible. These meetings range in size from very tight groups of representatives from each firm to a meeting including several hundred people including the building trades.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:46 [There were pre-existing relati..]
(6:3461-6:3791) (Super)
Codes: [Previous cooperation experience]
There were pre-existing relationships at both the firm and individual level for most of the participants, including major and minor subs. The architect noted, “healthcare building is a pretty small community. We do tend to know each other.” The owner added, “that was true of many of the other firms we were talking to.”

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:11 [Market Position This was a pri..]
(2:2122-2:2641) (Super)
Codes: [Motivator_Market]
Market Position: This was a primary driver for UCSF to opt for an IPD model. At the time UCSF was initiating the project, there was tremendous competition with several other large hospital projects underway in the region. It was difficult for UCSF, a public organization that typically

does hard bid projects, to attract firms with the capability to do a job of this size and complexity. In the end, UCSF was successful in creating a project team interested in creating a project with IPD characteristics.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:12 [Although the contract structur..]
(2:2816-2:3018) (Super)
Codes: [Motivator_Market]
Although the contract structure was not integrated, the collaborative experience proved very valuable to the contractor and architect and they are marketing their experience to win additional work.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:13 [Cost Predictability As with mo..]
(3:166-3:856) (Super)
Codes: [Motivator_Cost] [Target Value Design]
Cost Predictability: As with most large projects, budget was a significant factor and was a major driver for UCSF to select an IPD delivery model. The Director of Design and Construction, who had helped build the alliance building program while at Kaiser, felt cost was most predictable under the integrated model. The contractor was confident it would provide more control as it had on past project experience that also used a Target Value Design process. Perceived Benefits: IPD and Target Value Design provide much more control over cost. The team was able to price before the design was drawn, allowing the team to optimize the design to what the client could afford.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:14 [Schedule Predictability Schedu..]
(3:859-3:1015) (Super)
Codes: [Motivator_Schedule]
Schedule Predictability Schedule predictability was a driver because UCSF was to complete this project to satisfy the requirements of Senate Bill 1953.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:99 [The project team felt the proj..]
(3:2936-3:3119) (Super)
Codes: [Motivator_Schedule] [Perceived Schedule Performance] [Strong Motivator]
The project team felt the project required IPD and co-location in order to meet the OSHPD submittal dates, without it they estimate an additional 6 months would have been needed.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:15 [Reduced Risk Risk management w..]
(3:1504-3:2078) (Super)
Codes: [Motivator_Risk]
Reduced Risk: Risk management was a major driver to selecting IPD. The project was very large and complex with high risks. The project director felt the project would have been at far greater risk if it had been a hard bid job. Perceived Benefit: The team felt there were significantly lower risks due to the transparency and high functioning team provided by the integrated delivery. The contractor in particular noted, “you can only do so much as one company, having an entire team that works collaboratively has demonstrated significant risk reduction.”

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:16 [Design Complexity IPD was almo..] (3:2081-3:2481) (Super)
Codes: [Motivator_Technical] [Strong motivator]
Design Complexity: IPD was almost a necessity in order to build the team capable of successfully completing a project of this size and complexity. Many healthcare facilities provide primary care, while this hospital will be at the tertiary care level. Furthermore, this project is generating new care protocols that outpace typical healthcare evolution, which is typically a 6-8 month rate.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:17 [The architect felt the integra..] (3:2784-3:2934) (Super)
Codes: [Motivator_Technical]
The architect felt the integration gave them the ability to react to the technical complexities, providing more certainty and control to the owner.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:99 [The project team felt the proj..] (3:2936-3:3119) (Super)
Codes: [Motivator_Schedule] [Perceived Schedule Performance] [Strong Motivator]
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P16: 12 USCF Mission Bay Medical Center.pdf - 16:16 [Design Complexity IPD was almo..] (3:2081-3:2481) (Super)
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"P16: 12 USCF Mission Bay Medical Center.pdf - 16:22 [The owner created an incentive..] (4:1019-4:2048) (Super)
Codes: [Reward Structure- Incentive] [Culture fit]
The owner created an incentive program, whereby the team is rewarded for schedule performance, collaborative behavior, safety performance, change order mitigation, quality control, workforce collaboration and overall budget performance. The majority of these incentives are awarded based on performance to an established metric. The overall budget performance is a shared savings incentive in which the Contractor and the MEP subs with GMP subcontracts participate in a portion of the savings acquired through successful execution of the work under the budgeted cost. The Contractor believes these incentive arrangements played a significant role in tying the subs together, promoting open dialogue, and supporting the desired collaborative behavior. The MEP trades recognized that if they help their partners be more efficient, without significant impact to their own scope of work, there was mutual benefit. Conversely, if a situation caused a partner to lose money, it cost everyone money

P16: 12 USCF Mission Bay Medical Center.pdf - 16:26 [The shared savings program is ..] (4:3645-4:4216) (Super)

Codes: [Commitment] [Reward Structure- Incentive] [Manage]
The shared savings program is an effective cultural tool that maintains give and take between subs; after each executive meeting, individual participants spread the message about the importance of interaction, noticeably reinvigorating the larger team to work as one organization. One of the project's BIM coordinators commented, "Sometimes I feel like there's a lot of love in this room …people will say, 'Oh I'll move.' In the 2 years I've been doing coordination [for this project], there are maybe 5 instances where people said, 'No, I cannot move.'"

P16: 12 USCF Mission Bay Medical Center.pdf - 16:33 [Separate from the contract, th..] (5:1045-5:1240) (Super)
Codes: [Reward Structure- Incentive]
Separate from the contract, there was an incentive program tied to project milestones and team performance metrics as well as a shared savings incentive for MEP subs, see details under Goals

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:78 [Team members speculated that t..] (10:2933-10:3645) (Super)
Codes: [Remove obstacles]
Team members speculated that the degree of culture change may be related to the size of the group at the time a particular firm joined. As the project shifted into the construction phase, new team members were brought on and people redistributed. Team members noted relationships formed during construction were less close compared to earlier ones leading to more difficulty with communication and less enforcement of behavioral principles. To alleviate this disconnection, a team member from the architect team created an orientation packet for new team members; it outlined logistical information about the team as well as the team charter (goals and expectations) of each particular group.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:80 [Market Impact The market crash..] (10:4422-11:798) (Super)
Codes: [Manage] [Remove obstacles]
Market Impact: The market crash of 2008 was the biggest obstacle to maintaining a culture of trust on this project. The rumor of a hard bid circulated throughout the local industry. Sub-contractors who assumed that design assist would lead to construction contracts were concerned that their trust had been abused. In fact, the project did not switch to hard bid and the DA subs were awarded contracts as anticipated,
In response to the tension, the project leadership took action to restore the team relationships. They first developed a survey and distributed it to the entire team, giving everyone the opportunity to share their concerns and make suggestions for improvement (also see Goals under Communication & Alignment). Questions focused on each organization, UCSF, Stantec, and DPR. Once the results had been reviewed, an all hands meeting were held to share the results and identify action items that each organization could take to improve their standing with the team. At the time of this study, the team was still in the process of determining how frequently to follow-up on this exercise, but improvements in team morale have been noted.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:83 [Most team members adapted well..] (11:1723-11:2132) (Super)
Codes: [Co-location] [Remove obstacles]

Most team members adapted well to the co-located and open office environment, however the team recognized that not all activities were well suited to the active and open environment. To address this, they provided breakout rooms that gave individuals a place to work quietly in order to have a conference call or if they needed a private area to focus, think, and work out solutions independently.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:98 [A strategy implemented by the ..] (4:4594-5:445) (Super)
Codes: [Remove Obstacles] [Trust]
A strategy implemented by the team to build and maintain trust was a questionnaire and trust discussion (see more in Culture under Market Impact). A questionnaire was sent to the entire team, it asked individuals how they perceived each organization, owner, architect, contractor, in terms of good and bad behaviors or actions. Project leadership learned a great deal of information by reviewing the results. An all hands meeting was held where each organization committed to actions that would address the concerns raised, demonstrating their willingness to change. For example, DPR adapted their communication style so that factors other than cost (such as quality or sustainability) could be acknowledged more readily. Another follow-up exercise enabled team members to identify principles of trust that all individuals should abide by.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:68 [One of the biggest differences..] (9:2726-9:3118) (Super)
Codes: [Commitment] [Decision making system]
One of the biggest differences between IPD and design build is owner involvement. As an active part of the decision making process, the owner had significant influence on the project outcomes by offering valuable insight to the design and construction team, especially with regard to operational issues. Their perspective was critical to evaluating the true cost/benefit tradeoffs.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:71 [During the construction phase,..] (9:4679-10:910) (Super)
Codes: [Decision Making System][manage]
During the construction phase, the Captains group dissolved, replaced by the Project Solutions Group (PSG). The PSG group coordinates issues, evaluates solutions and provides direction on issues that are not resolved in the daily huddles. The group includes leaders from the owner, architect, and Contractor, and PM consultant, often the same people who had served as Captains during the design phase. Anyone on the integrated team can bring an issue to the PSG group; items are tracked on a PSG log. The individual that sponsors the issue, or a representative from their respective organization, attends the meeting to present the problem. This process enables - the project leadership to respond very quickly. PSG meetings occurred daily during “office hours,” a time when no other meetings could be scheduled. This ensures all team members are available to address any urgent issues. PSG items are sorted daily and color coded to help prioritize time critical items over issues that could be addressed at a later time. The PSG log also tracked costs so budget implications are known. Once a solution was identified, the issue was relegated to the appropriate path typically (RFI, field order, change order or submittal) for official resolution and documentation.

Most decisions were made through the PSG, with the exception of Elective Change Requests (ECR). Elective changes are brought to the executive level decision makers who control the elective contingency budget.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:72 [During design, the primary dec..] (9:3437-9:4674) (Super)
Codes: [Decision Making System][Negotiation]
During design, the primary decision makers were the Captains, representatives from every major firm involved at the time. Captains played several roles and met as needed, at times daily, sometimes every other day. The Captains group was responsible for helping resolve issues at many levels, from team structure and relationships to significant project decisions. Sometimes the group would function as mediator if there were disagreements at the cluster level. One of key roles they played was revising and streamlining the Project Modification and Innovation (PMI) process (see Implementation), which was a powerful tool for harnessing the expertise of all team members in problem solving. Most issues, including over 600 PMIs, went through the captain's group before going to the executive level. Their level of authority evolved as the confidence level rose between the executives and the Captains. In the beginning, every PMI was elevated to the executive level because the executives wanted control over decisions that may have significant impacts to construction. After about a 5-month calibration period, the executives granted the Captains power to make decisions with impacts up to $50,000.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:24 [The first, and possibly most s..] (4:2196-4:2772) (Super)
Codes: [Training] [Manage] [Aligned Project Goals]
The first, and possibly most significant strategy, was to contract the Center for Integrated Facility Engineering (CIFE) and an independent team facilitator to work with, educate, and build the team (see Project Planning). To reinforce and share those lessons, project leadership continue to hold alignment meetings to discuss how the team should work together to deliver the best project possible. These meetings range in size from very tight groups of representatives from each firm to a meeting including several hundred people including the building trades.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:25 [Another approach taken by the ..] (4:2776-4:3417) (Super)
Codes: [Manage] [Aligned project goals]
Another approach taken by the project team, was to clearly articulate goals, collaborative expectations, and incentives within the design assist (DA) contracts. Using the contract ensured subs understood expectations for meeting incentive requirements from the beginning. Additionally, the Contractor found that meeting with the superintendent and PM's participating in upcoming milestones was very effective at maintaining alignment and proactively ensuring each participant had a clear understanding of the relational behaviors needed to achieve that goal. These meetings served as a reminder of shared milestone goals

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:27 [Subcontractors, who were tied ..] (4:3479-4:3644) (Super)
Codes: [Information Sharing Mechanisms] [Manage]

Subcontractors, who were tied to the shared savings plan, meet monthly with the Contractor's executives to discuss items and issues affecting the entire project.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:43 [All groups, at both the produc..] (6:2089-6:2322) (Super)
Codes: [Information Sharing Mechanisms] [Manage]
All groups, at both the production and cluster level, identified a lead individual responsible to coordinate with other groups. Overlap and cross talk between groups enabled flexibility and control of cost, schedule and quality.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:50 [They observed that subcontract..] (7:1490-7:1927) (Super)
Codes: [Culture Fit] [Information sharing mechanisms]
They observed that subcontractors who were used to closed-door offices had difficulty adapting to the open environment; everything worked on is visible, open and accessible to everyone. On the positive side, most subcontractors (and the design team) recognized the benefit to having so many resource people available immediately; it saved time researching and eliminated the need for drafting emails or leaving phone messages.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:69 [Co-location was a critical par..] (9:3120-9:3434) (Super)
Codes: [Co-location] [Information sharing patterns]
Co-location was a critical part of leveraging the benefit of owner involvement. With everyone easily accessible, the team was able to confer with the owner immediately before they invested resources and time chasing down a user group request, or exploring a solution that may not be desirable to the owner.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:85 [Tool s • CMiC (Networked colla..] (11:3310-11:3599) (Super)
Codes: [Information Sharing Mechanisms]
Tools
- CMiC (Networked collaborative Project Management software)
- ProjectWise (Networked document repository software)
- BIM
- Smart Boards
- Face-to-face exchange/Co-location
- Lean tracking
- Visual Management Tools (publicly posted project metrics)

P16: 12 USCF Mission Bay Medical Center.pdf - 16:86 [The team used several tools to..] (11:3602-11:4133) (Super)
Codes: [Information Sharing Mechanisms]
The team used several tools to make information available. The Project Team tracked project metrics, such as Last Planner reliability and project cost goals, which were publicly posted throughout the workspace. One of the project's BIM managers noted that their particular combination of physical, cultural and software tools created the advantages; for example, co-

location ensured the people critical to making decisions were present and the project management software, CMiC, provided the information when needed.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:93 [The team used ProjectWise, a s..] (12:4813-12:5129) (Super)
Codes: [Information Sharing Mechanisms]
The team used ProjectWise, a shared, server based document management system, to manage the models. All project models were live, so everyone had access to the most current information. The server-based system allowed team members working remotely from other parts of the country to also work in real time.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:65 [The project team has seen sign..] (9:634-9:2188) (Super)
Codes: [Early involvement effectiveness] [BIM] [Problem addressed]
The project team has seen significant value added through integrating subcontractors into the team. One of the biggest advantages of the collaboration is the level of detail and reliability of the BIM that was achieved. For example, the detailed coordination of systems enabled shop welding of connections between structural steel and pre-cast and curtain wall elements. Welds were all shop welded by the structural steel sub, far more efficient for the project than field welding by multiple subs. This added some time to structural steel erection, but there was a significant net savings of time and cost to the owner. This would have been very difficult to achieve without IPD because it required accelerated coordination to meet tight time constraints for the steel fabrication submittals and full participation by the architect to determine the location of curtain wall sooner than expected.Another example of integrated collaboration leading to significant owner savings was an inventive cable support system. The project originally specified expensive cable trays. J-hooks are the less costly alternative, but were unacceptable since they limited flexibility for UCSF's facilities team. One of the team members came up with a triangular hook configuration that solved the flexibility issue yet remained low cost. The architects reviewed the option and the electrical sub confirmed they could easily install it, the idea was accepted, saving the project significant cost while meeting user needs.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:88 [BIM Model Manager: Shared betw..] (12:166-12:496) (Super)
Codes: [BIM] [Manage]
BIMModel Manager: Shared between Architect (Anshen + Allen, now Stantec) through DD and Contractor (DPR) for duration.Management Protocol: Team Charters developed during VDC Training with the Center for Integrated Facility Engineering (CIFE)Custom MEP Coordination Process developed by DPR based on owner requirements

P16: 12 USCF Mission Bay Medical Center.pdf - 16:89 [UCSF requested the project tea..] (12:499-12:784) (Super)
Codes: [BIM]
UCSF requested the project team utilize Building Information Modeling (BIM) tools to the greatest extent possible. This meant using BIM for coordination purposes, quantity take-off, estimating and for pre-fabrication. The focus of the coordination effort was on the MEP systems.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:90 [The architect and engineer (AR..] (12:975-12:1208) (Super)
Codes: [BIM]
The architect and engineer (ARUP) were responsible for high-level coordination of the model through 100% DD. The architecture model, built in ArchiCAD, served as the basis for MEP coordination from an architectural perspective.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:92 [One of the biggest challenges ..] (12:4398-12:4810) (Super)
Codes: [Problem Addressed] [BIM]
One of the biggest challenges to the BIM coordination was communicating changes to the entire team. A successful tool was a map of design changes with modifications clouded by the designers. Issues arose making sure other system changes were fully distributed to the team. For example, structural steel discoveries proved difficult to communicate to all systems affected -- some just slipped through.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:94 [The team added additional BIM ..] (13:627-13:1322) (Super)
Codes: [BIM] [Challenge]
The team added additional BIM functionality by linking the model with "Our Plan," the Contractor's software program used to track the Last Planner Schedule. The concept was to link quantities to schedule commitments, and use the information to validate field commitments. They were able to track how long it took trades to complete certain scopes of work, so they could better estimate future work durations. For example, when planning the slab on deck work, they were able to identify areas in the building with a higher number of inserts and adjusted the duration of that piece of work appropriately. BIM was valuable in helping trades visualize challenges to certain areas.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:95 [In addition to coordination, B..] (12:5134-13:204) (Super)
Codes: [BIM]
In addition to coordination, BIM was intended for use in quantity take-offs, estimating and pre-fabrication. The team was able to use the models for some quantity take-offs and prefabrication, but not for estimating.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:96 [A BIM matrix outlined detailed..] (12:3087-12:3236) (Super)
Codes: [BIM]
A BIM matrix outlined detailed roles and responsibilities by discipline; a format created by the Contractor based on past hospital BIM experience.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:97 [The goal was for the 100% CD m..] (12:2628-12:2920) (Super)
Codes: [BIM]
The goal was for the 100% CD model to be fully coordinated and clash free for submission to OSHPD. The model was used to extract the 2D drawings stamped by the design team and

submitted to OSHPD. Post OSHPD submittal, the models were used for shop drawing and prefabrication documents.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:59 [The contractor implemented the..] (8:3008-8:3621) (Super)
Codes: [Last Planner System]
The contractor implemented the Last Planner System managed by their proprietary schedule software called “Our Plan.” The visual and interactive format provided facilitated planning and serves as a learning tool; it helped subcontractors more accurately predict schedules and time commitments. To date, the project maintains an average of 82% reliability for the majority of the construction phase. The contractor noted they would have loved to get higher, but they were cautious that “sandbagging” commitments to reach a higher reliability would decrease willingness to pursue aggressive goals.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:13 [Cost Predictability As with mo..] (3:166-3:856) (Super)
Codes: [Motivator_Cost] [Target Value Design]
Cost Predictability: As with most large projects, budget was a significant factor and was a major driver for UCSF to select an IPD delivery model. The Director of Design and Construction, who had helped build the alliance building program while at Kaiser, felt cost was most predictable under the integrated model. The contractor was confident it would provide more control as it had on past project experience that also used a Target Value Design process. Perceived Benefits: IPD and Target Value Design provide much more control over cost. The team was able to price before the design was drawn, allowing the team to optimize the design to what the client could afford.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:30 [Another follow-up exercise ena..] (5:325-5:566) (Super)
Codes: [Visual management]
Another follow-up exercise enabled team members to identify principles of trust that all individuals should abide by. Those principles were recorded in a visual format and displayed throughout the shared workspace as daily reminders.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:60 [Another valuable implementatio..] (8:3627-8:4071) (Super)
Codes: [Daily Huddle]
Another valuable implementation tool was the daily huddle. Huddles allowed the subs to meet early in the morning with the architect and CM to identify items that may hold up their work for the day, such as an RFI. This allowed the team to prioritize work and decisions to avoid inefficiencies in the field. Decisions that cannot be made in the daily huddle are sent to the Project Solutions Group (PSG) for solution and or direction.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:58 [During design, the team develo..] (8:2267-8:2892) (Super)
Codes: [Other tools]

During design, the team developed a tool for capturing and exploring innovation ideas that could optimize project results. The tool, referred to as a Project Modification and Innovations (PMI), (see more in Decision Making). A PMI is a mechanism to allow everyone on the team to offer input, similar to the Lean tool known as an A3 form. The process was introduced to the team by Cambridge, the owner's consultant. As a result of the PMI process, the team was able to add back original scope that had been deleted to meet budget under the traditional design process of designing first and estimating second.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:65 [The project team has seen sign..] (9:634-9:2188) (Super)
Codes: [Early involvement effectiveness] [BIM] [Problem addressed]
The project team has seen significant value added through integrating subcontractors into the team. One of the biggest advantages of the collaboration is the level of detail and reliability of the BIM that was achieved. For example, the detailed coordination of systems enabled shop welding of connections between structural steel and pre-cast and curtain wall elements. Welds were all shop welded by the structural steel sub, far more efficient for the project than field welding by multiple subs. This added some time to structural steel erection, but there was a significant net savings of time and cost to the owner. This would have been very difficult to achieve without IPD because it required accelerated coordination to meet tight time constraints for the steel fabrication submittals and full participation by the architect to determine the location of curtain wall sooner than expected.
16: 12 USCF Mission Bay Medical Center.pdf - 16:65 (2) [The project team has seen sign..] (9:634-9:2188) (Super)
Codes: [Early involvement effectiveness] [Problem addressed] [Challenge]
Another example of integrated collaboration leading to significant owner savings was an inventive cable support system. The project originally specified expensive cable trays. J-hooks are the less costly alternative, but were unacceptable since they limited flexibility for UCSF's facilities team. One of the team members came up with a triangular hook configuration that solved the flexibility issue yet remained low cost. The architects reviewed the option and the electrical sub confirmed they could easily install it, the idea was accepted, saving the project significant cost while meeting user needs.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:10 [The team co-located on site an..] (2:1764-2:1955) (Super)
Codes: [Co-location]
The team co-located on site and collaboratively developed and coordinated the construction documents. As the team expanded, it remained co-located onsite for the duration of construction.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:57 [Co-location] (8:2233-8:2243) (Super)
Codes: [Co-location]
Co-location

P16: 12 USCF Mission Bay Medical Center.pdf - 16:69 [Co-location was a critical par..] (9:3120-9:3434) (Super)
Codes: [Co-location] [Information sharing patterns]

Co-location was a critical part of leveraging the benefit of owner involvement. With everyone easily accessible, the team was able to confer with the owner immediately before they invested resources and time chasing down a user group request, or exploring a solution that may not be desirable to the owner.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:74 [Co-location was identified as ..] (10:1328-10:1885) (Super)
Codes: [Co-location] [Culture Fit]
Co-location was identified as one of the most critical factors in creating the culture and relationships desired on the project, (see also Workplace). Separate parties work face to face with a higher degree of interaction compared to a non-integrated, non-co-located project. In addition to facilitating work communication, co-location supported social interactions outside of work hours, such as going out to lunch. Team members note that the level of social comfort carries over to work; people are more willing to accommodate one another.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:81 [In the design phase, the team,..] (11:841-11:1380) (Super)
Codes: [Co-location]
In the design phase, the team, up to 105 individuals from 19 firms, co-located to a large (12,000 sf) trailer complex adjacent to the building site. During construction, the complex more than doubled (sf) in size to accommodate the larger number of project engineers on the DPR and the subcontractor teams. The team unanimously placed high value in co-location, attributing to it many of the benefits achieved on the project and the success of the collaborative relationships (also see Decision Making, Culture, and BIM).

P16: 12 USCF Mission Bay Medical Center.pdf - 16:83 [Most team members adapted well..] (11:1723-11:2132) (Super)
Codes: [Co-location] [Remove obstacles]
Most team members adapted well to the co-located and open office environment, however the team recognized that not all activities were well suited to the active and open environment. To address this, they provided breakout rooms that gave individuals a place to work quietly in order to have a conference call or if they needed a private area to focus, think, and work out solutions independently.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:84 [The team identified several be..] (11:2137-11:3283) (Super)
Codes: [Co-location]
The team identified several benefits of full time co-location. Co-location significantly reduced latency on the project. The team discussed trying to measure this benefit and found software that could do it, but did not see the purpose in trying to document the time savings "of a ten second conversation with thirty seconds trying to track it." Even without official metrics, the team felt latency was very minimal. Time was not wasted drafting emails or waiting for responses. When there were delays, most involved consultants not located on site. One factor that likely optimized the benefit of co-location was that most team members, including the owner, were full time on the project – allowing all the resources to be immediately available.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:84 (2) [The team identified several be..] (11:2137-11:3283) (Super)
Codes: [Co-location]
Another significant benefit of co-location was the way it leveraged integration for continuous coordination during the BIM development process. The team was able to fully model and coordinate the 878,000 SF building in 18 months. DPR remarked that the speed and quality of the document production would not have been possible without the integrated, co-located team.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:67 [The Contractor contract requir..] (9:2312-9:2705) (Super)
Codes: [Trust] [Culture fit]
The Contractor contract required the team to work collaboratively, and the team agreed early on that in order to have collaboration you must have transparent communication and sharing of information. Although not explicitly stated in any of the written contracts, transparency was discussed and the team has understood that it was expected of everyone on the project from the start.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:98 [A strategy implemented by the ..] (4:4594-5:445) (Super)
Codes: [Remove Obstacles] [Trust]
A strategy implemented by the team to build and maintain trust was a questionnaire and trust discussion (see more in Culture under Market Impact). A questionnaire was sent to the entire team, it asked individuals how they perceived each organization, owner, architect, contractor, in terms of good and bad behaviors or actions. Project leadership learned a great deal of information by reviewing the results. An all hands meeting was held where each organization committed to actions that would address the concerns raised, demonstrating their willingness to change. For example, DPR adapted their communication style so that factors other than cost (such as quality or sustainability) could be acknowledged more readily. Another follow-up exercise enabled team members to identify principles of trust that all individuals should abide by.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:26 [The shared savings program is ..] (4:3645-4:4216) (Super)
Codes: [Commitment] [Reward Structure- Incentive] [Manage]
The shared savings program is an effective cultural tool that maintains give and take between subs; after each executive meeting, individual participants spread the message about the importance of interaction, noticeably reinvigorating the larger team to work as one organization. One of the project's BIM coordinators commented, "Sometimes I feel like there's a lot of love in this room …people will say, 'Oh I'll move.' In the 2 years I've been doing coordination [for this project], there are maybe 5 instances where people said, 'No, I cannot move.'"

P16: 12 USCF Mission Bay Medical Center.pdf - 16:39 [The architect, Contractor and ..] (5:2199-5:2572) (Super)
Codes: [Commitment] [Team member IPD experience] [Architect] [General Contractor]
The architect, Contractor and subcontractors fully supported the collaborative goals of the owner. There were individuals from these firms who had previous experience with IPD or similarly

collaborative models. Each party demonstrated this commitment by equally sharing the costs of outside consultants and facilitators that focused on integrated team building.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:68 [One of the biggest differences..] (9:2726-9:3118) (Super)
Codes: [Commitment] [Decision making system]
One of the biggest differences between IPD and design build is owner involvement. As an active part of the decision making process, the owner had significant influence on the project outcomes by offering valuable insight to the design and construction team, especially with regard to operational issues. Their perspective was critical to evaluating the true cost/benefit tradeoffs.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:22 [The owner created an incentive..] (4:1019-4:2048) (Super)
Codes: [Reward Structure- Incentive] [Culture fit]
The owner created an incentive program, whereby the team is rewarded for schedule performance, collaborative behavior, safety performance, change order mitigation, quality control, workforce collaboration and overall budget performance. The majority of these incentives are awarded based on performance to an established metric. The overall budget performance is a shared savings incentive in which the Contractor and the MEP subs with GMP subcontracts participate in a portion of the savings acquired through successful execution of the work under the budgeted cost. The Contractor believes these incentive arrangements played a significant role in tying the subs together, promoting open dialogue, and supporting the desired collaborative behavior. The MEP trades recognized that if they help their partners be more efficient, without significant impact to their own scope of work, there was mutual benefit. Conversely, if a situation caused a partner to lose money, it cost everyone money.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:42 [At the beginning of CDs, DA su..] (6:567-6:1021) (Super)
Codes: [Manage] [Culture fit]
At the beginning of CDs, DA subs became involved, and representatives from each organization participated in an event led by the Center for Integrated Facility Engineering (CIFE) to plan production team organization and group overlap strategy, (also see Project Planning). As a result, team structure became layered, with multiple teams interfacing horizontally and vertically to ensure cross collaboration and coordination between groups.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:49 [There was no special considera..] (7:834-7:1486) (Super)
Codes: [Culture Fit]
There was no special consideration given to personality types or collaborative skills when individual participants were selected for the integrated team. However, both the architect and contractor recognized that an individual's preference for, or aversion to large projects was key. The architect commented, "we are always looking for a good dynamic and good fit, especially for a project of this size and duration, but I don't think it's anything special that came from the fact that this was integrated."

P16: 12 USCF Mission Bay Medical Center.pdf - 16:67 [The Contractor contract requir..] (9:2312-9:2705) (Super)
Codes: [Trust] [Culture fit]
The Contractor contract required the team to work collaboratively, and the team agreed early on that in order to have collaboration you must have transparent communication and sharing of information. Although not explicitly stated in any of the written contracts, transparency was discussed and the team has understood that it was expected of everyone on the project from the start.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:74 [Co-location was identified as ..] (10:1328-10:1885) (Super)
Codes: [Co-location] [Culture Fit]
Co-location was identified as one of the most critical factors in creating the culture and relationships desired on the project, (see also Workplace). Separate parties work face to face with a higher degree of interaction compared to a non-integrated, non-co-located project. In addition to facilitating work communication, co-location supported social interactions outside of work hours, such as going out to lunch. Team members note that the level of social comfort carries over to work; people are more willing to accommodate one another.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:76 [Contractor As an organization,..] (10:2498-10:2645) (Super)
Codes: [Culture Fit]
Contractor As an organization, DPR has an open office culture, so the transition to the co-located, integrated working environment was smooth.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:21 [Collaboration was required by ..] (4:250-4:622) (Super)
Codes: [Manage]
Collaboration was required by contract, but the specific organizational structure to support it required development once the majority of the team was in place. The team invested in organizational and team building activities with outside organizations and facilitators (see Early Planning), however the decision to engage these methods was made collaboratively

P16: 12 USCF Mission Bay Medical Center.pdf - 16:24 [The first, and possibly most s..] (4:2196-4:2772) (Super)
Codes: [Training] [Manage] [Aligned Project Goals]
The first, and possibly most significant strategy, was to contract the Center for Integrated Facility Engineering (CIFE) and an independent team facilitator to work with, educate, and build the team (see Project Planning). To reinforce and share those lessons, project leadership continue to hold alignment meetings to discuss how the team should work together to deliver the best project possible. These meetings range in size from very tight groups of representatives from each firm to a meeting including several hundred people including the building trades.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:25 [Another approach taken by the ..] (4:2776-4:3417) (Super)
Codes: [Manage] [Aligned project goals]

Another approach taken by the project team, was to clearly articulate goals, collaborative expectations, and incentives within the design assist (DA) contracts. Using the contract ensured subs understood expectations for meeting incentive requirements from the beginning. Additionally, the Contractor found that meeting with the superintendent and PM's participating in upcoming milestones was very effective at maintaining alignment and proactively ensuring each participant had a clear understanding of the relational behaviors needed to achieve that goal. These meetings served as a reminder of shared milestone goals

P16: 12 USCF Mission Bay Medical Center.pdf - 16:26 [The shared savings program is ..] (4:3645-4:4216) (Super)
Codes: [Commitment] [Reward Structure- Incentive] [Manage]
The shared savings program is an effective cultural tool that maintains give and take between subs; after each executive meeting, individual participants spread the message about the importance of interaction, noticeably reinvigorating the larger team to work as one organization. One of the project's BIM coordinators commented, "Sometimes I feel like there's a lot of love in this room …people will say, 'Oh I'll move.' In the 2 years I've been doing coordination [for this project], there are maybe 5 instances where people said, 'No, I cannot move.'"

P16: 12 USCF Mission Bay Medical Center.pdf - 16:27 [Subcontractors, who were tied ..] (4:3479-4:3644) (Super)
Codes: [Information Sharing Mechanisms] [Manage]
Subcontractors, who were tied to the shared savings plan, meet monthly with the Contractor's executives to discuss items and issues affecting the entire project.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:28 [Informal events, intended to m..] (4:4221-4:4590) (Super)
Codes: [Manage]
Informal events, intended to maintain relationships, collaboration, and alignment, are another strategy. Each quarter, lunch is held for all the management on the project, close to 200 people. As an unstructured event, it gave everyone a chance to slow down and check in with each other in a relaxed, social environment to help maintain positive relationships.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:31 [The time spent communicating t..] (5:572-5:947) (Super)
Codes: [Manage]
The time spent communicating team performance expectations and maintaining the desired behavioral characteristics sometime competed with demands of project specific work. The leadership carefully considered the frequency of all hands alignment meetings; continual adjustments were made to balance time spent team building and that devoted to project specific work.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:42 [At the beginning of CDs, DA su..] (6:567-6:1021) (Super)
Codes: [Manage] [Culture fit]
At the beginning of CDs, DA subs became involved, and representatives from each organization participated in an event led by the Center for Integrated Facility Engineering (CIFE) to plan

production team organization and group overlap strategy, (also see Project Planning). As a result, team structure became layered, with multiple teams interfacing horizontally and vertically to ensure cross collaboration and coordination between groups.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:43 [All groups, at both the produc..]
(6:2089-6:2322) (Super)
Codes: [Information Sharing Mechanisms] [Manage]
All groups, at both the production and cluster level, identified a lead individual responsible to coordinate with other groups. Overlap and cross talk between groups enabled flexibility and control of cost, schedule and quality.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:44 [Anticipating the shift from de..]
(6:2325-6:2896) (Super)
Codes: [Manage]
Anticipating the shift from design to construction, a small representative group was charged with redesigning the organizational strategy to meet changing needs. Without outside facilitators, the group built on the CIFE strategies and their experiences during the design process, (see also Project Planning). They took into consideration the schedule, DPR's strategy for tackling the work, and available personnel resources. The work of the group was transparent, cycles of review and feedback improved the new strategy and created buy in from the team.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:45 [Anticipating the shift from de..]
(6:2325-6:3442) (Super)
Codes: [Manage] [Negotiation]
As the construction phase began, the design and construction production group was re-organized by building: the main hospital, the outpatient building, and energy center. Above the cluster groups, at the project leadership level was the Project Solutions Group. They were charged with resolving construction issues as quickly as possible and to mediate between the production and cluster groups as needed. Their primary objective is to eliminate barriers for the subcontractors in the field, (see details in Decision Making).

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:51 [The team focused a great deal ..]
(7:2089-7:2674) (Super)
Codes: [Manage] [Training]
The team focused a great deal of effort on non-contractual methods of creating team alignment. Since a true multiparty IPD contract was not possible in the UC system, non-contractual means were used to establish relational expectations and implementation details. Team building events and facilitation were thoroughly documented and resulted in formal or informal agreements between the owner, architect, Contractor, and DA subs. Agreements covered topics such as: team organization, collaborative working process, team performance metrics, and behavioral objectives.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:55 [Managing the collaborative tea..]
(8:1232-8:2108) (Super)
Codes: [Manage] [Commitment]

Managing the collaborative team changed effort distribution; the resources were allocated differently. Processes that would normally be completed end to end became overlapped. For example, work that subs typically do in CA was shifted up into the CD phase. Changes had to be made in staffing for the architect and DPR. For the architect, the primary increase in resources and staffing came from additional project leadership required to support the new overlapping process flows. Overall this increased the duration of certain team resources and required more dedicated resources to the project. There was also investment in team building efforts and workshops not typically done in traditional or design build projects. Give and take was needed to accommodate the costs for this different way of working; team members shared costs for team building.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:71 [During the construction phase,..] (9:4679-10:910) (Super)
Codes: [Decision Making System][manage]
During the construction phase, the Captains group dissolved, replaced by the Project Solutions Group (PSG). The PSG group coordinates issues, evaluates solutions and provides direction on issues that are not resolved in the daily huddles. The group includes leaders from the owner, architect, and Contractor, and PM consultant, often the same people who had served as Captains during the design phase. Anyone on the integrated team can bring an issue to the PSG group; items are tracked on a PSG log. The individual that sponsors the issue, or a representative from their respective organization, attends the meeting to present the problem. This process enables - the project leadership to respond very quickly. PSG meetings occurred daily during "office hours," a time when no other meetings could be scheduled. This ensures all team members are available to address any urgent issues. PSG items are sorted daily and color coded to help prioritize time critical items over issues that could be addressed at a later time. The PSG log also tracked costs so budget implications are known. Once a solution was identified, the issue was relegated to the appropriate path typically (RFI, field order, change order or submittal) for official resolution and documentation. Most decisions were made through the PSG, with the exception of Elective Change Requests (ECR). Elective changes are brought to the executive level decision makers who control the elective contingency budget.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:80 [Market Impact The market crash..] (10:4422-11:798) (Super)
Codes: [Manage] [Remove obstacles]
Market Impact: The market crash of 2008 was the biggest obstacle to maintaining a culture of trust on this project. The rumor of a hard bid circulated throughout the local industry. Sub-contractors who assumed that design assist would lead to construction contracts were concerned that their trust had been abused. In fact, the project did not switch to hard bid and the DA subs were awarded contracts as anticipated, In response to the tension, the project leadership took action to restore the team relationships. They first developed a survey and distributed it to the entire team, giving everyone the opportunity to share their concerns and make suggestions for improvement (also see Goals under Communication & Alignment). Questions focused on each organization, UCSF, Stantec, and DPR. Once the results had been reviewed, an all hands meeting were held to share the results and identify action items that each organization could take to improve their standing with the team. At the time of this study, the team was still in the

process of determining how frequently to follow-up on this exercise, but improvements in team morale have been noted.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:88 [BIM Model Manager: Shared betw..] (12:166-12:496) (Super)
Codes: [BIM] [Manage]
BIMModel Manager: Shared between Architect (Anshen + Allen, now Stantec) through DD and Contractor (DPR) for duration.Management Protocol: Team Charters developed during VDC Training with the Center for Integrated Facility Engineering (CIFE)Custom MEP Coordination Process developed by DPR based on owner requirements"

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:94 [The team added additional BIM ..] (13:627-13:1322) (Super)
Codes: [BIM] [Challenge]
The team added additional BIM functionality by linking the model with "Our Plan," the Contractor's software program used to track the Last Planner Schedule. The concept was to link quantities to schedule commitments, and use the information to validate field commitments. They were able to track how long it took trades to complete certain scopes of work, so they could better estimate future work durations. For example, when planning the slab on deck work, they were able to identify areas in the building with a higher number of inserts and adjusted the duration of that piece of work appropriately. BIM was valuable in helping trades visualize challenges to certain areas.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:65 (2) [The project team has seen sign..] (9:634-9:2188) (Super)
Codes: [Early involvement effectiveness] [Problem addressed] [Challenge]
Another example of integrated collaboration leading to significant owner savings was an inventive cable support system. The project originally specified expensive cable trays. J-hooks are the less costly alternative, but were unacceptable since they limited flexibility for UCSF's facilities team. One of the team members came up with a triangular hook configuration that solved the flexibility issue yet remained low cost. The architects reviewed the option and the electrical sub confirmed they could easily install it, the idea was accepted, saving the project significant cost while meeting user needs.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:45 [Anticipating the shift from de..] (6:2325-6:3442) (Super)
Codes: [Manage] [Negotiation]
As the construction phase began, the design and construction production group was re-organized by building: the main hospital, the outpatient building, and energy center. Above the cluster groups, at the project leadership level was the Project Solutions Group. They were charged with resolving construction issues as quickly as possible and to mediate between the production and cluster groups as needed. Their primary objective is to eliminate barriers for the subcontractors in the field, (see details in Decision Making).

P16: 12 USCF Mission Bay Medical Center.pdf - 16:72 [During design, the primary dec..] (9:3437-9:4674) (Super)

Codes: [Decision Making System][Negotiation]
During design, the primary decision makers were the Captains, representatives from every major firm involved at the time. Captains played several roles and met as needed, at times daily, sometimes every other day. The Captains group was responsible for helping resolve issues at many levels, from team structure and relationships to significant project decisions. Sometimes the group would function as mediator if there were disagreements at the cluster level. One of key roles they played was revising and streamlining the Project Modification and Innovation (PMI) process (see Implementation), which was a powerful tool for harnessing the expertise of all team members in problem solving. Most issues, including over 600 PMIs, went through the captain's group before going to the executive level. Their level of authority evolved as the confidence level rose between the executives and the Captains. In the beginning, every PMI was elevated to the executive level because the executives wanted control over decisions that may have significant impacts to construction. After about a 5-month calibration period, the executives granted the Captains power to make decisions with impacts up to $50,000.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:63 [When DPR was brought on, they ..] (8:4591-9:179) (Super)
Codes: [Problem Addressed]
When DPR was brought on, they evaluated the design and current estimate and found the project was well over the established budget. In March 2009, 7 months after the Contractor was contracted, DA subs were brought on to participate in design and find options to bring the design within target.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:65 [The project team has seen sign..] (9:634-9:2188) (Super)
Codes: [Early involvement effectiveness] [BIM] [Problem addressed]
The project team has seen significant value added through integrating subcontractors into the team. One of the biggest advantages of the collaboration is the level of detail and reliability of the BIM that was achieved. For example, the detailed coordination of systems enabled shop welding of connections between structural steel and pre-cast and curtain wall elements. Welds were all shop welded by the structural steel sub, far more efficient for the project than field welding by multiple subs. This added some time to structural steel erection, but there was a significant net savings of time and cost to the owner. This would have been very difficult to achieve without IPD because it required accelerated coordination to meet tight time constraints for the steel fabrication submittals and full participation by the architect to determine the location of curtain wall sooner than expected.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:65 (2) [The project team has seen sign..] (9:634-9:2188) (Super)
Codes: [Early involvement effectiveness] [Problem addressed] [Challenge]
Another example of integrated collaboration leading to significant owner savings was an inventive cable support system. The project originally specified expensive cable trays. J-hooks are the less costly alternative, but were unacceptable since they limited flexibility for UCSF's facilities team. One of the team members came up with a triangular hook configuration that solved the flexibility issue yet remained low cost. The architects reviewed the option and the

electrical sub confirmed they could easily install it, the idea was accepted, saving the project significant cost while meeting user needs.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:92 [One of the biggest challenges ..] (12:4398-12:4810) (Super)
Codes: [Problem Addressed] [BIM]
One of the biggest challenges to the BIM coordination was communicating changes to the entire team. A successful tool was a map of design changes with modifications clouded by the designers. Issues arose making sure other system changes were fully distributed to the team. For example, structural steel discoveries proved difficult to communicate to all systems affected -- some just slipped through.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:101 [Even with the additional desig..] (8:1002-8:1208) (Super)
Codes: [Actual Schedule Growth] [Actual Cost Growth]
Even with the additional design and coordination time, ultimately the team significantly reduced estimated costs and saved 5 months from the construction schedule another major savings for the owner.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:99 [The project team felt the proj..] (3:2936-3:3119) (Super)
Codes: [Motivator_Schedule] [Perceived Schedule Performance]
The project team felt the project required IPD and co-location in order to meet the OSHPD submittal dates, without it they estimate an additional 6 months would have been needed.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:101 [Even with the additional desig..] (8:1002-8:1208) (Super)
Codes: [Actual Schedule Growth] [Actual Cost Growth]
Even with the additional design and coordination time, ultimately the team significantly reduced estimated costs and saved 5 months from the construction schedule another major savings for the owner.

Neutral

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:38 [UCSF's Director of Design and ..] (5:2028-5:2198) (Super)
Codes: [Team member IPD experience] [Owner]
UCSF's Director of Design and Construction had previous experience with collaborative delivery models similar to IPD and championed the process through the UC system.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:39 [The architect, Contractor and ..] (5:2199-5:2572) (Super)
Codes: [Commitment] [Team member IPD experience] [Architect] [General Contractor]
The architect,
Contractor and subcontractors fully supported the collaborative goals of the owner. There were individuals from these firms who had previous experience with IPD or similarly collaborative

models. Each party demonstrated this commitment by equally sharing the costs of outside consultants and facilitators that focused on integrated team building.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:39 [The architect, Contractor and ..] (5:2199-5:2572) (Super)
Codes: [Commitment] [Team member IPD experience] [Architect] [General Contractor]
The architect,
Contractor and subcontractors fully supported the collaborative goals of the owner. There were individuals from these firms who had previous experience with IPD or similarly collaborative models. Each party demonstrated this commitment by equally sharing the costs of outside consultants and facilitators that focused on integrated team building.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:87 [Regular meetings were frequent..] (11:4439-11:4632) (Super)
Codes: [Information Sharing Mechanisms]
Regular meetings were frequent, although some team members felt the number of formal meetings may be less than other projects due to co-location, where informal conversations were common.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:66 [Open books are an inherent par..] (9:2205-9:2307) (Super)
Codes: [Financial Transparency]
Open books are an inherent part of GMP contracts, so the project operated transparently financially.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:56 [Project Modification and Innov..] (8:2170-8:2225) (Super)
Codes: [Other tools]
Project Modification and Innovation or PMI (modified A3)

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:9 [Several subs, including MEP, d..] (2:1623-2:1761) (Super)
Codes: [Phase of involvement]
Several subs, including MEP, drywall and concrete contractors, provided design assist services during the construction document phase.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:61 [A/E: Conceptual Design & Progr..] (8:4094-8:4251) (Super)
Codes: [Phase of involvement]
A/E: Conceptual Design & Program Validation
Cambridge: Schematic Design
CM/GC: End of Design Development
Trade Contractors: Start of Construction Documents

P16: 12 USCF Mission Bay Medical Center.pdf - 16:62 [The architect was contracted i..] (8:4255-8:4589) (Super)

Codes: [Phase of involvement]
The architect was contracted in January 2007. In August 2008, late into the DD phase, the contractor DPR was brought on. This timing was not considered ideal by either the UCSF project management team or the architect team. UCSF had intended that a GC and major trade subcontractors would participate earlier in the DD phase.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:64 [When DPR was brought on, they ..] (8:4591-9:628) (Super)
Codes: [Phase of involvement]
When DPR was brought on, they evaluated the design and current estimate and found the project was well over the established budget. In March 2009, 7 months after the Contractor was contracted, DA subs were brought on to participate in design and find options to bring the design within target. Participants agreed this was later than ideal but also found that it was difficult to know what timing would have been preferable. As a firm, DPR has been trying to determine the ideal time to involve DA subs. Based on their experience, DA involvement during SD may be too early, it can be unclear how much value subs add when the design is still in its infancy and pace of development may not warrant dedicated time of the DA subs.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:82 [However, the architect noted t..] (11:1381-11:1720) (Super)
Codes: [Co-location]
However, the architect noted that there are nuances to co-location, for example line of sight seems to have played a larger factor than originally anticipated. They noticed some of the relationships forged during design disintegrated somewhat as team members shifted around and were no longer located directly next to one another.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:55 [Managing the collaborative tea..] (8:1232-8:2108) (Super)
Codes: [Manage] [Commitment]
Managing the collaborative team changed effort distribution; the resources were allocated differently. Processes that would normally be completed end to end became overlapped. For example, work that subs typically do in CA was shifted up into the CD phase. Changes had to be made in staffing for the architect and DPR. For the architect, the primary increase in resources and staffing came from additional project leadership required to support the new overlapping process flows. Overall this increased the duration of certain team resources and required more dedicated resources to the project. There was also investment in team building efforts and workshops not typically done in traditional or design build projects. Give and take was needed to accommodate the costs for this different way of working; team members shared costs for team building.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:73 [The team leadership observed t..] (10:923-10:1040) (Super)
Codes: [Commitment]
The team leadership observed team members generally had positive attitudes and personal commitments to the project.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:47 [Although not formally part of ..] (6:4162-6:4314) (Super)
Codes: [Culture Fit]
Although not formally part of the RFP or the selection consideration, there were discussions regarding the collaborative aspirations of the project.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:48 [Unique to this project, bid do..] (7:333-7:573) (Super)
Codes: [Culture Fit]
Unique to this project, bid documents included a page that described expectations for teams relative to the principles of IPD. Criteria were aligned to support these goals; collaborative experience qualification was heavily weighted.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:50 [They observed that subcontract..] (7:1490-7:1927) (Super)
Codes: [Culture Fit] [Information sharing mechanisms]
They observed that subcontractors who were used to closed-door offices had difficulty adapting to the open environment; everything worked on is visible, open and accessible to everyone. On the positive side, most subcontractors (and the design team) recognized the benefit to having so many resource people available immediately; it saved time researching and eliminated the need for drafting emails or leaving phone messages.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:75 [When the project began, many a..] (10:1899-10:2495) (Super)
Codes: [Culture Fit]
When the project began, many architects on the team were hesitant to move from their home office to the site. Architecture is very peer oriented and many were concerned about losing touch with their peers. When the project started, the architect stationed only 4 people on site with others based in the home office. This split was not well received from the larger integrated team, so they successfully adjusted by bringing more team members to site.

P16: 12 USCF Mission Bay Medical Center.pdf - 16:77 [According to the project leade..] (10:2665-10:2929) (Super)
Codes: [Culture Fit]
According to the project leadership, the most noticeable cultural shifts could be seen within the primary organizations -- Stantec, DPR, and Cambridge (the owner’s consultant). Some degree of change penetrated to the level of MEP subs, but to a lesser degree.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:35 [Dispute Resolution The dispute..] (5:1311-5:1681) (Super)
Codes: [Negotiate]
Dispute Resolution: The dispute resolution process follows an “Alternative Dispute Resolution model”. If an issue cannot be resolved within the project leadership levels, it is elevated to the executives of each company. If the executives cannot reach a resolution, the issue goes through mediation or arbitration, and if those outlets have failed, litigation.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:37 [The team has found non-contrac..] (5:1686-5:1874) (Super)
Codes: [Problem Addressed]
The team has found non-contractual processes are most critical to preventing escalation of an issue, time spent working out the RFI and submittal processes helped to avoid major issues.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:100 [The architects' original effor..] (7:4775-8:701) (Super)
Codes: [Perceived Schedule Performance]
The architects' original effort estimates were based on traditional contracts, document deliverables and timescales. Once the CM and DA subs were on board, the integrated team had to recreate and revalidate the schedule based on a collaborative plan. The revised schedule added 5 months to the design phase and extended the overall project schedule by 2 months. The additional design development time can be attributed to several factors including transitional time to educate and team build with late arriving contractor team members, time to collectively reassess the project's objectives and milestones, and a potentially overly optimistic original time estimate.

Negative

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:32 [There was no shared risk/rewar..] (5:963-5:1042) (Super)
Codes: [Reward Structure-risk pool]
There was no shared risk/reward pool on this project; no fees were put at risk

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:34 [Liability No limits on liabili..] (5:1245-5:1308) (Super)
Codes: [Reward structure liability waiver]
Liability: No limits on liability were included in the contract.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:36 [Insurance Typical professional..] (5:1877-5:1968) (Super)
Codes: [Reward structure_insurance]
Insurance: Typical professional insurance was used, no project specific insurance product.

"P16: 12 USCF Mission Bay Medical Center.pdf - 16:75 (2) [When the project began, many a..] (10:1899-10:2495) (Super)
[Culture Fit]
The architect observed the engineers struggled most with culture change that affected traditional relationships and hierarchies.

Not Given

There is no quotation under this category.

Case Study-Project B
Positive
Owner
"P17: Structured interview with Owner.pdf - 17:37 [Training I feel along the way ..] (9:99-9:244) (Super)
Codes: [Training] [Culture fit]
Training: I feel along the way between the time I spent enough time with The Design Supplier and reading the materials, we got a pretty good training. FIT

"P17: Structured interview with Owner.pdf - 17:2 [To what extent have you worked..] (2:752-2:832) (Super)
Codes: [Previous cooperation experience]
To what extent have you worked with the other parties in the project team before?
Comment: G Working Closely with the Architect

"P17: Structured interview with Owner.pdf - 17:16 [I feel like you are not able t..] (5:715-5:1106) (Super)
Codes: [Trust]
I feel like you are not able to include the designer. You are not able to think about IPD and designer right
now together. It feels that they were separate things. That's maybe a function of me because I have this long relationship with The Architect. And a very comfortable relationship with them. So I disagree. That's my comfort zone. I always feel free to work with the architects.

"P17: Structured interview with Owner.pdf - 17:9 [I actually like the concept. I..] (4:848-4:1162) (Super)
Codes: [Commitment]
I actually like the concept. I did some study starting with a book that you have seen called The Commercial Real Estate Revolution. The Design Supplier was a big part of helping found of the mind-shift of a group. I'm not really anti-IPD. I just think there is a proper scale. I'm still intrigued by it. I learned a lot.

P17: Structured interview with Owner.pdf - 17:22 [I was on board. I knew we woul..] (6:1984-6:2117) (Super)
Codes: [Commitment]
I was on board. I knew we would spend a lot of money on XC1. I knew we take a lot of our resources in terms of time to do this.

P17: Structured interview with Owner.pdf - 17:41 [Do you have to make some chang..] (9:666-9:855) (Super)
Codes: [Commitment]
Do you have to make some changes about the traditional culture of your organization to make it fit for the IPD execution? If yes, to what extent are you willing to make the changes? Yes

"P17: Structured interview with Owner.pdf - 17:28 [Project Documentation Manageme..] (8:195-8:238) (Super)
Codes: [Culture fit]
Project Documentation Management Software
Comment: G It's a fit based on owner.
P17: Structured interview with Owner.pdf - 17:35 [Performance compensation: Yeah..] (8:1138-8:1259) (Super)
Codes: [Culture fit]
Performance compensation: Yeah. Like some of the elements. The incentive structures in general IPD are very worthwhile.

P17: Structured interview with Owner.pdf - 17:40 [Behavior Compensation Evaluati..] (8:66-8:108) (Super)
Codes: [Culture fit]
Behavior Compensation Evaluation □ 5

P17: Structured interview with Owner.pdf - 17:37 [Training I feel along the way ..] (9:99-9:244) (Super)
Codes: [Training] [Culture fit]
Training: I feel along the way between the time I spent enough time with The Design Supplier and reading the materials, we got a pretty good training. FIT "

"P17: Structured interview with Owner.pdf - 17:45 [Who worked as integrator betwe..] (11:812-11:1006) (Super)
Codes: [Manage]
Who worked as integrator between tiers? How did they work? What did they do to enable or hinder communication and information exchange?AR1 was probably the most effective. AR1 and OPS1

"P17: Structured interview with Owner.pdf - 17:42 [How do you balance conflict or..] (9:862-9:1247) (Super)
Codes: [commitment to IPD process]
How do you balance conflict or lack of "fit," if there is any conflict or lack of "fit," between your organization culture and the IPD features? I still believe the principles brought out in the study and IPD are the way of future. My response is that I was looking for the opportunity to bring us up to date. So I didn't see it as a problem. I thought it was kind of exciting.

P17: Structured interview with Owner.pdf - 17:46 [After this experience in your ..] (11:1444-11:1709) (Super)
Codes: [Commitment to IPD process]
After this experience in your future projects, how willing are you to devote time, resources and energy to the IPD project? I would do it. I would do it again if it is the right scale. Complexity to warrant an IPD structure. It has to have a certain complexity
Comment: G with example.

Architect

"P18: Structured Interview with Architects.pdf - 18:34 [The sessions AR1- 4 AR2- We collab..] (6:384-6:442) (Super)
Codes: [Training] [Culture fit]
The sessions
AR1- 4
AR2- We collaborate all the time
AR1- 5

"P18: Structured Interview with Architects.pdf - 18:2 [OPM, I worked with for..] (1:1555-1:1912) (Super)
Codes: [Previous cooperation experience]
OPM1, I worked with for 20 years, mostly real estate, marketing, quick renovations the existing building, he has his facility people involved and he typically has a contractor he likes to use. A contractor that he used over the years. For a building from scratch, starting all the way from the very beginning, this is his first project with us.

"P18: Structured Interview with Architects.pdf - 18:15 [UR1- Yeah, I understand that you..] (3:2072-3:2263) (Super)
Codes: [Motivator_Market]
UR1- Yeah, I understand that your reward and motivation was that getting to know in a work with IPD so you are also ahead of the market and being a leader in this process as well.
AR1- Yeah.

"P18: Structured Interview with Architects.pdf - 18:59 [AR1- I think IPD process helped…..] (10:2131-10:2672) (Super)
Codes: [Commitment to IPD process] [Early involvement effectiveness]
AR1- I think IPD process helped… Even The GC came and went quickly, I think that process helped a lot communications from contractors point of view early on. I think it opened OPM1and OPS1's eyes. I think it's actually a good process to have contractor and GC involved early on to help understand the process of construction and schedule. I think that was a really good thing. I think that The Architect would be very willing to do another project with IPD if we all have the same goals and minds and it wasn't so driven by just budget.

"P18: Structured Interview with Architects.pdf - 18:39 [G- It's different at risk when..] (6:1336-6:1614) (Super)
Codes: [Trust]
AR1- It's different at risk when you haven't had worked with all these people. Between The Development Corporation and the Owner, the Architect there is a complete trust. But the entity at the beginning of a contractor out of state, we've seen a lot of his work but it wasn't the same comfort as well.

"P18: Structured Interview with Architects.pdf - 18:25 [G- We were following the lead ..] (4:3523-4:4129) (Super)
Codes: [Commitment]
AR1- We were following the lead of OPM1. If OPM1 felt he wanted to do IPD, I think myself, my boss

were very willing to go down that path. It wasn't typical, we never done that before. First of all we'd never done it with OPM1 and fortunately all three of us were new at it. So it wasn't like any of them have great experience so they could tell the others to do it properly. I think we were very willing to do it. At this point I think we expended lot more time in the design process because of it. In a typical project we probably would not put ???(high) percentage of our fees in the design phase.

P18: Structured Interview with Architects.pdf - 18:26 [AR2- from my perspective, I've b..] (4:4152-5:188) (Super)
Codes: [Commitment]
AR2- from my perspective, I've been doing a lot of research over the years in integrative project delivery, all the different philosophies in cost structures and risk sharing and collaboration models and so I was happy to be a part of the team. But I wasn't the decision maker at our end, nonetheless encouraging excited this was rolling out in such a fashion. For my perspective, I was happy to be able to put some practice to things I've been looking into in researching.

"P18: Structured Interview with Architects.pdf - 18:31 [What about project documentati..] (6:22-6:204) (Super)
Codes: [Culture fit]
What about project documentation management software in terms of communications technology, we never got to use that….
AR1- We use that a lot…
AR2- I'd say a 4 or 5
AR1- I'd say a 5

P18: Structured Interview with Architects.pdf - 18:34 [The sessions AR1- 4 AR2- We collab..] (6:384-6:442) (Super)
Codes: [Training] [Culture fit]
The sessions
AR1- 4
AR2- We collaborate all the time
AR1- 5

P18: Structured Interview with Architects.pdf - 18:36 [Project meetings? G- 5] (6:497-6:520) (Super)
Codes: [Culture fit]
Project meetings?
AR1- 5

P18: Structured Interview with Architects.pdf - 18:37 [Project stewards G- like an ou..] (6:527-6:660) (Super)
Codes: [Culture fit]
Project stewards
AR1- like an outside leader?
UR1- Someone who communicates and facilitates communication between team members.
AR1- 5"

"P18: Structured Interview with Architects.pdf - 18:41 [Who was responsible for monito..] (6:2712-7:113) (Super)
Codes: [Monitor]
Who was responsible for monitoring the internal and external factors, between you and AR2…
AR1- I'd say Project B was the most cognoscente of who was and who wasn't, because in fact we had a 4th person University S, and every time we'd miss somebody someone would jump up and say "Hey, we have got make sure this person involved. I think that complexity also added to the communication level

P18: Structured Interview with Architects.pdf - 18:53 [so about integration of tiers ..] (8:2174-8:3530) (Super)
Codes: [Manage]
so about integration of tiers (OPM1, the contractor and you), so correct me if I'm wrong, but you're your organizations representative in that tier, right?
AR1- yes
UR1- so the organization, you work with AR2?
AR1- there is a project principle AR3
UR1- AR3, as well. You didn't get to the point where you work with your design engineers, suppliers or outside engineers?
AR1- there was a structural engineer involved, we have three mechanical, electrical, plumbing engineers, that have been consulted with so far in the projects
UR1- who would be the person to integrate organization with the suppliers with the engineers?
AR1- The manager of the job would have gotten all those people involved. Now when it got down to suppliers the person designing the project or managing as an architect would have probably got hold to the suppliers. ??? came differently because we were looking at donated suppliers. But also AR2 was very involved and trying to find some outside supplying companies that could provide some sort of donation that will be part of the project because of the sustainable products and material.
UR1- does AR2 work with any of the structural engineers the MEP designers…
AR2- yes
AR1- we all work together, our office is very… I don't want to say flat but, we team up a lot on projects so it's not unusual.

P18: Structured Interview with Architects.pdf - 18:54 [UR1- Can you talk about integrat..] (9:1-9:1328) (Super)
Codes: [Manage]
UR1- Can you talk about integrative roles? Can you elaborate on that, and is it different in the IPD project than your normal traditional way of doing business.
AR1- Well… when we have a typical project, we would typically have an internal team meeting where we'd present the project we talk about internal budget and the roles. In this instance, our mechanical, electrical and plumbing are all in house We were asking them to give us a design and a scope of work. Because in an IPD, that traditional will be a supplier not the engineer. Because we need to get some pricing done, we need to engage them and have them do a little bit more than just an outline. They had to kind of layout what it was going to look like. Mostly mechanical Same with structural, because the building had to have some sort of budget to it, we

had our structural engineer got involved. So they could look to see how it was going to be constructed with us. That should be typical they are invited to our team meetings, one entity that hasn't got involved yet, that' going to happen in the next couple of weeks is one of our interior designer is now going to step in and start to put a little bit of finish to it. Looking at the materials, we've established materials so they are going to help us hold together the fit-and-finish

P18: Structured Interview with Architects.pdf - 18:56 [UR1- Would you say you are the m..] (9:2081-9:3477) (Super)
Codes: [Manage]
UR1- Would you say you are the main integrator between the project team and you organization? AR2 is the main integrator between the organization suppliers and design engineers.
AR1- I don't know, AR2 is doing a different role than typically in our office, because the IPD (project) it's a small job we don't have as many roles, typically there would be a project manager who deal with the client and the entire team and organizes the team. And they are from the very beginning to the very end. But it's interesting about what AR2 is done as he actually jumped on board with AR3 early on because it was a marketing the project. There wasn't a full project yet. When it became a full project, then he is taking over a different role. He is doing some design, document coordination. Because we eventually have to put together some sort of specification,he is contacting the suppliers, because we have to know constructible, but also because PROJECT B need some donations. So if you take on a much of different role, you typically would take as a normal pass of the project. He is also one of our sustainable coordinator, so it was the natural fit. A lot of products we are trying to use in this building are more pushing the envelope on sustainability and maybe something we just want to try for the first time. That's a good thing. This is the right building to do that way.

"P18: Structured Interview with Architects.pdf - 18:57 [AR1- I would say, we would be wi..] (9:3634-9:4294) (Super)
Codes: [Commitment to IPD process]
AR1- I would say, we would be willing but now would know a little more about it we'd want to take a more substantial role and making sure the process starts differently in the beginning.
AR2- I think we'd want more of a say in how it's organized but not necessarily 'say' as we are the authority in it, but at least help shape… I think there is a lot that is kind of shaped by The Design Supplier. They just say this is how we always do it. This is the contract you should use. This is the tiers of the project team. I just feel like we'd want more at least input into that process, using this as an experience lessons we learned. We know what communication tools…

P18: Structured Interview with Architects.pdf - 18:59 [AR1- I think IPD process helped…..] (10:2131-10:2672) (Super)
Codes: [Commitment to IPD process] [Early involvement effectiveness]
AR1- I think IPD process helped… Even The GC came and went quickly, I think that process helped a lot communications from contractors point of view early on. I think it opened OPM1 and OPS1's eyes. I think it's actually a good process to have contractor and GC involved early on to help understand the process of construction and schedule. I think that was a really good thing. I think that The Architect would be very willing to do another project with IPD if we all have the same goals and minds and it wasn't so driven by just budget.

General Contractor

"P16: Structured interview with Contractor.pdf - 16:18 [There is always debate over th..] (6:1831-7:167) (Super)
Codes: [Decision Making System] [Negotiate]
There is always debate over the design when you are trying to get the cost down. I wouldn't say it was a controversy. I was a big proponent of making sure that there was radiate perimeter heat at these tall extends of glass set from the floor. I was kind of overwritten on that in the final analysis based on the desire to get the cost down. I don't' know where they are ultimately went, but they in the last round when I was involved in they were going into very cheap in that system, which is fine. They understood the risks to it. We had a long conversation about that. How was that handled? We have some good discussion about it. We engaged subcontractors to comment on it as well. And of course AR1 and her design team had comment on it. We had conference calls with her engineers who would ultimately design the system and OPM1 and OPS1 and everyone. We measured about the pros and cons and ultimately OPM1 make the decision. At least he made the decision based on very informed

P16: Structured interview with Contractor.pdf - 16:30 [Did anyone take a central role..] (12:863-12:993) (Super)
Codes: [Decision Making System]
Did anyone take a central role in conflict management and negotiation? How? Sacrifice? OPM1 is the central role in negotiation.
Comment: G According to PM1: As to decision making, OPM1 is very collabortive, when making changes in building design, he always ask opions and feedbacks and input.

"P16: Structured interview with Contractor.pdf - 16:17 [We also collaborated very earl..] (6:638-6:1275) (Super)
Codes: [Information Sharing Mechanisms] [Early involvement effectiveness]
We also collaborated very early on even in early budget stage, we go to subcontractors in their market to get some idea and cost from them and some of their feedback on cost on different things. We collaborated on the design. So you have to view your experience and ask the right questions to make sure that you were cleaning the information you need to put together comprehensive cost. So there were a lot of back and forth communication with the design team around that. PM1 also collaborate with OPM1 and OPS1. It is done via emails and phone calls. At this preconstruction stage, the tools for communication were adequate.

P16: Structured interview with Contractor.pdf - 16:20 [It was all handled via verbal ..] (7:198-7:1809) (Super)
Codes: [Information sharing mechanisms]
It was all handled via verbal communication between OPM1 and I and even AR1 at times. In the numbers, I layout everything, all the details, how I estimated how I contract the numbers they've got in. Everybody could see how it was all put together. I always welcome that they put codes on it and give us a critical feedback on it. We always have to do that in team relationship like that.

"P16: Structured interview with Contractor.pdf - 16:17 [We also collaborated very earl..] (6:638-6:1275) (Super)
Codes: [Information Sharing Mechanisms] [Early involvement effectiveness]

We also collaborated very early on even in early budget stage, we go to subcontractors in their market to get some idea and cost from them and some of their feedback on cost on different things. We collaborated on the design. So you have to view your experience and ask the right questions to make sure that you were cleaning the information you need to put together comprehensive cost. So there were a lot of back and forth communication with the design team around that. PM1 also collaborate with OPM1 and OPS1. It is done via emails and phone calls. At this preconstruction stage, the tools for communication were adequate.

"P16: Structured interview with Contractor.pdf - 16:21 [There was absolutely no lack o..] (7:2481-7:2624) (Super)
Codes: [Trust]
There was absolutely no lack of trust among the team member. OPM1 does extremely well. I wouldn't say that I trust anyone any more or any less.

P16: Structured interview with Contractor.pdf - 16:27 [The key to these relationships..] (11:976-11:1171) (Super)
Codes: [Trust]
The key to these relationships is trust. Internally, we don't ask our staff to do anything except what is the best interest of the client. So we work in a very transparent manor with our clientComment: G some more description are given in the interview

"P16: Structured interview with Contractor.pdf - 16:28 [Did do try to adopt or accept ..] (11:1468-11:2579) (Super)
Codes: [Challenge] [Reward structure_incentives] [Culture Fit]
Did do try to adopt or accept some new ideas which your organization is not familiar with in this project? What are they?
Yes. The idea behind compensation layer and aligning all of the players with incentives is something that we are going to continue to promote in even non IPD project. I think there is some value there. I think there is something there that I can really get the design, construction and ownership team alignment. If you don't have the financial alignment, your alignment is really about the wanting to maintain a great relationship will result in the teamwork together in the next job. But you also add this Compensation layer to it and to put your fee at risk, there is really solid connection that adds to that.
2) Did you encourage the members of your organization to challenge the existing mechanism with this IPD project and provide some new methods or ideas to this project? How did that go? Yes
3) Do you think challenging existing mechanism can contribute to the performance of this project? How? Do you have any examples from the project so far? Yes

P16: Structured interview with Contractor.pdf - 16:37 [Reduced Risk ? 5] (9:768-9:785) (Super)
Codes: [Culture Fit]
Reduced Risk □ 5

P16: Structured interview with Contractor.pdf - 16:41 [Relational Contract ? 5] (9:1060-9:1085) (Super)
Codes: [Culture Fit]

Relational Contract ☐ 5

P16: Structured interview with Jeff.pdf - 16:49 [3) Do you have to make some ch..] (10:100-10:301) (Super)
Codes: [Culture Fit]
3) Do you have to make some changes about the traditional culture of your organization to make it fit for the IPD execution? If yes, to what extent are you willing to make the changes? No
Comment: G In the interview, PM1 said, they don't need to make changes in terms of culture in this IPD project, they have the similar culture before, e.g. get involved early in the project.

P16: Structured interview with Contractor.pdf - 16:44 [Project Meetings ? 5] (9:1148-9:1168) (Super)
Codes: [Culture fit]
Project Meetings ☐ 5

"P16: Structured interview with Contractor.pdf - 16:18 [There is always debate over th..] (6:1831-7:167) (Super)
Codes: [Decision Making System] [Negotiate]
There is always debate over the design when you are trying to get the cost down. I wouldn't say it was a controversy. I was a big proponent of making sure that there was radiate perimeter heat at these tall extends of glass set from the floor. I was kind of overwritten on that in the final analysis based on the desire to get the cost down. I don't' know where they are ultimately went, but they in the last round when I was involved in they were going into very cheap in that system, which is fine. They understood the risks to it. We had a long conversation about that. How was that handled? We have some good discussion about it. We engaged subcontractors to comment on it as well. And of course AR1 and her design team had comment on it. We had conference calls with her engineers who would ultimately design the system and OPM1 and OPS1 and everyone. We measured about the pros and cons and ultimately OPM1 make the decision. At least he made the decision based on very informed

P16: Structured interview with Contractor.pdf - 16:29 [If known, what is your main pr..] (12:294-12:484) (Super)
Codes: [Negotiate]
If known, what is your main principle (e.g., refuse any changes if you are right; will to compromise your approach to contribute to the whole project) in negotiation to reach a consensus?
Comment: G Description of compromising the design to meeting budget requirement is given

"P16: Structured interview with Contractor.pdf - 16:46 [After this experience in your ..] (12:1728-12:1997) (Super)
Codes: [Commitment to IPD process]
After this experience in your future projects, how willing are you to devote time, resources and energy to the IPD project? Very willing
2) What is your commitment to IPD project in the future?
If it had some the facts I mentioned earlier, we will be jumping in.
Comment: G Right project (size) and right place

"P16: Structured interview with Contractor.pdf - 16:16 [Did IPD help with the decision..] (5:2722-6:415) (Super)
Codes: [Problem Addressed]
Did IPD help with the decision making? If so, how? The way we operate in anyway, we didn't feel a lot of different although you did know that in the back of your mind that some point some of??? the compensation layer was going to be laid out and we were all going to be really joint, really make sure that this happened with minimal changes in the cost run target and everything else. So I guess that probably impacted how thorough we are up front to

Design Supplier
"P19: Structured Interview with Major Supplier.pdf - 19:1 [What, if any, prior experience..] (1:918-2:1391) (Super)
Codes: [Team member IPD experience] [Other]
What, if any, prior experiences have you had in IPD projects (either philosophy or contractual) before?
Yes, 3 contractual IPD projects before
2) (If applicable) Please briefly describe those projects.
SPM1- One was an internal project for The Design Supplier where The Design Supplier was the owner and vendor, supplier. That was our Atlanta show room. That was basically the kick off for IPD within our organization. It was a tough mode. We'd been out talking about it and learning but we said it's OK. Before we could start recommending it to clients, we need to do it ourselves. So when the opportunity presented itself, we decided to go with the show room. It was approximately 7000 sf. It was not a new construction. The shell was already there. It was basically interiors only. We organized that around clients or suppliers that had been worked with The Design Supplier in the past. That would be Contractor 3 and Architect 2 and also Architect 3, which is the MEP here in City D State A. We approached them and said "This is a new concept a new philosophy, we believe everything we are hearing and seeing will bring values to our organizations collectively. Would you like to do this with us?" And they all agreed to do that. That was our first experience. The second experience, I can't release the name. It's an educational organization university level. We just completed team formation. So we hadn't broke ground yet. It was interesting because the architect that on this project has done the master plan and they were not IPD users. So we had to go into this, making decision. The owner had to decide is the Architect we had already on board that we have invested substantial time and money in, are they going to be the architect that can go with us into this philosophy. So that was kind of a sell we have to do to them and they were still on the fence after we presented to them. But once we give them references within the industry, such as Autodesk,…, Sutter Health, substantial organizations that have gone to IPD, they came back and said they were in. It's small but we want to learn this. It's interesting that Aaron might appreciate this even a bit more that the senior partners that on this architectural firm were in their mid to late 50's while the project manager had been out of college maybe 5-6 years and he was the one that was the most gung-ho on going IPD and he was the one that was the most familiar with it. He had actually utilized them at his past job and he saw the benefit. He was the one that did a lot of internal selling to make that happen.
S- Interesting. If somebody really committed to it, it goes a long way. Don't you think?

SPM1- Yeah. I think again it's changing behaviors. Much I played with IPD is to people. Our first two years is just telling people what is was. Once they understand what it was, we didn't really have to twist the arms. Everybody says this is so logical. It's not the logic that makes the challenge, it's the changing behaviors, that is the sampling block sometimes. That is what we saw with these two, the older more experienced principles versus the younger, "OK, I've seen this, I've heard about it. I'm less fearful to take that leap."

"P19: Structured Interview with Major Supplier.pdf - 19:6 [Organizationally, it was a str..] (4:1507-4:1922) (Super)
Codes: [Motivator_Market]
Organizationally, it was a strong business case, I tend to be more of the warm and fuzzy side, but it always come down to my business training always tell me, what's the business case. Well, there is such a strong business case for IPD. I mean who wouldn't want their project to come in on time, on budget and reduce waste. That's just so logical and so it presents a very strong business case to the owner.

"P19: Structured Interview with Major Supplier.pdf - 19:27 [SPM1- I was the main person inter..] (11:1800-12:226) (Super)
Codes: [Information Sharing Mechanisms]
SPM1- I was the main person internally from both… because again it's new for The Design Supplier, so there is two of us. I am an integrator. I would be the key point of contact between the owner of the project and the internal decision makers, so I was kind of between the Tier 1 and the Tier 2 and I was doing both actually.
2) How did you monitor the communication? An example of that?
SPM1- City B is a good example that you all had the contract negotiation session in City B at The GC. I couldn't be there because I had a client in Toronto. XC1 and SPM2 were. After each day, we had a download. We had a phone conference and we talked it through. It's like instantaneous, this is what we've got talk about; this is how it's going. So we were joined at the hip.

"P19: Structured Interview with Major Supplier.pdf - 19:15 [SPM1- Well The owner was very dev..] (8:1362-8:1786) (Super)
Codes: [Commitment]
SPM1- Well The owner was very devoted. I give them high marks for the devotion. I don't think I ever see a owner as involved and passionate about this vision. So that was admirable. I would say the others in this project people were pretty devoted to making it happen… they went through different… you know cost analysis. People on this project really try to make it happen. I would say they did a very good job on that.

"P19: Structured Interview with Major Supplier.pdf - 19:20 [Process Planning-Design Charre..] (10:267-10:339) (Super)
Codes: [Culture Fit] [Phase of involvement]
Process Planning-Design Charrettes ☐
Project: 2; Organization: 5

P19: Structured Interview with Major Supplier.pdf - 19:22 [Reduced Risk ? 5 Shared Risk ?..] (10:434-10:483) (Super)
Codes: [Culture Fit]
Reduced Risk □ 5
Shared Risk □ Proj.2 Org. 5

P19: Structured Interview with Major Supplier.pdf - 19:26 [Do you have to make some chang..] (10:1041-11:1177) (Super)
Codes: [Culture Fit] [Commitment to IPD process]
Do you have to make some changes about the traditional culture of your organization to make it fit for the IPD execution? If yes, to what extent are you willing to make the changes? SPM1- No question, this is a learning curve for The Design Supplier. This is something we are pursuing as matter of fact. We convey to our partners that going forward. All our builds will be IPD. But even still to this day, we have to go back and remind, the old behaviors are still so easy to fall back into. Yeah, this definitely a lot we've got learn yet.
UR1- OK. But what is the extent that you are willing to make those changes in The Design Supplier?
SPM1- We are willing to make those changes. The first project was in Atlanta, we came in a budget which they've done a three year benchmark from our last showroom in San Francisco. So over four to three years we know the cost have gone up, but they just it as a benchmarks say "OK, here is your dollars, even though it's three years later, we came in with more, in the showrooms we had restrooms which we never do, they usually a part of the lobby, so we incorporated restrooms inside our showroom which is typically about $100,000 expense, we also put in technology, with those added items, our showrooms still came in at $15,000 under budget. So we are definitely going to make that commitment of going forward.

"P19: Structured Interview with Major Supplier.pdf - 19:26 [Do you have to make some chang..] (10:1041-11:1177) (Super)
Codes: [Culture Fit] [Commitment to IPD process]
Do you have to make some changes about the traditional culture of your organization to make it fit for the IPD execution? If yes, to what extent are you willing to make the changes?
SPM1- No question, this is a learning curve for The Design Supplier. This is something we are pursuing as matter of fact. We convey to our partners that going forward. All our builds will be IPD. But even still to this day, we have to go back and remind, the old behaviors are still so easy to fall back into. Yeah, this definitely a lot we've got learn yet.
UR1- OK. But what is the extent that you are willing to make those changes in The Design Supplier?
SPM1- We are willing to make those changes. The first project was in Atlanta, we came in a budget which they've done a three year benchmark from our last showroom in San Francisco. So over four to three years we know the cost have gone up, but they just it as a benchmarks say "OK, here is your dollars, even though it's three years later, we came in with more, in the showrooms we had restrooms which we never do, they usually a part of the lobby, so we incorporated restrooms inside our showroom which is typically about $100,000 expense, we also put in technology, with those added items, our showrooms still came in at $15,000 under budget. So we are definitely going to make that commitment of going forward.

P19: Structured Interview with Major Supplier pdf - 19:31 [I think an enhancement to this..] (13:117-13:1320) (Super)
I think an enhancement to this IPD, even though it didn't go through forward, was having University S involved. I think when you have that academic engagement, it leans to the pursuit of excellence and betterment. rather it be business practice or personal. I think this is knowledge and research. I would love to going forward, have that type of partnership in future project. Because I think that mental accountability like "OK, we are not just responsible for the outcome this building in which people will have it (?) and work. We are also responsible for this learning mechanism. That's one thing that I would say it's an added benefit. I'm working on a couple of other projects with a significant healthcare organization. Because health-care as we know is one of the most construction projects, it used to be per bed in the cost of a hospital would come in right around 4 million dollars, now it is double that. That's why California was the first to initiated IPD, because of the health care cost. I think going forward, absolutely this is what we have to do. It's no longer an option. I would not even hesitate to say too much that it wouldn't (?) become mandated some day

"P19: Structured Interview with Major Supplier.pdf - 19:29 [SPM1- No. I'd actually say IPD pr..] (12:1011-12:1624) (Super)
Codes: [Problem Addressed]
SPM1- No. I'd actually say IPD probably enhanced it. Because if we hadn't had IPD, there would have been much more lag time. I've worked on project before it was like "OK, I'll get to it, I'll get to it. But IPD is kind of, even though we didn't sign the contract, it kind of mentally put you into some of a verbal contract and it kind of enhanced its accountability. That is really what IPD is, too. It's the accountability factor. There maybe once or twice OPS1 had to track me down but they were very responsive when we needed some information. I think IPD actually enhanced the communication process.
UR1- Well even though was not pursued full contractually, it added to the quality of the project in that sense.
SPM1- It is. I think people walk away from it maybe a little disappointed, because they would have loved to pursue it. Because of that innovative edge, they want to be part of that. You want to test that and see if it really does work. For those who have tested this before, I think would be a little disappointed. I will be very surprised if anybody walked away from that and said "This is crap. I will never do this again."

Neutral

Owner

"P17: Structured interview with Owner.pdf - 17:38 [Session I didn't think they we..] (9:247-9:379) (Super)
Codes: [Training]
Session
I didn't think they were as effective as they could be. XC1's value probably comes in drafting the documents.

"P17: Structured interview with Owner.pdf - 17:34 [Do you think you were sharing ..] (8:754-8:1134) (Super)
Codes: [Culture Fit] [Reword Structure_risk pool]

Do you think you were sharing the risk by all?
No. The architect and contract get their cost covered. Their profits were at risk. But I had more than that at risk which is fair. That's why I do what I do and they do what they do. I also have an unlimited reward. Their reward is very limited. The notions of shared risk is a little oversold from my perspective as an owner.

"P17: Structured interview with Owner.pdf - 17:6 [You can be the best writer in ..] (3:999-3:1741) (Super)
Codes: [Information Sharing Mechanisms] [Remove Obstacles]
You can be the best writer in the world, but it's very hard to convey a nuanced situation in an email. I am also in written to correspondence and record in fact. I am really a proponent of that. It's kind of verbal communication might have been better. But then I could never fully resolve myself. That one-on-one verbal communication was somehow violating the spirit of IPD. Through email you could CC everybody and said OK, I have made a team thing. There is a couple of times that I want to pick up the phone and call SPM1 and say SPM1 here is what's going on. And I did that a couple of times and I could have done that more. But then I am keeping people out of the loop. I can't schedule a conference call of 10 minutes.

"P17: Structured interview with Owner.pdf - 17:18 [I think this get us back to th..] (6:9-6:249) (Super)
Codes: [Trust] [Commitment]
I think this get us back to the trust that is required. I fought the temptation to revert to standard procedures. SPM2 in The Design Supplier and XC1 keep talking about that people reverting to their standard operating procedures.

"P17: Structured interview with Owner.pdf - 17:7 [The reason is because it was t..] (3:2346-3:2652) (Super)
Codes: [Commitment]
The reason is because it was the condition of The Design Supplier contribution to the project. They originally had a conditional support. They said " OPM1, we will do all this for Project B, provided you implement and allow us to document the study in IPD process. So that wasabsolute condition.

P17: Structured interview with Owner.pdf - 17:17 [So The GC actually did not imp..] (5:1109-5:1188) (Super)
Codes: [Commitment]
So The GC actually did not impact any design decisions while they were on board.

P17: Structured interview with Owner.pdf - 17:18 [I think this get us back to th..] (6:9-6:249) (Super)
Codes: [Trust] [Commitment]
I think this get us back to the trust that is required. I fought the temptation to revert to standard procedures. SPM2 in The Design Supplier and XC1 keep talking about that people reverting to their standard operating procedures.

P17: Structured interview with Owner.pdf - 17:41 [Do you have to make some chang..] (9:666-9:855) (Super)
Codes: [Commitment]
Do you have to make some changes about the traditional culture of your organization to make it fit for the IPD execution? If yes, to what extent are you willing to make the changes? Yes

"P17: Structured interview with Owner.pdf - 17:43 [OPS1 is the only one to monito..] (10:129-10:439) (Super)
Codes: [Monitor]
OPS1 is the only one to monitor. He is being actually educated in the process. If he a person saying, "OK, this is not going to the right direction".it could have been earlier in decision making not to go for IPD? I think he did a great job. Our structure ???47:37was pretty low. That was not the problem

"P17: Structured interview with Owner.pdf - 17:19 [Did you see any loops of commu..] (6:1344-6:1610) (Super)
Codes: [Manage]
Did you see any loops of communication or time lost because of the mechanisms in project management?
We are kind of training OPS1 on the job. He learns a lot. He also learns how to manage me and how to work with the owner. He has got a lot of things to balance.

P17: Structured interview with Owner.pdf - 17:21 [I think this get us back to th..] (6:9-6:745) (Super)
Codes: [Manage]
I think this get us back to the trust that is required. I fought the temptation to revert to standard procedures. SPM2 in The Design Supplier and XC1keep talking about that people reverting to their standard operating procedures.
Who is the leader of the project?
OPS1 is supposed to be the leader. The literature and documents are pretty clear on that in terms of sort of the owner' committee Tier 1 committee and Tier 2 committee. These are committee decisions of which I sort of have a vital power I didn't learn that was a flawed model??? If the numbers are came in OK, we wouldn't be talking about any of this. We probably just be proceeding on the IPD. It is possible to lose the side of the effect in IPD.
Comment: N does not have a strong climate environment, leader is not very clear in terms of SPM1, XC1 or OSM1 & OPM1

"P17: Structured interview with Owner.pdf - 17:4 [You quit IPD, but were you sat..] (2:1819-3:313) (Super)
Codes: [Participants Satisfaction] [Remove Obstacles]
You quit IPD, but were you satisfied with the skill levels of the project participants or not (incentives/incentives management efforts to remove obstacles for implement)? I think the team was overqualified in the project. Yes I was satisfied, but that level of sophistication get in the way of the actual delivery of a fairly simple building. It is completely depended on the complexity of the project. If this were an complex project, it would have an different answer.

Architect

"P18: Structured Interview with Architects.pdf - 18:1 [Some of the techniques that I ..] (1:359-1:953) (Super)
Codes: [Architect] [Team member IPD experience]
Some of the techniques that I have used in IPD whether they are collaborative with the owner doing a design charrettes some sort of early on before we even have a budget or before we have a contractor involved. Also, we've also done projects with Herman-Miller and gordons foods, where they have a contractor early on board. They are as a CM role and all three team players are following the project from design and stepping into design development so we can price it properly and make sure we are on/ within a budget. Those projects I feel sometimes make owners be more accountable…

"P18: Structured Interview with Architects.pdf - 18:10 [I think that was urged by the ..] (2:2866-2:3328) (Super)
Codes: [Motivator_Market]
I think that was urged by the The Design Supplier group. I think it was something they truly wanted to try. And I think I don't know what your involvement early on until the start this at the very beginning, weather it was a great tool, you know I think it was a great research product, you can see something from the begging to the end. I think you guys were so involved of wanting it to be a IPD as well. I think he was continuing to try to see how it would work.

P18: Structured Interview with Architects.pdf - 18:13 [UR1- What were your motivations ..] (3:1023-3:1664) (Super)
Codes: [Motivator_Market]
UR1- What were your motivations as an individual organization to join this IPD project?
AR1- Well, we'd never done one. Sounded like a great thing for all of us to learn from, because it'd been really a talk among the American Institute of Architect publications. They developed a contract and items for us to prove and use, but we'd never had that opportunity. It really has to be an owner that really want to try it. It can't be just the Architect says "Hey, let' do this." It has to be a driving force from the owner. I think OPM1 was definitely willing to try something new as long as it's going to fit into this process for him.

P18: Structured Interview with Architects.pdf - 18:40 [AR2- You need lots of communicat..] (6:1744-6:2414) (Super)
Codes: [Reward Structure- Incentive]
AR2- You need lots of communication up front about why you are hesitant to engage in this process and then from the owner stand point, they would have to reestablish or renegotiate some of the risk rewards. So that's what we do it as a business. We are always kind of managing our risks and if we don't see appropriate reward for that, whatever risk it takes. But if it is something that we can tolerate, we have a large enough carrot, and then I think it could be more…
G- We just don't want to be a looser. If anything we want to be even. If you go below the even mark, then there is the problem. Network communication has to be totally on all three parties.

"P18: Structured Interview with Architects.pdf - 18:6 [G- we had some conference call..] (2:784-2:1363) (Super)
Codes: [Information Sharing Mechanisms]

AR1- we had some conference calls with them. Did we have any go-to meetings with them?
AR2-uhh, I think it was primarily conference calls
AR1- we just tried that go-to recently with The new contractor. That's the first time the Owner ever tried that. We had many conversations with PM1. Weather when we all went to visit, also before the visit, during interview process, after that we have conference calls to talk about different contractors that could be involved and we could save money. And we did that, a number of those without the Owner because we are trying to get him up to speed.

"P18: Structured Interview with Architects.pdf - 18:38 [AR2- I think the challenge there..] (6:804-6:1333) (Super)
Codes: [Commitment] [Trust]
AR2- I think the challenge there is the culture of trust and risk sharing is the big hiccup. We had to be concerned with that and that's, to me, one of a big shifts in the whole process. We are not silos. We're looking each for our own reward. We are looking as a group and you can't do that in isolation, you can't do that with people you don't trust. Our offices have relations with a lot of different contractors and other key players. But I think we are shy in committing to that kind of risk sharing, and obligation.

"P18: Structured Interview with Architects.pdf - 18:38 [AR2- I think the challenge there..] (6:804-6:1333) (Super)
Codes: [Commitment] [Trust]
AR2- I think the challenge there is the culture of trust and risk sharing is the big hiccup. We had to be concerned with that and that's, to me, one of a big shifts in the whole process. We are not silos. We're looking each for our own reward. We are looking as a group and you can't do that in isolation, you can't do that with people you don't trust. Our offices have relations with a lot of different contractors and other key players. But I think we are shy in committing to that kind of risk sharing, and obligation.

"P18: Structured Interview with Architects.pdf - 18:12 [AR2- I have to say though that i..] (3:162-3:825) (Super)
Codes: [Culture Fit]
AR2- I have to say though that in our early kind of IPD design charrettes with The Design Supplier, some of the things we discussed are still apart of the project, so I think we can't label this as a failure The Design Supplier was instrumental in encouraging OPM1 to do more of a collaborative, open office atmosphere work space atmosphere versus kind of a more tradition box, with private offices and close conference rooms and something like that. And that's something we are still working with, still pursing, from that perspective, I think the IPD process still works but I think the contractual part petered out. Just to reiterate some the positives of the whole process

P18: Structured Interview with Architects.pdf - 18:29 [Okay shared risk G- A 3] (5:3043-5:3067) (Super)
Codes: [Culture Fit]
Okay shared risk: AR1- A 3

P18: Structured Interview with Architects.pdf - 18:32 [What about relational contract..] (6:211-6:274) (Super)
Codes: [Culture Fit]
What about relational contract in terms of the agreement?
AR1- 3

P18: Structured Interview with Architects.pdf - 18:30 [Behavior compensation G- Behav..] (5:3131-6:15) (Super)
Codes: [Culture fit]
Behavior compensation
AR1- Behavior?
UR1- Yeah
AR2- More like working as a team to get…
AR1- ooooh
UR1- Yeah
AR1- 4!
Comment: N, performance compensation 3
P18: Structured Interview with Architects.pdf - 18:33 [What about communication tools..] (6:282-6:378) (Super)
Codes: [Culture fit]
What about communication tools? Is it a good fit to your culture or not. So IPD training?
AR1- 4

"P18: Structured Interview with Architects.pdf - 18:42 [UR1- to what extent were the mem..] (7:117-7:387) (Super)
Codes: [Monitor]
UR1- to what extent were the member of your team encouraged to monitor those factors?
AR1- well every time we had any communication we were asked to copy multiple entities. There is a fifth entity—The Design Supplier. That was very confusing. There wasn't just three. There is five.

"P18: Structured Interview with Architects.pdf - 18:23 [I think at the point we stoppe..] (4:1403-4:1779) (Super)
Codes: [Manage]
I think at the point we stopped, I don't think we had any controversial things. At that point I don't think anybody was at risk. Once you get to a point that you have some risk, and that you are not paid for the service you are doing, I think that can sometimes cause communication to be more important. At the time we stopped, I didn't see any problem about management.

P18: Structured Interview with Architects.pdf - 18:24 [The only thing I would say neg..] (4:1780-4:2377) (Super)
Codes: [Manage]
The only
thing I would say negatively and I caution myself in saying this, is that with OPS1 and with OPM1, because OPS1 was recently graduating, I feel that sometimes the newness of trying to be a leader for the owner's perspective is the newness and he is still in learning mode. I think he is

doing great. I think they are trying to collect and find products that are possibly donation process and a lot of this is just new and how you even do that? Some of that sophistication of managing a project hasn't come yet. I think it will. I think between OPM1 and OPS1, it's a new entity.

P18: Structured Interview with Architects.pdf - 18:55 [We also have an administrative..] (9:1333-9:2077) (Super)
Codes: [Manage]
We also have an administrative person in our office. That person is taking our notes and putting them on paper. She got a few things but not completely involved. We can then communicate with those as well. That person was not fully engaged yet. Then we have another person at the end would have got more involved and would have been our construction administrator. In an IPD I'm not sure how involved that person would get. They typically would go out to the site during construction from an architecture firm perspective, they are looking at it to make sure the design thing is followed and there is no major gap in constructability. In a IPD, I don't know that would happen in the same way, could also be taking as an equal role.

"P18: Structured Interview with Architects.pdf - 18:51 [Challenge wise. Did you try to..] (8:941-8:1485) (Super)
Codes: [Challenge]
Challenge wise. Did you try to adopt any new ideas that your organization was not familiar within this project?
AR1- Do you mean for the project process or are you saying have we just learn something new that
we didn't normally do?
UR1- yeah…
AR1- I think there was a number of products we investigated on this project that are always a learning experience.
UR1- process wise..?
AR1- Well, because IPD is new to us, I think that is going to be a new challenge force but I don't think we implementing anything new at the beginning yet.

"P18: Structured Interview with Architects.pdf - 18:52 [AR1- We were waiting for the bas..] (8:1567-8:1975) (Super)
Codes: [Negotiate]
AR1- We were waiting for the basic contract from XC1 and we never saw that. I had reviewed the contract words and a few contractual things there was different. It's the liability of a project and how is an architecture firm ensured. It's different on an IPD. Those things we would probably have to work our way through a little bit.
UR1- We didn't get to the negotiation portion yet?
AR1- No, we never,

"P18: Structured Interview with Architects.pdf - 18:58 [AR1- I would say our organizatio..] (10:1-10:2062) (Super)
Codes: [Commitment to IPD process]
AR1- I would say our organization is willing, but I don't think it would be foremost… Everyone wants to try something new when the economy is not robust. This project was very time

consuming and the economy is not very robust, I think the process would probably not do well as fast tracked job. And a lot of projects we tend to get right now, they can be in the ground in six month. That was probably whatever other huddles at the very beginning on this job that we all remember "The project need to be built by August, so it was to be open for school." Am I wrong? Or we considered in May for summer. We were trying to get it done by may so it could have summer sessions. Because there is too much of learn curves of IPD, all the players are new. It won't happen quickly.
AR2- I don't think the delay in the schedule was because of IPD. I think it was because we need to secure some of the donors. It was taking a lot of time. We switched to multiple donors…. We confirmed to certain donors that kind of backed out afterwards. It wasn't just like that IPD is the anchor and slowing us down. It was really a process that we are trying to get donation, donated material.
AR1- I would say if we had another project where a lot of the product could be a donation we would probably not suggest to use IPD. [Laugh…]
AR2- I don't think the IPD process contributed at all to the problem of let's say finding donators working around donators and so on.
AR1- I think the IPD process helped bring products to like to be used in the building, but I don't necessary think it's a proper tool to provide donors.
AR2- I don't think it had negative impact on the project. I think it was helpful in a lot of ways. Some of the benefits it provided are still part of the project. I just really don't think …
AR1- I don't think it helped or hindered either way. We had probably four different skins in the building, brick, metal… all those different choices had nothing to do with IPD. I just think the donation process has caused the problem.

General Contractor
"P16: Structured interview with Contractor.pdf - 16:2 [Philosophy. We are brought ver..] (2:976-2:1568) (Super)
Codes: [General Contractor] [Team member IPD experience]
Philosophy. We are brought very early in the design process. We worked definitely as a team and very transparent approach to bring the best value for the client by analyze the systems understand the cost and make sure we are watching the drawings as design is developed to make sure that it stays in concert with budget that established. And the constructability is also watched. We called it a negotiation projects or CM agreement in some cases. IPD does take that a step a little further by aligning all the parties with their financial goals, but we have not had that project yet.

P16: Structured interview with Contractor.pdf - 16:3 [CM at risk and very much desig..] (3:122-3:335) (Super)
Codes: [General Contractor] [Team member IPD experience]
CM at risk and very much design build relationships but the contracts have not been design build. We have not held design build contract. It's always been the separate contract with the architect and the owner.

"P16: Structured interview with Contractor.pdf - 16:28 [Did do try to adopt or accept ..] (11:1468-11:2579) (Super)
Codes: [Challenge] [Reward structure_incentives] [Culture Fit]

Did do try to adopt or accept some new ideas which your organization is not familiar with in this project? What are they?
Yes. The idea behind compensation layer and aligning all of the players with incentives is something that we are going to continue to promote in even non IPD project. I think there is some value there. I think there is something there that I can really get the design, construction and ownership team alignment. If you don't have the financial alignment, your alignment is really about the wanting to maintain a great relationship will result in the teamwork together in the next job. But you also add this Compensation layer to it and to put your fee at risk, there is really solid connection that adds to that.
2) Did you encourage the members of your organization to challenge the existing mechanism with this IPD project and provide some new methods or ideas to this project? How did that go?
Yes
3) Do you think challenging existing mechanism can contribute to the performance of this project? How? Do you have any examples from the project so far? Yes

"P16: Structured interview with Contractor.pdf - 16:15 [Who took part in what major de..] (5:2616-5:2715) (Super)
Codes: [Decision Making System]
Who took part in what major decision making in this project?
The final decisions were made by OPM1.

"P16: Structured interview with Contractor.pdf - 16:7 [1 email 2 phone call 3 meeting..] (3:1975-3:2640) (Super)
Codes: [Information Sharing Mechanisms]
1 email 2 phone call 3 meeting. Web-based tool? We actually internally here have been looking at different system, because we hope to operate a construction management software to a new system that have web-based capabilities So far we have not found the systems that meets all of our needs. During that process on this project is when we were investigating and trying to decide which direction we were going to go internally on that. Since then we were settled on separate web-based systems that we were using for many of our projects which we could put this on as well. At the same time this project had not quite got to that where it is necessary to.

"P16: Structured interview with Contractor.pdf - 16:23 [Is there anything you want to ..] (8:128-8:236) (Super)
Codes: [Confidence in project management]
Is there anything you want to share about confidence in project management? Everyone felt very comfortable.

"P16: Structured interview with Contractor.pdf - 16:5 [By the true IPD process, we al..] (3:1026-3:1280) (Super)
Codes: [Phase of involvement]
By the true IPD process, we all would have been working together before AR1 even put the first design on the table to OPM1. We all would have been on the team a little bit earlier and the goal would have been established before it was even designed.

P16: Structured interview with Contractor.pdf - 16:12 [Here because we were brought a..] (4:1947-4:2064) (Super)
Codes: [Phase of involvement]
Here because we were brought a little bit later than the design is already in motion conceptually fairly far along .

P16: Structured interview with Contractor.pdf - 16:25 [We were early in the process i..] (11:118-11:202) (Super)
Codes: [Phase of involvement]
We were early in the process in some ways but late to the IPD process in other ways.

P16: Structured interview with Contractor.pdf - 16:34 [In the true IPD process, where..] (9:9-9:273) (Super)
Codes: [Phase of involvement]
In the true IPD process, where budget schedule and quality goals established even before things are start to be drawn. That would be a significant different. Usually there are couple of month for owner and designer to work on the bid before GC is get involved.

"P16: Structured interview with Contractor.pdf - 16:4 [OPM1 did a great job in establi..] (3:619-3:684) (Super)
Codes: [Early involvement effectiveness]
OPM1 did a great job in establishing the proper relationship early.

"P16: Structured interview with Contractor.pdf - 16:8 [To your best knowledge, why is..] (4:326-4:1034) (Super)
Codes: [Commitment] [Owner][Team's IPD experience]

To your best knowledge, why is IPD being pursued in this project? The Design Supplier was the main driver behind that. OPM1 was not familiar with the process necessarily when he was involved ??? in the project. Donation, time.
2) What were your motivations (individual aspect and organizational aspect) to join this IPD project?
It is new in the industry. We'd like to be a part of it We wanted to learn, experiment and understand. You were on board because of IPD or Demonstration Building? The biggest one is that it was demonstration building it was fairly unique building. It was a great opportunity for us to try the project in State A to see if we might want to pursue additional work in State A.

P16: Structured interview with Contractor.pdf - 16:31 [We were very committed to it. ..] (8:607-8:816) (Super)
Codes: [Commitment]
We were very committed to it. From the beginning I was skeptical that that wasn't the best approach for this project based on when we all enter the team and based on the size and relatively effort around IPD.

P16: Structured interview with Contractor.pdf - 16:33 [Really what we were doing is j..] (8:1529-8:1926) (Super)
Codes: [Commitment]
Really what we were doing is just getting pricing and ideas from them based on initial set of drawings with no commitment. Very little resistance. It is not a real project for them yet. They know they are going to have to ultimately put in the hard work to bid it later. You have to careful about how the effort put in by them ,donating their time basically translates to accurate numbers.

"P16: Structured interview with Contractor.pdf - 16:10 [They need to be really joint c..] (4:1548-4:1725) (Super)
Codes: [Culture Fit]
They need to be really joint closely, they need to work together more collaboratively, you would hope that you develop a strong relationship that we carry to the next project.

P16: Structured interview with Contractor.pdf - 16:35 [Process Planning-Design Charre..] (9:629-9:672) (Super)
Codes: [Culture Fit]
Process Planning-Design: Charrettes ☐ 4

P16: Structured interview with Contractor.pdf - 16:38 [Shared Risk ? 3] (9:789-9:805) (Super)
Codes: [Culture Fit]
Shared Risk: ☐ 3

P16: Structured interview with Contractor.pdf - 16:36 [Set based Design-Early Contrib..] (9:702-9:744) (Super)
Codes: [Culture fit]
Set based Design-Early Contribution: ☐ 4

P16: Structured interview with Contractor.pdf - 16:39 [Performance Compensation ? 4 B..] (9:833-9:907) (Super)
Codes: [Culture fit]
Performance Compensation: ☐ 4
Behavior Compensation Evaluation: ☐ 4

P16: Structured interview with Contractor.pdf - 16:40 [Project Documentation Manageme..] (9:995-9:1045) (Super)
Codes: [Culture fit]
Project Documentation Management Software: ☐ 3

P16: Structured interview with Contractor.pdf - 16:42 [IPD Training ? 3] (9:1112-9:1129) (Super)
Codes: [Culture fit]
IPD Training: ☐ 3

P16: Structured interview with Contractor.pdf - 16:43 [Project Steward ? 3] (9:1189-9:1209) (Super)

Codes:[Culture fit]
Project Steward: ☐ 3 "

"P16: Structured interview with Contractor.pdf - 16:24 [To what extent are members of ..] (10:1224-10:1861) (Super)
Codes: [Monitor]
To what extent are members of your team encouraged to monitor those factors? How are members encouraged?
I did not bring them into the process. They were involved a bit and attended the first IPD section etc. Certainly it will happen when we got a little further in the project. Pitfalls? In the early stage there are a lot of subject responsibilities, subjective understanding of information. A lot of problem can happen is those things are properly communicated back and forth to additional team members. Here because I handled the whole process on our end and we did not really have that opportunity for that break down.

"P16: Structured interview with Contractor.pdf - 16:22 [Is there a project leader in t..] (7:2765-8:121) (Super)
Codes: [Manage]
Is there a project leader in this project to manage information exchange on a regular basis? [If yes= How is it conducted?]
OPS1. We didn't do anything in this process that was necessarily different or enhance than a non IPD process.

"P16: Structured interview with Contractor.pdf - 16:28 [Did do try to adopt or accept ..] (11:1468-11:2579) (Super)
Codes: [Challenge] [Reward structure_incentives] [Culture Fit]
Did do try to adopt or accept some new ideas which your organization is not familiar with in this project? What are they?
Yes. The idea behind compensation layer and aligning all of the players with incentives is something that we are going to continue to promote in even non IPD project. I think there is some value there. I think there is something there that I can really get the design, construction and ownership team alignment. If you don't have the financial alignment, your alignment is really about the wanting to maintain a great relationship will result in the teamwork together in the next job. But you also add this Compensation layer to it and to put your fee at risk, there is really solid connection that adds to that.
2) Did you encourage the members of your organization to challenge the existing mechanism with this IPD project and provide some new methods or ideas to this project? How did that go? Yes
3) Do you think challenging existing mechanism can contribute to the performance of this project? How? Do you have any examples from the project so far? Yes

"P16: Structured interview with Contractor.pdf - 16:48 [In what ways has IPD contribut..] (13:1024-13:1147) (Super)
Codes: [Problem Addressed]
In what ways has IPD contributed to your positive or negative perceptions about this project and process flow? Positively

"P16: Structured interview with Contractor.pdf - 16:47 [How satisfied are you with the..] (13:409-13:459) (Super)
Codes: [Participants Satisfaction]
How satisfied are you with the overall process? Yes

Design Supplier
"P19: Structured Interview with Major Supplier.pdf - 19:24 [IPD Training ? 3 Sessions ? 3-..] (10:777-10:813) (Super)
Codes: [Training]
IPD Training: ☐ 3
Sessions: ☐ 3-4

"P19: Structured Interview with Major Supplier.pdf - 19:5 [To your best knowledge, why wa..] (4:39-4:908) (Super)
Codes: [Motivator_Market]
To your best knowledge, why was IPD being pursued in this project?
SPM1- I think IPD was first referred to it because our founder's son who is now retired still does a lot of work with the State of State A with businesses and he and OPM1 are colleagues on different boards, in terms of economy and business development so I think when he and OPM1 started talking about OPM1's vision under the organization, OPM1 is building support for his vision, that's when SEM said to him "If you're going to do this sustainable project you should really look at incorporating IPD into this" because it will further strengthen your story. So it really came into us on more of a personal I mean just basically got a call one day and say you need to be in City A, because this gentleman wants to go IPD. So it came more from an executive level. He is our champion.

"P19: Structured Interview with Major Supplier.pdf - 19:24 (2) [IPD Training ? 3 Sessions ? 3-..] (10:777-10:813) (Super)
Codes: [Information sharing mechanism]
Project Meetings: ☐ 3-4

"P19: Structured Interview with Major Supplier.pdf - 19:18 [UR1- So how about now? Has your ..] (9:723-9:1199) (Super)
Codes: [Culture Fit] [Financial Transparency]
UR1- So how about now? Has your perception change so far?
SPM1- I don't think at this point… I think the reality is unless OPM1 comes back to us with a different scope… I think we could still initiate an IPD successfully on this but it has to be where there is a lot more transparency on the up front in terms of this is the money I have… and again I put us in the in the category of failing to determine that early enough. I think should have taken the post much earlier.

"P19: Structured Interview with Major Supplier.pdf - 19:17 [SPM1- I'd say I was probably 75% ..] (9:173-9:720) (Super)
Codes: [Confidence in project management]

SPM1- I'd say I was probably 75% confident at the onset. Especially with OPS1, it's just like wow he has got it, he wants to run with this, he is enthusiastic, we are going to do this. OPM1 was a very engaged owner. I was very confident this is a good start. That started backsliding a little bit once we started to not meet deliverables in terms of expected budget, discrepancies between the reality of what the cost would be. So then they started sliding back. But I would say going up front I was 75% to 80% thinking this was going to go.

"P19: Structured Interview with Major Supplier.pdf - 19:20 [Process Planning-Design Charre..] (10:267-10:339) (Super)
Codes: [Culture Fit] [Phase of involvement]
Process Planning-Design
Charrettes: ☐ Project: 2: Organization: 5
Comment: G Culture fit; N Phase of involvement, the conceptual design was finished when the Charrettes happened

P19: Structured Interview with Major Supplier.pdf - 19:21 [Set based Design-Early Contrib..] (10:368-10:410) (Super)
Codes: [Phase of Inovlvement]
Set based Design-Early Contribution ☐ 2"

"P19: Structured Interview with Major Supplier.pdf - 19:14 [SPM1- Just because you have confl..] (7:2215-8:211) (Super)
Codes: [Trust]
SPM1- Just because you have conflict doesn't mean you don't have trust. It's how you resolve the issue. I expect to have conflict on a project, that's healthy, that's even healthier when you resolve together as a team. Where they break down is when decisions were made without team's input or your find out about it after the fact. It could be unintentional, it could be a haste type of thing but when you do that, it does create impediment to having a trust based team. So that needs to be driven all the time to continue that mechanism work(?). Developing and building on that trust, it has to have total transparency. If you don't have that, you are not going to have a trust based team.

"P19: Structured Interview with Major Supplier.pdf - 19:16 [I'd say the less devoted was… ..] (8:1788-8:2642) (Super)
Codes: [Commitment]
I'd say the less devoted was… I wouldn't say devoted, but I think what happened at least with myself and some of my colleagues internally is when we started seeing some of the little cracks we started having our questions in terms of feasibility and we backed off a little bit, because we saw some of the red flag, and we started thinking, OK how much do we invest in it. Do we have other projects that are progressing forward and they want to do this. How much do we allocate time to a project where we think is highly likely to not proceed. In terms of devotion, again, I am not sure if it is the right word, commitment, I have no
question that the other partners were committed. I think The Design Supplier at some point was committed but they started backing up thinking that this might not go ahead. So the reality of that kind of downed on us.

"P19: Structured Interview with Major Supplier.pdf - 19:4 [I think part of it again is cu..] (3:1811-3:2125) (Super)
Codes: [Culture Fit]
I think part of it again is cultural, in the Midwest, I am not from here, but everybody is so afraid of offending somebody that they are too bold or too… requiring information is just not polite. And I think you need a lot more of that understanding and we could present that to get more valid information.

P19: Structured Interview with Major Supplier.pdf - 19:19 [SPM1- Here internally, I work wit..] (9:1439-9:2143) (Super)
Codes: [Culture Fit]
SPM1- Here internally, I work with a very large organization. It was a tougher sell internally, believe or not, even with a strong business case but it's more difficult to get people to make sightful changes when it involves millions of dollars especially in this economy. I think the culture was right because OPM1 has a vision in sustainability and high performance and great partners, I mean, who wouldn't want UNIVERSITY S as a partner… so I think in terms of culture The Design Supplier likes to align themselves with visionaries… so I think that culture was a fit. So I'd say culturally we were aligned, because we both had the right or the same goals going forward. It's just the perceptions were a little off

P19: Structured Interview with Major Supplier.pdf - 19:23 [Relational Contract ? 4] (10:725-10:750) (Super)
Codes: [Culture Fit]
Relational Contract: ☐ 4

"P19: Structured Interview with Major Supplier.pdf - 19:25 [Project Steward ? 4] (10:856-10:876) (Super)
Codes: [Manage]
Project Steward: ☐ 4

Negative

Owner

"P17: Structured interview with Owner.pdf - 17:1 [What, if any, prior experience..] (2:577-2:681) (Super)
Codes: [Owner] [Team member IPD experience]
What, if any, prior experiences have you had in IPD projects (either philosophy or contractual) before?
Comment: P, The owner did not have any IPD experience

P17: Structured interview with Owner.pdf - 17:3 [What, if any prior projects ha..] (2:1614-2:1813) (Super)
Codes: [Owner] [Team member IPD experience]
What, if any prior projects have you use collaborative deliver methods (i.e., partnering, design-build)?
Sustainable design build. If you have a partner, they all have to be interaction together.
Comment: P The owner is not satisfied with the design build experience he had before.

P17: Structured interview with Owner.pdf - 17:6 [You can be the best writer in ..] (3:999-3:1741) (Super)
Codes: [Information Sharing Mechanisms] [Remove Obstacles]
You can be the best writer in the world, but it's very hard to convey a nuanced situation in an email. I am also in written to correspondence and record in fact. I am really a proponent of that. It's kind of verbal communication might have been better. But then I could never fully resolve myself. That one-on-one verbal communication was somehow violating the spirit of IPD. Through email you could CC everybody and said OK, I have made a team thing. There is a couple of times that I want to pick up the phone and call SPM1 and say SPM1 here is what's going on. And I did that a couple of times and I could have done that more. But then I am keeping people out of the loop. I can't schedule a conference call of 10 minutes.

P17: Structured interview with Owner.pdf - 17:23 [We saw benefits in that becaus..] (7:378-7:760) (Super)
Codes: [Remove Obstacles]
We saw benefits in that because that was a big culture fit. We saw some benefit of exposure in City B, to a higher profile company. So we saw the value on that. I think in the end it wasn't really a The GC problem. It was a level of company problem. That level of contractor that we were dealing with just couldn't deliver the product for earning less than $250,000 premium.

P17: Structured interview with Owner.pdf - 17:24 [And a little bit of experts pr..] (7:786-7:889) (Super)
Codes: [Remove Obstacles]
And a little bit of experts problem. Because we double our experts. In house experts: OPM2, OPM1, OPS1.

P17: Structured interview with Owner.pdf - 17:47 [I don't think even that would ..] (13:1669-13:1744) (Super)
Codes: [Remove obstacles]
No negotiation procedure? I don't think even that would help. Just conflicting in organizational goals

"P17: Structured interview with Owner.pdf - 17:13 [What were the general processe..] (5:13-5:367) (Super)
Codes: [Decision Making System]
What were the general processes followed and the factors considered to making important decisions in this project? The selection of contractor That was a very methodical process. In the process by which The Design Supplier took us through in that , that lead to a very good fit for a builder except to the point we didn't realize it was a bad financial model.
Comment: P OPM1 said GC selection was the ONLY decision they made as a team. And None of them realize the financial model issue at the beginning.

P17: Structured interview with Owner.pdf - 17:14 [Contract- administrator (Howar..] (5:371-5:711) (Super)
Codes: [Decision Making System]

Contract- administrator (XC1) It was very clear that The Design Supplier's preference was we need to use that. It's very expensive. It was 10% of the cost of what The Design Supplier donated. It's just the cost of the donation. That wasn't really a joint decision, that was almost, like the selection of IPD itself, that was kind of what came with The Design Supplier.

P17: Structured interview with Owner.pdf - 17:15 [To your best knowledge, why is..] (3:2278-3:2652) (Super)
Codes: [Decision Making System]
To your best knowledge, why is IPD being pursued in this project?
The reason is because it was the condition of The Design Supplier contribution to the project. They originally had a conditional support. They said " OPM1, we will do all this for Project B, provided you implement and allow us to document the study in IPD process. So that was absolute condition.

"P17: Structured interview with Owner.pdf - 17:5 [We were trying to schedule stu..] (3:823-3:955) (Super)
Codes: [Commitment]
We were trying to schedule stuff with The Design Supplier and they kept pushing it back just because of scheduling, they can't get together.

P17: Structured interview with Owner.pdf - 17:44 [Use cost Project control. Here..] (10:1011-10:1647) (Super)
Codes: [Commitment] [Manage]
Use cost Project control. Here is where it failed. This is kind of The GC's fault. We did everything to reduce the cost. But those were the only cost reductions we had. We reduced the scope of the buildings, we changed the materials. Nothing came from The GC. What if we did this differently. But it did with the new contractor. They have some ideas that save us a lot of money. The GC were great technicians. When AR1 and I made changes to reduce the scope of the project, they could determine how much it would save us. But that's all it was. In that sense, they were just accounts. We didn't see any value added (from The GC).

P17: Structured interview with Owner.pdf - 17:48 [The Design Supplier just dropped out the I..] (13:981-13:1131) (Super)
Codes: [Commitment]
The Design Supplier just dropped out the IPD program. Essentially, the whole teams thing is breaking down. She (SPM1) just thought it isn't working as an IPD.

"P17: Structured interview with Owner.pdf - 17:4 [You quit IPD, but were you sat..] (2:1819-3:313) (Super)
Codes: [Participants Satisfaction] [Culture fit]
You quit IPD, but were you satisfied with the skill levels of the project participants or not (incentives/incentives management efforts to remove obstacles for implement)?
I think the team was overqualified in the project. Yes I was satisfied, but that level of sophistication get in the way of the actual delivery of a fairly simple building. It is completely depended on the complexity of the project. If this were an complex project, it would have an different answer.

P17: Structured interview with Owner.pdf - 17:10 [Different motivations of team ..] (4:1255-4:1486) (Super)
Codes: [Culture fit]
Different motivations of team members. I think The Design Supplier is a very deliberate big organization, very rational, very methodical. Sometimes we are ready fire aim kind of people. We are not used to institutionalizing decision making.

P17: Structured interview with Owner.pdf - 17:11 [We were on the site every day...] (4:1488-4:1742) (Super)
Codes: [Culture Fit]
We were on the site every day. So we were very hand-on owner-developer. Whereas The Design Supplier was trying to bring in a level of sophistication with building contractor that we just didn't need. There is a significant financial premium to be paid for that.

P17: Structured interview with Owner.pdf - 17:33 [Reduce risk and share risk I c..] (8:664-8:750) (Super)
Codes: [Culture Fit]
Reduce risk and share risk: I called it increasing my risk by engaging in IPD process.

P17: Structured interview with Owner.pdf - 17:34 [Do you think you were sharing ..] (8:754-8:1134) (Super)
Codes: [Culture Fit] [Reword Structure_risk pool]
Do you think you were sharing the risk by all?
No. The architect and contract get their cost covered. Their profits were at risk. But I had more than that at risk which is fair. That's why I do what I do and they do what they do. I also have an unlimited reward. Their reward is very limited. The notions of shared risk is a little oversold from my perspective as an owner.

P17: Structured interview with Owner.pdf - 17:36 [The relational contract: I nev..] (8:1291-9:95) (Super)
Codes: [Culture Fit]
The relational contract: I never signed one. That was never executed. Because we never had any number to put in. In theory? No, it was more a leap of faith. It was not a good fit for our organization.

"P17: Structured interview with Owner.pdf - 17:39 [SPM1 was the IPD project stew..] (9:383-9:656) (Super)
Codes: [Manage]
SPM1 was the IPD project steward.
Do you think it is fit to have her has a good communicator?
No. Because she is a little intimidating. She is very capable, very bright, very personable???, very strong willed. She said things indirectly that are in essence orders.

P17: Structured interview with Owner.pdf - 17:44 [Use cost Project control. Here..] (10:1011-10:1647) (Super)

Codes: [Commitment] [Manage]
Use cost Project control. Here is where it failed. This is kind of The GC's fault. We did everything to reduce the cost. But those were the only cost reductions we had. We reduced the scope of the buildings, we changed the materials. Nothing came from The GC. What if we did this differently. But it did with the new contractor. They have some ideas that save us a lot of money. The GC were great technicians. When AR1 and I made changes to reduce the scope of the project, they could determine how much it would save us. But that's all it was. In that sense, they were just accounts. We didn't see any value added (from The GC).

Architect

"P18: Structured Interview with Architects.pdf - 18:22 [I think that for PM1 and for ..] (2:1841-2:1943) (Super)
Codes: [Previous cooperation experience]
I think that for PM1 and for The GC, not having work with OPM1 before, their personality is fabulous.

"P18: Structured Interview with Architects.pdf - 18:3 [I think The GC could have been..] (1:2124-1:2225) (Super)
Codes: [Remove Obstacles]
I think The GC could have been a great asset to the team. I just think distance was a huge factor.

P18: Structured Interview with Architects.pdf - 18:4 [The GC is from the Midwest, bu..] (1:2731-1:3452) (Super)
Codes: [Culture Fit] [Remove Obstacles]
The GC is from the Midwest, but I think a larger firm out of City B would have done a fabulous job building the building and the quality would have been there. But I think the distance of trying to be comfortable with the climate of construction in State A, difficult. Even though he may have got some preliminary bids from people locally, I'm not sure because of his distance or non-familiarity with the contractors. Even though we gave them all names, we give them at least two to three names of each different categories for bidding, with his unfamiliarity, connections and experiences with these people, I don't feel that it was easy for them to dial down the numbers to where they could have been.

P18: Structured Interview with Architects.pdf - 18:7 [G- I am trying to get somethin..] (2:1538-2:2310) (Super)
Codes: [Remove Obstacles]
AR1- I am trying to get something out that I think has made this more difficult for the IPD. That has been the donation factor. It's complicated the whole effort. It's complicating the effort, it's still difficult. Because it's a moving target and a moving target for a contractor is not comfortable. I think that for PM1 and for The GC, not having work with OPM1 before, their personality is fabulous. I don't think there is anybody that had a problem. It is more the moving target, you know… one day the skin is donated and the next day it's not; roof is donated by this company and now it's ??? something else. You know all those factors have caused this project to be still kind of a roller coaster a little bit. I think it's a smaller roller coaster now.

P18: Structured Interview with Architects.pdf - 18:16 [Any obstacles we can talk abou..] (3:2266-3:2547) (Super)
Codes: [Remove Obstacles]
Any obstacles we can talk about in team procurement, in choosing IPD for this project, or about risk sharing.. any obstacles in the IPD process and the project itself?
AR2- The biggest obstacle was the size of the project.
UR1- The size was not a good fit for IPD?
AR1- Its small.

P18: Structured Interview with Architects.pdf - 18:49 [AR2 – the scalability .. the siz..] (8:1-8:343) (Super)
Codes: [Manage] [Remove Obstacles]
AR2 – the scalability .. the size of the project, I don't think anybody one person maybe outside of the PROJECT B's team was solely dedicated to this project. It was hard to have this daily huddles or weekly meetings, there may have been weeks, I don't have even engaged in the process at all.
AR1- Because we are sitting and waiting for pricing

P18: Structured Interview with Architects.pdf - 18:50 [AR2- The scale of the project wa..] (8:349-8:934) (Super)
Codes: [Remove Obstacles]
AR2- The scale of the project was the main hurdle f this project. The call is that the resurgence of the scale issues kind of manifesting all these waste.
AR1- It could also have been only one of three projects The GC was working on or one of the three projects were working on. Then I can set a time frame of doing a daily huddle might make some sense. But as AR2 was saying, when it's not going to the same process of a normal project, it's taking longer. The scale is so small, in a bigger firm or a bigger contractor, it's not the focus of 100% percent of one individual.

P18: Structured Interview with Architects.pdf - 18:5 [I think if we were doing a bui..] (2:224-2:648) (Super)
Codes: [Remove Obstacles]
I think if we were doing a building closer to where they were located they would have been a fabulous choice. I think the quality probably is superior to the contractors in City C or in West State A. But I also think that may also be a factor in it as well. I'm not sure that this building has the sophistication that is necessary that would have been fit in the middle of downtown City B, a language different.

P18: Structured Interview with Architects.pdf - 18:9 [When it became economically un..] (2:3330-2:3530) (Super)
Codes: [Remove obstacles]
When it became economically unfeasible to do it, because of I think in this size of a project. I am not sure that that process work as easily when you got an owner that's so driven by the dollars.

P18: Structured Interview with Architects.pdf - 18:47 [UR1- For example, commitment log..] (7:2869-7:3413) (Super)

Codes: [Manage] [Remove obstacles]
UR1- For example, commitment logs, daily huddles, they never used, weekly meetings, were not used.
AR1- Not yet. One thing I would probably make a suggestion about is that I know SPM1 talked a lot about doing daily huddles. Daily huddles on a 5400 sf building would have absolutely been, to me, a waste of time.
UR1- Okay
AR1- if you're doing a project 200,000 sf and you made decision on a daily bases or every Thursday, their project could handle a 15 minutes huddle, but the process for an IPD was lost on the project of this small "

"P18: Structured Interview with Architects.pdf - 18:21 [I think we had too big of a ga..] (4:1125-4:1206) (Super)
Codes: [Aligned Project Goals]
I think we had too big of a gap of the cost of the building and the true budget.

"P18: Structured Interview with Architects.pdf - 18:43 [Can you talk about any example..] (7:392-7:1115) (Super)
Codes: [Manage] [Monitor] [Information sharing mechanism]
Can you talk about any examples of the problems of monitoring or the advantages of monitoring the communications?
AR1- I think, that one thing that would have helped, I think it was starting, but it hasn't got there yet. In an IPD there have be one main communicator, and everything go through that person.
UR1- Do you mean project steward kind of a person?
AR1- It's different than the project management, more of a communication steward, I know we are starting to be done with???, I don't know how far it got.. It seems that there needed to be a web-based or website where everything got housed. All you did is getting this one email out. Everything is being put on this website. It hadn't got far enough yet.

P18: Structured Interview with Architects.pdf - 18:44 [AR2- One of the things that I ha..] (7:1118-7:1928) (Super)
Codes: [Information Sharing Mechanisms]
AR2- One of the things that I have looked at successful IPD's have implemented web based collaboration tool, that isn't internal to any of the organization contract party, but it is kind of outside of everything and everyone is plugging into and then kind of exports communication to all (participants). You can do communication management. It's very valuable as a tool. I don't think it was ever developed. I only think it's a master list of everybody like a project team, like a spread sheet was developed for these, that had all the different players and communication, how to get hold of them and all those sort of stuff. So I kind of sometimes felt left in the dark… It was like who am I supposed to be talking to, who might supposed to be including in this email
AR1- and players were changed

"P18: Structured Interview with Architects.pdf - 18:27 [I think if the budget was alig..] (5:765-5:1325) (Super)
Codes: [Confidence in project management]

I think if the budget was aligned better and we know what would be donated early on. I think the process took so much time we kind of lost sight of the process.
UR1- That's true
AR1- You know what I mean? It took place over holidays and the budgeting and all that with The GC and all the donation process took a while to come to fruition. I think the IPD typically would be a shorter constraint of time and some of that also accentuated the need to move to a typical time line because we were losing sight of when the building would actually get built.

"P18: Structured Interview with Architects.pdf - 18:18 [G- No. Oh well, I think anothe..] (3:3009-3:3878) (Super)
Codes: [Trust]
AR1- No. Oh well, I think another thing. Do you know there was another bidder in between? Did you know that?
UR1- No
AR1- The GC knew about that, PM1 said "if you want to get a local contractor to look at this, it might be a good idea" just to make yourself feel better in the bidding process so they asked Contractor 2 which was one of the interviewers that was not chosen, and I don't know where that bid came out at. I never saw. The next person that came into the play came from… I believe they were introduced by OPM2 DeCam. Because he kept saying they had done a lot of real estate projects and design-build. I think the mentality of where they really wanted to head is more of a design-build contractor. It's very similar to an IPD. You are trying to be collaborative and figure out how you are going to build the project when you know the budget first.

"P18: Structured Interview with Architects.pdf - 18:19 [I think the other problem with..] (3:3880-3:4387) (Super)
Codes: [Commitment]
I think the other problem with the GC, maybe knew sort of the budget but was never driving the design, the cost or the materials to that budget. I think in a true IPD you might probably know budget more up to front and all the parties are working toward that same goal of a nice building and a budget. I think the reason why the new contractor has been selected is that they are more in that design-build mentality where they are going to try to work the materials and contractions around more of a budget.

"P18: Structured Interview with Architects.pdf - 18:4 [The GC is from the Midwest, bu..] (1:2731-1:3452) (Super)
Codes: [Culture Fit] [Remove Obstacles]
The GC is from the Midwest, but I think a larger firm out of City B would have done a fabulous job building the building and the quality would have been there. But I think the distance of trying to be comfortable with the climate of construction in State A, difficult. Even though he may have got some preliminary bids from people locally, I'm not sure because of his distance or non-familiarity with the contractors. Even though we gave them all names, we give them at least two to three names of each different categories for bidding, with his unfamiliarity, connections and experiences with these people, I don't feel that it was easy for them to dial down the numbers to where they could have been.

P18: Structured Interview with Architects.pdf - 18:8 [The GC is kind of a different,..] (2:2371-2:2699) (Super)
Codes: [Culture Fit]
The GC is kind of a different, City B has a different culture, the building culture. I think that was a part of the break down. they had a different set of standard, a different set of normal, the project teams. It just made it difficult, I think they were a very good choice, but not for this project, not this location.

P18: Structured Interview with Architects.pdf - 18:11 [I think OPM1… He has known me f..] (2:3880-2:4233) (Super)
Codes: [Culture Fit]
I think OPM1… He has known me for a long time. I think he likes to see some design before he ever puts a number before he put a number to it. He likes the design process and part of the IPD process is to do the design as a whole group that had already taken place. I think some of that lost the spark. Because that was one of his favorite parts.

P18: Structured Interview with Architects.pdf - 18:17 [I think it would have made mor..] (3:2549-3:2835) (Super)
Codes: [Culture Fit]
I think it would have made more sense to have all three of the tri-add of this project to be within probably within a two-hour time period. I don't think the distance for The GC was the issue, I think it was the distance of the culture difference. It wasn't the distance in travel.

P18: Structured Interview with Architects.pdf - 18:28 [How much of a fit are these in..] (5:2801-5:3026) (Super)
Codes: [Culture Fit]
How much of a fit are these in the culture of your organization in a Likert scale of 1 – 5 (1: not fit at all; 5: fit perfectly) so: reduce risk, for example use contractually for risk management.
AR1- I'd say low, like a 2

"P18: Structured Interview with Architects.pdf - 18:43 [Can you talk about any example..] (7:392-7:1115) (Super)
Codes: [Manage] [Monitor] [Information sharing mechanism]
Can you talk about any examples of the problems of monitoring or the advantages of monitoring the communications?
AR1- I think, that one thing that would have helped, I think it was starting, but it hasn't got there yet. In an IPD there have be one main communicator, and everything go through that person.
UR1- Do you mean project steward kind of a person?
AR1- It's different than the project management, more of a communication steward, I know we are starting to be done with???, I don't know how far it got.. It seems that there needed to be a web-based or website where everything got housed. All you did is getting this one email out. Everything is being put on this website. It hadn't got far enough yet.

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P18: Structured Interview with Architects.pdf - 18:46 [UR1- Let me ask you something ab..] (7:2142-7:2865) (Super)
Codes: [Manage]
UR1- Let me ask you something about managing. What strategies do you use to improve the performance of teams normally and what did you use in terms of strategies here in this project for example, schedules, project controls…
AR1- If the process was fully going to be a IPD we would have organized a timeline where we would say every week we'll have an hour conference call and all these parties need to be part of that period.
UR1- but that didn't happened…
AR1- It did not happened. I think the time frame of the stretching of going to the donation through that off of the loop, because we were doing that… First got through the process of the design, started to look at the budget we ??? regularly trying to talk.

P18: Structured Interview with Architects.pdf - 18:47 [UR1- For example, commitment log..] (7:2869-7:3413) (Super)
Codes: [Manage] [Remove obstacles]
UR1- For example, commitment logs, daily huddles, they never used, weekly meetings, were not used.
AR1- Not yet. One thing I would probably make a suggestion about is that I know SPM1 talked a lot about doing daily huddles. Daily huddles on a 5400 sf building would have absolutely been, to me, a waste of time.
UR1- Okay
AR1- if you're doing a project 200,000 sf and you made decision on a daily bases or every Thursday, their project could handle a 15 minutes huddle, but the process for an IPD was lost on the project of this small

P18: Structured Interview with Architects.pdf - 18:48 [daily email versus daily call ..] (7:3501-7:3751) (Super)
Codes: [Manage]
daily email versus daily call when the project is not taking more than 10% of our persons' time in their work load, that's a lot of , you know, you have to wait for ten people to get on the phone. It's not 15 minutes. It's half an hour or an hour.

P18: Structured Interview with Architects.pdf - 18:49 [AR2 – the scalability .. the siz..] (8:1-8:343) (Super)

Codes: [Manage] [Remove Obstacles]
AR2 – the scalability .. the size of the project, I don't think anybody one person maybe outside of the PROJECT B's team was solely dedicated to this project. It was hard to have this daily huddles or weekly meetings, there may have been weeks, I don't have even engaged in the process at all.
AR1- Because we are sitting and waiting for pricing

"P18: Structured Interview with Architects.pdf - 18:45 [During different donations, ev..] (7:1965-7:2139) (Super)
Codes: [Negotiate]
During different donations, everybody when they sign up to get product, they all want some sort of say in the process and it's challenging too to navigate through all that.

General Contractor
"P16: Structured interview with Contractor.pdf - 16:8 [To your best knowledge, why is..] (4:326-4:1034) (Super)
Codes: [Commitment] [Owner][Team's IPD experience]
To your best knowledge, why is IPD being pursued in this project? The Design Supplier was the main driver behind that. OPM1 was not familiar with the process necessarily when he was involved ??? in the project. Donation, time.
2) What were your motivations (individual aspect and organizational aspect) to join this IPD project?
It is new in the industry. We'd like to be a part of it We wanted to learn, experiment and understand. You were on board because of IPD or Demonstration Building? The biggest one is that it was demonstration building it was fairly unique building. It was a great opportunity for us to try the project in State A to see if we might want to pursue additional work in State A.

"P16: Structured interview with Contractor.pdf - 16:1 [For a project of that size, we..] (2:146-2:433) (Super)
Codes: [Remove Obstacles]
For a project of that size, we are probably not a good fit from the beginning to travel. The way we approached it is a little bit more expensive. It does not translate to a project of that size. It becomes a noticeable premium rather than just a minor premium when it's a bigger job.
P16: Structured interview with Contractor.pdf - 16:6 [During preconstruction, we are..] (3:1282-3:1928) (Super)
Codes: [Remove Obstacles] [commitment]
During preconstruction, we are essentially billing by the hour. We never get reimbursed with what we are owed for it. Actually, when you look at what you are going to put into the project up front. It is a substantial amount of staff time. When that's tagged on to the cost of the project that they really want it to be under $ 1 million. It becomes a significant premium. With a fairly simple building like this, you can cut to the chase a little bit faster with a traditional negotiate approach. Everybody is still on board early, at the table early and transparent, but you are not necessarily following every steps of IPD process.

P16: Structured interview with Contractor.pdf - 16:20 [It was all handled via verbal ..] (7:198-7:1809) (Super)

Codes: [Remove Obstacles]
It was all handled via verbal communication between OPM1 and I and even AR1 at times. In the numbers, I layout everything, all the details, how I estimated how I contract the numbers they've got in. Everybody could see how it was all put together. I always welcome that they put codes on it and give us a critical feedback on it. We always have to do that in team relationship like that. From the time the initial numbers were on the table, there was clearly consternation between OPM1's office and AR1's team about " we should be paying less for this building" First of all I am talking to all the subcontractors in State A that you recommended I talk to and getting pricing from them based what is being drawn and described here.
Secondly, I said I would rather your curiosity be ??? early if you think you would like another general contractor in State A that where you worked on regular bases to numbers on this so that you can compare. Please do. If that switch had to be made, I'd rather it had be made earlier than later. In the final round of pricing, they ultimately did that. I think they found that the numbers were not significantly less, but when you take our general conditions and the amount of staff we put on the project and the time of travel. On a small project like this virus a general contractor that can do that project in the neighborhood they doesn't have to put a full time field superintendent on site because he has a superintendent doing other project in the area. The premiums were enough and they realized that they had to go different direction.

"P16: Structured interview with Contractor.pdf - 16:13 [The factors are very good poin..] (5:455-5:1467) (Super)
Codes: [Aligned project goals]
The factors are very good points here because typically, factors like budget, scheduling and quality level essentially drives the decisions made in the design of the project. Here the budget is typically set by the amount of revenue you can gain. Here because that this was really something that OPM1 was putting up the money for with other investors and something he knew would really be just sort of a show piece and not something that he would get any kind of return on investment for. I didn't have that parameter 100%. It sort of revolve around OPM1 and his feeling for what he really want this to be and how much he really want to spend. I think that's a little bit different than most of the project where most of the parameters are pretty well set and pretty well confined. Here it was a little bit more subjective and really kind of entirely in OPM1's hands because I think in his mind he had a range of cost. It was only to spend based on much bank he was going to get from the buck??? .

"P16: Structured interview with Contractor.pdf - 16:14 [I think everyone was very unif..] (5:2063-5:2609) (Super)
Codes: [Phase of involvement]
I think everyone was very unified. Everybody is like 'this is really going to a great building. Then the reality cost is brought into it as it was a few month ago, we did our initial budget on it after the IPD process had begun. It makes it very difficult to start to stripping away some of the things that you were really thought great in the project. Unfortunately some of that had to happen to get the numbers down to where it will be applaudable to OPM1. Both OPM1 and Designer had to sacrifice some of the design to meet the budget.

P16: Structured interview with Contractor.pdf - 16:32 [In the true sense of IPD, we d..] (8:1372-8:1526) (Super)

Codes: [Phase of involvement]
In the true sense of IPD, we didn't get there. We had not brought on any subcontractors or vendors that were going to participate in the IPD process with

P16: Structured interview with Contractor.pdf - 16:11 [What was unique in this case i..] (4:1818-4:2186) (Super)
Codes: [Early involvement effectiveness]
What was unique in this case is that. Usually sizeable project have some baseline for cost even before you begin to design it. Here because we were brought a little bit later than the design is already in motion conceptually fairly far along . The building was unique, it wasn't something that you could go out and find comparable cost for comparable buildings on

"P16: Structured interview with Contractor.pdf - 16:6 [During preconstruction, we are..] (3:1282-3:1928) (Super)
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"P16: Structured interview with Contractor.pdf - 16:26 [If this is a true IPD. We prob..] (11:204-11:442) (Super)
Codes: [Manage]
If this is a true IPD. We probably would have probably have comprehensive preconstruction schedule. We would have been meeting regularly and make sure we are on track of that schedule and also make sure we were all on the same pages.

"P16: Structured interview with Contractor.pdf - 16:19 [There was a period of time a c..] (7:1811-7:2229) (Super)
Codes: [Negotiate]
There was a period of time a couple of weeks went by, I really hadn't heard that much from the team. I kind of suspected that at that time they kick me up of my operate and actually going out for someone else. I finally did connect with OPM1. He was very upfront honest and very gracious and said we have decided to go with one of our local contractor here just to keep it simple now that it's a simple building.

Design Supplier

"P19: Structured Interview with Major Supplier.pdf - 19:3 [You quit IPD, but were you sat..] (3:580-3:999) (Super)
Codes: [Team member IPD experience] [Owner] [General Contractor][Architect]
You quit IPD, but were you satisfied with the skill levels of the project participants or not (incentives/incentives management efforts to remove obstacles for implement)?

SPM1- I don’t think that it was the level. … because it’s so new, I wish people had had more experience but I myself am still learning so it’s somewhat unfair of me to judge that and say I am satisfied or not satisfied. It’s more of a reality.

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"P19: Structured Interview with Major Supplier.pdf - 19:2 [To what extent have you worked..] (3:69-3:160) (Super)
Codes: [Previous cooperation experience]
To what extent have you worked with the other parties in the project team before? SPM1- none

"P19: Structured Interview with Major Supplier.pdf - 19:18 [UR1- So how about now? Has your ..] (9:723-9:1199) (Super)
Codes: [Remove obsacles] [Financial Transparency]
UR1- So how about now? Has your perception change so far?
SPM1- I don’t think at this point… I think the reality is unless OPM1 comes back to us with a different scope… I think we could still initiate an IPD successfully on this but it has to be where there is a lot more transparency on the up front in terms of this is the money I have… and again I put us in the in the category of failing to determine that early enough. I think should have taken the post much earlier.

P19: Structured Interview with Major Supplier.pdf - 19:10 [SPM1- Especially for project of t..] (6:464-6:719) (Super)
Codes: [Remove Obstacles]
SPM1- Especially for project of this size and it is interesting, I don’t quite get it yet, because I haven’t work on the scale of the project as some of my colleagues have. They are telling me that the larger projects are easier than the smaller projects."

"P19: Structured Interview with Major Supplier.pdf - 19:9 [SPM1- We form a team like that. T..] (5:2744-6:380) (Super)

Codes: [Aligned Project Goals] [Decision Making System]
SPM1- We form a team like that. That is what you hold each other accountable, right? As far as (?) we get into the project, they have… you know, not feasible options, that what you can discuss together as a team, but before you even form the full team, you change the scale or scope of the project which happened. Those went from… "OK. We are going to build this high performance green building with IPD to get us there, by the way, we are going to bring in all the partners and they are going to contribute, they are going to donate. That changed the scope.

P19: Structured Interview with Major Supplier.pdf - 19:11 [SPM1- The communication at this p..] (6:1519-6:1789) (Super)
Codes: [Decision Making System]
SPM1- The communication at this point was, because we knew we had to build a team, it was more on scheduled, "OK, this is the date. This is where we get together. This is where the decision will be made. Those were defined by the owner, and already determined partners.

P19: Structured Interview with Major Supplier.pdf - 19:12 [To what extent was everyone in..] (6:1949-7:375) (Super)
Codes: [Decision Making System]
To what extent was everyone in the project able to unify their different thoughts and perspectives to reach final decisions on the project? If you were able to reach unity in your collective decision making, how was this achieved?
SPM1- I think that was weak. I think where that happened was once the reality of the budget came to light and alternative direction for taken. I don't think the team has full awareness of that anyway. All we knew is that the audit is being done, and the next thing we knew is that the decision was made. If you are under IPD, you are part of that audit, you are part of making that determination. This is preempted by the whole budget. This isn't going to happen. You know, we can't cost this much money in alternative default plan. It's not what we called IPD.

P19: Structured Interview with Major Supplier.pdf - 19:28 [SPM1- um, I don't think… I think ..] (12:333-12:846) (Super)
Codes: [Decision Making System] [Negotiate]
SPM1- um, I don't think… I think it could have been better. I don't' think it was terrible. I don't want to use the word "panic" But when the scale of the project in terms of budget didn't align with the owner's expectations. I think a lot of decisions were made in haste and those negotiations were probably done behind doors, close doors. That's not my expectation in terms of how to manage that but I think it was just circumstantial and related to lack of IPD experience and the type of covert behaviors.

"P19: Structured Interview with Major Supplier.pdf - 19:7 [SPM1- For this project I think th..] (5:9-5:1361) (Super)
Codes: [Aligned Project Goals]
SPM1- For this project I think the obstacles were probably we started at a running start. We should have assessed earlier what the owner's familiarity was. We have to ???, because all we heard the first time was "we want to have University S class here in May and June. We should have probably assessed their readiness compare to their feasibility. I think that was one obstacle that probably created a rocky start, because the perceptions were not aligned, the expectation

weren't aligned. I think the first real understanding of that I came to City B session when the topic of budget came up. I wasn't there of course, I was in Toronto, but my colleagues said that they could read that point that there was a huge gap in terms of expectations related to budget.
UR1- In terms of the budget, are you talking about the amount of the time and upfront cost that needs to be devoted to IPD projects?
SPM1- I don't know, but obviously with IPD, you do have of more a cost upfront. Because of the investment upfront, that's a better reward on the other end, but it was more in terms of understanding to what the real cost are period. When you have an owner that think he can get a high performance building with $100/ sf, his understanding and expectation and our understanding to what is really going on in the build world were very far apart.

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Codes: [Culture Fit]
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UR1- So we're not just talking about really budget in term of IPD but rather high performance green buildings here?
SPM1- Well no, I think it all comes together, the cost is not skewed by IPD in this sense it was just having a basic understanding to what it costs to build these types of a building. The expectations the owner had did not equal to the cost of delivering that project would be. So then there was a shift that IPD would be the main focus of this project. That's why The Design Supplier was in it. We knew it was worth well cost to support our sustainability story but then when the costs of coming together in terms of what it would really be, one of the objectives of the project or goals in seeking cosponsors and contributors definitely changed the tone of the IPD. With IPD, one of the key components is that it is repeatable. You can't repeat this with other projects. To the level of contributors, that is not realistic to expect that other projects are going to be able to go out and meet those types of contributions.

"P19: Structured Interview with Major Supplier.pdf - 19:13 [What, if any, controversies ha..] (7:385-7:2126) (Super)
Codes: [Negotiate] [Sustainability]
What, if any, controversies have appeared in the project so far? How was it handled?

SPM1- One controversy was The Design Supplier being a part of this project was to bold for IPD and we were donating products. Now when the pre-construction quotes were being done, I got an email from OPM1 saying that "to cut costs we were going with the HVAC units on the roof." And that is totally contradictory to our raised floors are intended to do. Our product is intended to run the HVAC under the floor. That was something that I had to push back on and say " This is not what the original agreement was. This was one thing. I am trying to think what the other one was. There was a decision to cut costs which is very typical in other projects, people made these value engineer decisions. But they are very short-sighted.
UR1- They are not value adding, actually.
SPM1- They are detracting because in making that quick decision to tear down budget, they could be short-sighted in terms of long-term pay back on some of these original investments. That is not unique to this project. That happened in many ways on "value-engineering". People just think they are going to cut costs and so there were a couple of those situations where in the haste to bring this project within owner comfort of scale or budget. Some short-term decision were determined that negatively impact the sustainability story. So those decisions can be made via email, and then I responded back saying that " Please understand that, you might think this is cutting dollars here, but in the long run it's going to cost you more in terms of either hard dollars, or PR, or it wil negate the image of a high performance building. That can happen at many projects.

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Not Given

There is no quotation under this category.

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