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BARRIERS AND CHALLENGES TO THE ADOPTION OF COLLABORATIVE PROJECT DELIVERY METHODS: A MULTIPLE-CASE STUDY ANALYSIS

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BARRIERS AND CHALLENGES TO THE ADOPTION OF COLLABORATIVE PROJECT DELIVERY METHODS: A MULTIPLE-CASE STUDY ANALYSIS

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Abstract

The last 30 years have seen considerable advantages afforded to those who chose to adopt more collaborative project delivery methods (IPD, Progressive Design Build) in the Construction Industry; however, despite these benefits, construction projects utilizing collaborative delivery methods still only account for a small fraction of overall construction deliveries. This research focused on probing leading industry professionals to better identify the barriers and challenges which are currently preventing project stakeholders across the United States from adopting these more collaborative project delivery methods, particularly first-time adopters. This study collected data from semi-structured interviews with 13 professionals in the Construction Industry who had experience with collaborative project delivery methods. Detailed analysis of stakeholder responses using NVivo software led to key insights associated with the implementation of IPD and Progressive Design Build projects including those related to teaming, learning, and administration. A new class of challenges is proposed related to managerial obstacles. The implication of this research is that appropriately recognizing and categorizing the pitfalls associated with the implementation of collaborative project delivery methods can provide Construction Industry professionals with a valuable framework for formulating effective solutions to overcome them.

Chapter 1: Introduction

1.1 Background to the Research

Integrated Project Delivery (IPD) is a construction delivery method that seeks to engage multiple stakeholders throughout the phases of design, fabrication, and construction. With an emphasis on increased communication between all parties involved, IPD seeks to avoid time overruns, increase productivity, reduce inter-party conflict, and enhance final product quality (Forbes & Ahmed, 2020). Despite the obvious benefits of the IPD delivery method, many market participants have been slow to adopt this system of contracting for their projects (LCI 2018). Reasons for this include unfamiliarity with the project delivery method, the hallmark stubbornness of the AEC (Architecture, Engineering, & Construction) professions, lack of proper technologies for facilitating IPD, and insufficient incentive mechanisms.

The idea of integrating project delivery is not a new one; but the path to what has become known today as IPD was not direct. In the past two decades, there has been significant research focused on IPD in the construction industry. Research surrounding this project delivery method can be divided into three prominent periods: 2001 to 2009, 2010 to 2012, and 2013 to the present (Kahvandi et al., 2017). From 2001 to 2009, researchers focused on establishing the basics, principles, and definitions of IPD and introducing it to the AEC professions. Moving into 2010 to 2012, studies shifted towards lessons learned from IPD implementation and investigating contracts from a feasibility viewpoint. More recently, from 2013 until now, research has evaluated the challenges of this emerging method and presented solutions to address them (Kahvandi et al., 2017).

1.2 Purpose of the Research

Despite its myriad benefits, IPD still only accounts for approximately 1% of construction deliveries (LCI 2018). In order to better understand the lackluster use of this project delivery method, it is crucial to first understand the barriers and challenges which are currently

preventing its more widespread adoption. The more correctly the obstacles are identified, the more precise the resulting remedies can be. Toward that end, the purpose of this research is to explore, identify, and outline the barriers, challenges, and benefits in the adoption of the integrated project delivery (IPD) approach, as perceived by major stakeholders in the construction industry. Similarly oriented research has been done before; however, much of the extant literature on the topic is nearly a decade old or older (Ey et al., 2014; Ghassemi & Becerik-Gerber, 2011; Kent & Becerik-Gerber, 2010; Korb et al., 2016; Leicht et al., 2017; Mossman, 2009; Nanda et al., 2017). This research seeks to update and, when necessary, make revisions to the existing body of knowledge.

The findings of this study will expand the existing knowledge base by assessing the construction sector's present readiness to adopt IPD and identifying the specific obstacles that hinder its implementation. This information can be utilized by industry leaders or owners who seek to advocate for IPD adoption in their organizations. Additionally, by responding to the call for more practice-oriented research studies on IPD (Svejvig & Anderson 2015), this study contributes to the contemporary research on IPD by increasing the body of knowledge in the field.

1.3 Research Objectives

With the research purpose in mind, the specific objectives of the study are listed below:

- To clearly define what the barriers and challenges are to the adoption of collaborative delivery methods (specifically IPD) in the construction industry currently.

- To better understand and catalog, when possible, the barriers and challenges which are unique to first time adopters in the construction industry of the IPD delivery method.

1.4 Project Deliver Methods in the AEC Industry

Construction project delivery is a crucial process that involves the coordination of various procedures and components necessary for designing and building a facility. The culmination of project delivery is the completion of a project that meets the owner's specifications. The process starts by gathering the owner's needs and requirements as outlined in the architectural program. These requirements are then translated into preliminary plans, which are used to make initial material, equipment, and systems selections.

As the design process proceeds through each selection decision, the design is further refined until all design decisions are made. This eventually leads to the creation of a final set of contract plans and specifications, which will guide the construction process. At this stage, the owner determines the delivery methodology that will be used to purchase the construction services, as well as the criteria for selecting the contractor.

Finally, the owner chooses an overall strategy for the delivery of the project in accordance with the developed plans and specifications. This decision is based on various factors, including the project's size and complexity, the project schedule, and the available resources. Once the overall strategy has been determined, all the parts and pieces of the agreement are put in place, and the game plan is established.

The delivery method not only determines the project's overall strategy, but also outlines how the various players involved in the project will interact and communicate with one another throughout the project's duration. This is essential to ensure that everyone involved in the project is on the same page and working towards a common goal. Effective communication and collaboration are essential to delivering a successful project that meets the owner's specifications.

1.4.1 Project Delivery Methods

In the realm of construction projects, there are four primary project delivery methods:

Design Bid Build, Construction Management at Risk, Design Build, and Integrated Project Delivery. These methods differ in five crucial ways: the quantity of contracts that the owner enters into, the relationship and functions of each party in the contract, the juncture at which the contractor enters into the project, the potential for design and construction to overlap, and the entity that guarantees the adequacy of the plans and specifications (Jackson, 2020).

The involvement of the three parties - the owner, the designer (including architects and/or engineers), and the contractor - remains constant regardless of the chosen project delivery method. It is vital to note, however, that the accountabilities and relationships differ with the various project delivery methods. Moreover, additional players will always be included in the project team, usually as subcontracted partners.

Each of these methods has specific advantages and disadvantages, and it is incumbent upon the owner to evaluate the project delivery options with regard to their project needs. Given that the success of any project relies on its given project delivery method, it is imperative that owners undertake a rigorous assessment process to determine which method is best suited for their respective project.

These four project delivery methods can be categorized into three wide categories: traditional, integrated design and delivery arrangements, and integrated project teams (Walker & Lloyd-Walker, 2015). The traditional approach completely segregates the design and construction processes while the other two emphasize integrating them into the project. This research will focus on the Progressive Design Build approach and Integrated Project Delivery, both of which are from the third category. Information from the traditional approach (Design Bid Build) and other integrated design approaches (Construction Management at Risk) is presented solely as a conceptual pendant meant to highlight the similarities and differences between these delivery methods and IPD.

1.4.2 Design-Bid-Build

Design Bid Build (DBB), also known as the traditional approach to project delivery, sees participants adhering to traditional roles and responsibilities. In this method, the owner initiates the project by commissioning an architect or engineer to design the building or structure. The design expert subsequently proceeds through the standard three design phases of schematic design, design development, and contract documents. Typically, the design professional is chosen based on qualifications and compensated through a fee or percentage of the building cost for their services.

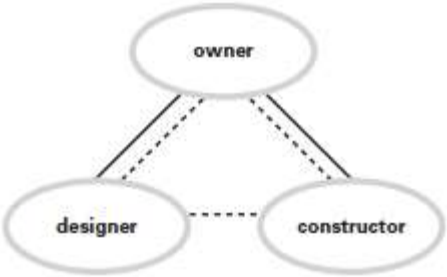


Figure 1 Design Bid Build Relationships (American Institute of Architects, 2007)

Upon completion of the plans and specifications, the owner engages a general contractor who provides all necessary construction and management services. The selection of the contractor in this case is based on low price or low bid, where multiple contractors submit bids for the project based on the contract documents, and the contractor with the lowest bid secures the contract. The general contractor typically then subcontracts various portions of the work to specialized contractors.

In this method, the owner holds two separate contracts, one with the designer and another with the general contractor. All interactions between the general contractor and designer are routed through the owner, as there is no direct legal agreement between the two parties (Jackson, 2020). The Design Bid Build approach is linear and segmented in

nature, and the general contractor does not have any authority over, or involvement in, the design of the project. Instead, the contractor is solely responsible for implementing the work outlined in the plans and specs, utilizing whichever construction management functions they deem necessary to accomplish this goal.

With the Design Bid Build delivery method, the owner bears the responsibility of ensuring the sufficiency of the plans and specs to the contractor. If there are discrepancies between the plans and specs and the owner's requirements, the contractor is frequently the one who identifies the errors and submits change orders to remedy the work. This approach can be advantageous in terms of its clear division of roles and responsibilities, but it can also lead to inefficiencies due to a lack of communication and collaboration between the contractor and designer.

1.4.3 Design-Bid-Build and Integrated Project Delivery

As mentioned above, the Design Bid Build (DBB) delivery method is the traditional approach used in the construction industry. It is characterized by a sequential process where the design is completed first and then the construction is bid upon and carried out. This approach has been used for many years and has been proven to be effective in many cases. However, the DBB approach has some limitations, such as the lack of collaboration between the different project stakeholders, lack of integrated thinking, and limited opportunities for continuous improvement.

Integrated Project Delivery (IPD) seeks to address these limitations by incorporating the principles of lean thinking and encouraging collaboration between all stakeholders. The IPD method encourages the involvement of all stakeholders from the beginning of the project, providing opportunities for continuous improvement and a more integrated approach to project delivery. The goal of IPD is to create a project team that is truly integrated and working together

to achieve the best possible outcomes for the project.

The would-be combination of DBB and IPD poses a formidable challenge since the contractor's participation in the project occurs at a substantially later phase than IPD's early engagement and collaboration requires. As such, DBB is widely viewed as the least compatible method to integrate with IPD. To actualize an IPD, the owner and architect would need to solicit bids at the earliest feasible stage and unequivocally indicate their intention to work collaboratively in pursuit of an IPD (AIA, 2007).

1.4.4 Construction Management at Risk (CM@R)

Construction Management at Risk (CM@R) is a project delivery method that involves a commitment by the Construction Manager to deliver the project within a Guaranteed Maximum Price (GMP). This arrangement allows for the construction manager to act as a consultant to the owner during the development and design phases, and then as a more traditional general contractor during the construction phase (Jackson, 2020). The CM@R method only requires two contracts: one between the owner and designer and the other between the owner and the CM@R.

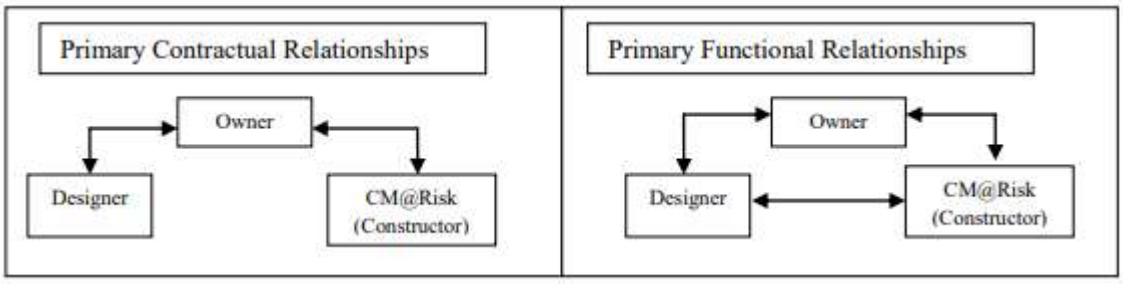


Figure 2 Construction Management at Risk Contractual and Functional Relationships (Construction Industry Institute, 2003)

This arrangement is popular with owners because the Construction Manager at Risk assumes the responsibility of completing the construction while ensuring that it is within budget and completed on time. Furthermore, the CM@R method promotes early communication between the owner, the design team, and the Construction Manager. By providing a variety of

services including value engineering, life-cycle cost analysis, conceptual estimating and scheduling, and constructability reviews during the design process, the Construction Manager at Risk can work to mitigate potential discrepancies between design and construction – such inconsistencies which frequently lead to legal claims, cost overruns, time delays, and conflicts as the project progresses.

One of the more significant benefits of this method is that it enables owners to incorporate the services of the Construction Manager into the project planning process, thus ensuring a more streamlined and efficient execution. This collaborative approach helps enhance the quality of projects by increasing their constructability and actively working to minimize the risks associated with late design changes.

1.4.5 Construction Management at Risk and Integrated Project Delivery

While both CM@R and IPD aim to improve the overall construction process, the differences between these methods are evinced through their respective approaches and structures. CM@R is closer to what would be considered a traditional delivery method and focuses on providing cost guarantees and early involvement of the Construction Manager, while IPD emphasizes collaborative team efforts as a means to optimize the design and construction processes. In an IPD project, the project risk is directly shared by more parties than just the Construction Manager.

The American Institute of Architects (AIA, 2007) advises that IPD aligns favorably with the Construction Management (CM) delivery method. A core tenant of IPD is the involvement of all pertinent stakeholders in the project's delivery process at an early stage in order to influence decision-making for improved performance. This early involvement role is one which could be fulfilled and facilitated by the Construction Manager (Schroeder, 2014). Moreover, the AIA asserts that in projects mandating a bid-delivery model, the Construction Management (CM) delivery method provides the optimal fit for IPD (AIA, 2007). That said, the multiple separate contracts in the CM delivery method do present an obstacle to IPD's full implementation, which could result in differing alignment with regard to

objectives and subsequently the methods used to achieve them. In order to have the project stakeholders operate as a unified team to integrate IPD fully into CM, the owner would have to insist that the parties agree to specific terms or conditions which foster conflict resolution and more direct collaboration.

1.4.6 Design Build (DB)

The Design Build project delivery method is a single-source approach that integrates the design and construction phases, combining the roles and responsibilities of the designer and builder into one entity. In this scenario, the owner contracts with a design-build entity, typically selected on a qualification basis, to provide a comprehensive package of design and construction services under a single contract.

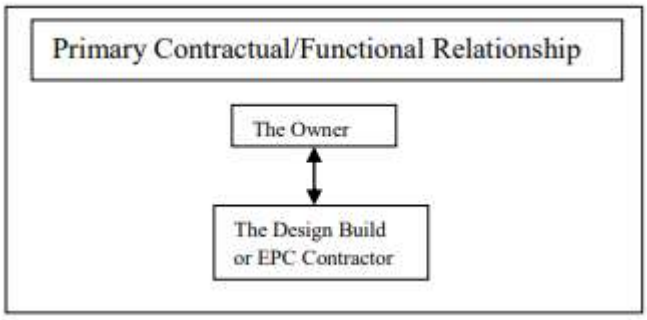


Figure 3 Design Build Relationships (Construction Industry Institute, 2003)

Design Build's greatest advantage is the possibility for early contractor involvement. This method provides an opportunity for all team members, including designers, contractors, material suppliers, and manufacturers, to be in continuous communication throughout the project. The integrated nature of this approach allows for a collaborative, synergistic relationship between the designer and the builder, potentially leading to a faster, more cost-effective project delivery.

Under Design Build, the design and construction phases can overlap and run concurrently, allowing for fast-tracking of the project. This means that construction can begin before the design is fully completed, which can save time and money. The design-builder is responsible for warranting the sufficiency of the plans and specifications to the owner and is

liable for any gaps between the plans and specs and the owner's requirements for the building's performance (Jackson, 2020). In this way, the design-builder takes on the risk associated with ensuring the success of the project.

The most recent evolution of Design Build is Progressive Design Build (PDB). The Progressive Design Build project delivery method emerged as an alternative to the traditional Design-Bid-Build and Design-Build approaches. In Design-Build, the owner hires a single entity, the design-builder, to provide both design and construction services, with the design being developed after the contractor has been hired. In contrast, PDB is a qualifications-based selection process where the design-builder is chosen primarily on qualifications, followed by a process whereby the owner then progresses toward a design and contract price with the delivery team. In PDB, the contractor is involved in the design process much earlier, allowing for more collaboration and transparency between the owner, designer, and contractor. Overall, PDB places more emphasis on collaboration and communication among the project team, while Design-Build focuses more on a single point of contact and project cost savings. PDB can result in greater transparency, collaboration, and innovation, with an emphasis on achieving the owner's goals while minimizing risks and maximizing value. PDB has gained popularity in recent years and is seeing increased use across various sectors, including healthcare, education, and infrastructure.

1.4.7 Design Build and Integrated Project Delivery

Of the four construction project delivery processes outlined in this chapter, the Design Build and Integrated Project Delivery methods share the most similarities; however, there are also significant differences between them. Both methods are collaborative in nature and aim to improve the construction processes by involving the owner, designer, and builder in a collaborative process. In the DB method, the owner hires a single entity that is responsible for

both design and construction. This approach provides the owner with a single point of contact for the entire project, simplifying communication and decision-making. IPD, on the other hand, is a collaborative project delivery method where the owner, architect, contractor, trade partners, and suppliers work together as a team to achieve the project's goals. IPD relies on a shared risk and reward system, with each team member incentivized to prioritize the success of the project over their own individual interests.

While both methods have collaborative elements, the key differences are the level of collaboration and the introduction of risk-reward sharing that is present in IPD. In DB, the design-builder assumes most of the risk, while in IPD, the risks and rewards are shared among all project team members. IPD also emphasizes early engagement and integration of all stakeholders, while DB has a somewhat more sequential process similar to a traditional delivery method.

Integrated Project Delivery (IPD) tenets can be readily integrated into a Design Build delivery model since the contractor and designer are engaged at the same stage, thus providing ample opportunities for collaborative project efforts. Though DB is typically selected to reduce owner involvement, the owner also has the flexibility with regard to their level of involvement in the Design Build team. This deviates directly from one of IPD's fundamental principles which seeks to engage all project stakeholders. If an owner selects DB in an attempt to be more hands off, the approach can potentially curtail innovation and progress for the project. The most salient difference between the successful implementation of DB and IPD centers on the owner's focus shifting from one of cost minimization to project enhancements (AIA, 2007).

1.5 Definitions

Barriers – For the purposes of this research, barriers are defined as any impediments to the project team's ability to adopt and deliver a collaborative project which were beyond the direct control of the project team, (e.g., municipal and legal restrictions, or enterprise restrictions such as ability to underwrite a project or secure insurance/bonding for an IPD, etc.). In short, these are the restrictions and limitations which are external to the project team.

Big Room – The Big Room is an on-site co-location space that physically brings together designers, builders, and often facility operators to work together. First and foremost, it aims to improve collaboration through greater team integration. Through the intense interdisciplinary collaboration that happens, teams are able to design a building with systems that complement and support each other and the goals of the project. Co-location also makes it easier to ask team members for the latest information, reducing the time wasted looking for up-to-date information, or working with outdated information. (DPR Construction, 2022)

Challenges – For the purposes of this research, challenges are defined as any impediments to the project team's ability to adopt and deliver a collaborative project which were within the direct control of the project team, (e.g., lack of a cohesive project culture, an unwillingness to be vulnerable with other project participants, difficulty with the transition into IPD, etc.). In short, these are the restrictions and limitations which are internal to the project team.

Collaborative Delivery Method – For the purposes of this research, collaborative delivery methods means a project delivery method which contains, at a minimum, all of the following

elements:

- Continuous involvement of the owner and key designers and builders from early design through project completion
- Business interests which are aligned through shared risk/reward, including financial gain which is at risk and is dependent upon project outcomes, not individual performance
- Joint project control by owner and key designers and builders
- A multi-party agreement or equal interlocking agreements

Design Assist – A project arrangement in which architects prepare a design and trade contractors estimate the cost based on the information provided to them. (Forbes & Ahmed, 2020)

Integrated Project Delivery (IPD) – a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication and construction. (AIA California Council, 2007)

IPD Lite – A project delivery method which uses the same principles as full IPD, but does not require all parties to sign a single contract (e.g., AIA-195, IFOA, multi-party agreement, etc.). Many of the same practices are still used such as Big Room co-location and Pull-Planning. (Building, Design, and Construction 2011)

Lean Construction – Lean construction is a way to design production systems to minimize

waste of materials, time, and effort in order to generate the maximum possible amount of value. (Koskela et al., 2002)

Pull-Planning – A collaborative approach to project scheduling that takes a reverse approach to sequencing. This type of planning involves gathering team members to identify and isolate key project milestones. After identifying milestones, the team works backward to add all details and requirements. (Levelset, 2022)

Scrum – A framework within which people can address complex adaptive problems while productively and creatively delivering products of the highest possible value. (Forbes & Ahmed, 2020)

Takt Planning – A system where work in each area is scheduled to be continuous, where possible, within the work area or Takt zone, but more importantly, synchronized with all other areas on a rhythm. (Lean Construction Blog, 2022)

Chapter 2: Literature Review

This chapter provides a survey of the relevant literature. It establishes a context for the study at hand by providing a review of the research deemed most salient to the current investigation. The literature review begins by outlining the history of Integrated Project Delivery (IPD) and enumerating some of its key features. The following section probes the research to discover the barriers to IPD adoption which have been discussed by other researchers.

2.1 History of Integrated Project Delivery

The idea of Integrating Project Delivery is not new. In fact, the delivery methods of Design-Build (DB) and Construction Management at Risk (CMAR) have elements of integrated project delivery models in that both seek to engage the contractor in charge of constructing the project as early as possible in the design process. Furthermore, each of these delivery methods contractually obligates key project members (i.e., Owner, Architect, and Contractor) to one another in some form or another. Recognizing the need for a more granular distinction between these delivery types, recent research conducted by Haaskjold et al. (2021) produced a tool by which project managers may use reference values to compare their current projects to one that is a "Full IPD Project" to communicate project designation with key stakeholders and team members.

The primary point of departure between the DB and CMAR models and bona fide IPD has to do with the introduction of a multiparty agreement. This multiparty agreement is more commonly referred to as an Integrated Form of Agreement or IFOA. The IFOA is a shared agreement under which the Owner, Architect, and Contractor share joint liability in the project's design, development, and delivery. The purpose of the IFOA is to "provide a legal relationship among the owner, design team, and construction team that aligns them on what is best for the project as a whole" (Hanson Bridgett, 2022). On larger, more complex projects, it is common

for trade partners with larger scopes of work in the project to share in signing the IFOA. This is addressed further below in the subsection on Distributed Governance.

As mentioned above, the idea of integrating project delivery is not a new one; however, the path to what has become known today as IPD was not direct. Early research on the topic was largely conceptual and focused on clarifying and detailing the principles and definitions of the delivery method (Kahvandi et al., 2017). Prior to this standardization, early researchers began probing the potential of what would become IPD through the use of terms like "Partnering" and "Alliancing" (Anvuur & Kumaraswamy, 2007; El-adaway, 2010). A critical moment for IPD arrived in 2007 when the American Institute of Architects formally outlined IPD as a distinctive process for designing and delivering projects (AIA, 2007). This seminal guide provided the first instance of a framework where the IPD method was thoroughly defined, explained, and, perhaps most importantly, advocated. In the decade and a half since the arrival of the 2007 AIA guide to IPD, research surrounding IPD has primarily been focused on the development of its key principals in various applications and the challenges associated with this delivery method, along with their associated solutions (Kahvandi et al., 2017).

Just as critical to the developing theoretical work on IPD in its early years was the adoption and continuous improvement of IPD by Sutter Health. Sutter Health is a not-for-profit integrated health delivery system headquartered in Sacramento, California. It operates 24 acute care hospitals and over 200 clinics in Northern California (Sutter Health, 2022). Sutter Health's development and use of the IPD method began in response to California Senate Bill 1953 (SB 1953) which required a majority of California's hospitals to be retrofitted, reconstructed, or closed if they did not achieve the new building standards for seismic compliance and safety. Catalyzed by this monumental policy change, Sutter Health took charge of developing the systems by which they would be able to deliver projects which were on time or early, within or

under budget, without claims, safe, and did not burnout their Facility Planning and Development (FDP) department (Lichtig, 2005). Sutter Health's dedication to the IPD method is unparalleled. In the 11 years between 2007 and 2018; the Sutter Health capital projects program delivered 22 projects totaling $3.1 billion all of which were on time, on budget, and without any scope compromises (Christian & Pease, 2018).

Despite the obvious benefits to the IPD method, few owners are choosing it as a project delivery method (LCI, 2018). Even with this slow rate of adoption, the value of the IPD method has been recognized beyond the realm of ordinary commercial construction. Researchers have claimed its applicability to public projects (Collins & Parrish, 2014) and it is gaining some traction in residential construction (Jenkins et al., 2020). To reduce the variance in cost, schedule, and quality, owners are shifting the way they put together project teams (Adolphus & Keller, 2022). With this in mind, it seems likely that owners will continue to adopt elements of IPD, even if it is not described as such. The next section provides a review of the fundamental principles behind the Integrated Project Delivery method.

2.2 Principles of integrated Project Delivery

The IPD method allows for a system of interconnected agreements which simultaneously incentivizes teamwork and reduces the historically adversarial relationships which exist between key project stakeholders (Raisbeck et al., 2010). The IPD framework allows project participants to collaborate, innovate, and redefine the construction project lifecycle. Crucial to the paradigm shift which separates IPD from traditional contracting methods is the recognition that projects are both complex and dynamic (Forbes & Ahmed, 2020).

Reasons for choosing IPD are varied, but research shows that owners tend to select IPD where either team integration is paramount or when a project has a demanding budget, or both (Allison & Cheng, 2015). Other project characteristics which have been found to be of chief

importance to owners selecting IPD were efficiency and quality (Ashcraft, 2022). One large, implicit benefit experienced by project participants though not typically tracked by current project metrics was learning (Nanda et al., 2017).

Nanda et al. (2017) conducted an in-depth literature review which was followed by a case study of an IPD project. The case study included interviews with project leadership team members and focus groups with both the integrated team and the design team. An online survey of all project stakeholders was also conducted. In addition to discovering that IPD was preferred to traditional design-bid-build methods, the research also revealed that many stakeholders found the learning which occurred during the IPD project to be one of the most valuable advantages to adopting the delivery method (Nanda et al., 2017).

While the transition from more traditional contracting methods to IPD is understandably daunting to many owners, there is evidence to support the use of collaborative project delivery methods: the key tenets of IPD are consistent with research showing a correlation between project success and team integration (Ashcraft, 2022). Furthermore, more than even architects or contractors, owners' expectations were met or exceeded when IPD was adopted for project delivery (Allison & Cheng, 2015). This section has addressed the rationale which might guide an owner to select IPD as a project delivery method. The next section reviews some of the more common means by which these values are achieved in IPD.

2.3 Common Components of Integrated Project Delivery

Integrated Project Delivery Agreements (IPDAs) are a multiparty agreement between at least three parties (Owner, Designer, and Contractor). On larger, more complex projects, IPDAs may also include other parties such as consultants, suppliers, and trade partners. There are certain commonalties identified within the literature which are shared between all IPDAs. These include: relational contracting, shared risk-reward mechanisms, and some form of distributed governance.

2.3.1 Types of Contracts: Transactional vs. Relational

Forbes and Ahmed (2020, p.485) define Relational contracting as:

[A] transaction or contracting mechanism that apportions responsibilities and benefits of the contract fairly and transparently, based on trust and partnership between the parties. It provides a more efficient and effective system for construction delivery in projects that require close collaboration for execution. The relationship between the parties transcends the exchange of goods and services and displays the attributes of a community with shared values and trust-based interaction.

The collaborative relationship outlined in the above definition serves to improve many of the systematic problems associated with traditional contracting methods. These problems have been identified as (1) the repression of good ideas, (2) limited cooperation and innovation, (3) trouble with coordination, and (4) insistence on local optimization (Matthews & Howell, 2005).

A study was conducted on behalf of a multinational contracting firm which sought to introduce IPD into its industry operations (El-adaway, 2010). More specifically, the thrust of the study was to determine which elements would be critical to the success of a partnering contract. A survey of 21 industry professionals each with over 15 years of experience and sufficient familiarity with partnering contracts found that there were five critical elements which should be included in every partnering contract: (1) duties of fairness, teamwork, mutual cooperation and shared financial motivation; (2) clearly defined roles and duties in a fully integrated document; (3) agreed allocation of risks for each project with changes priced in advance; (4) flexibility as to payments with clear payment entitlements; incentives for exceptional performance; and (5) mechanisms for avoidance of conflict and speedy dispute resolution (El-adaway, 2010).

Research has revealed that a functional relational contract is one that promotes effective

risk management through (1) identifying risks and their potential costs; (2) eliminating or reducing these potential costs; (3) covering risks where affordable and applicable; and (4) distributing risk exposure proportional to partnering members' ability to manage it (El-adaway, 2010).

2.3.2 Shared Risk-Reward Mechanisms

Directly associated to the concepts of relational contracting is the idea of a shared risk-reward mechanism which is established by the IPDA. This shared risk-reward mechanism functions as a material way for project stakeholders to directly express their commitment to delivering the project in a satisfactory manner as outlined in the conditions of satisfaction. There are a variety of ways the shared risk-reward mechanism might be achieved; however, Forbes and Ahmed (2020) outline the six most typical across all IPDAs as:

(1) Signatories should be fully transparent about their costs and seek to regularly challenge one another on said costs.

(2) The total cost of the work, less profit, is guaranteed by the Owner.

(3) The total cost of the work contains a contingency to offset the project risk of which the team will typically receive an unused portion at the end of the project.

(4) Non-owner signatories place a part of their profit at risk.

(5) Overhead can be addressed in a variety of ways. It can be guaranteed, fixed as a lump sum, or even have a portion of it placed at risk.

(6) Until project completion, the owner bears the risk of paying the cost of non-signatory partners until the completion of the project when the at-risk portions of the budget are depleted.

The following figure illustrates the shared risk-reward relationship established under the IPDA. To the owner, the IPDA does not include a GMP, but rather an EMP. The owner's risk begins during the execution phase of the project once all at-risk portions of the signatories' scopes have been depleted. This is represented by the left side of the vertical dotted line.

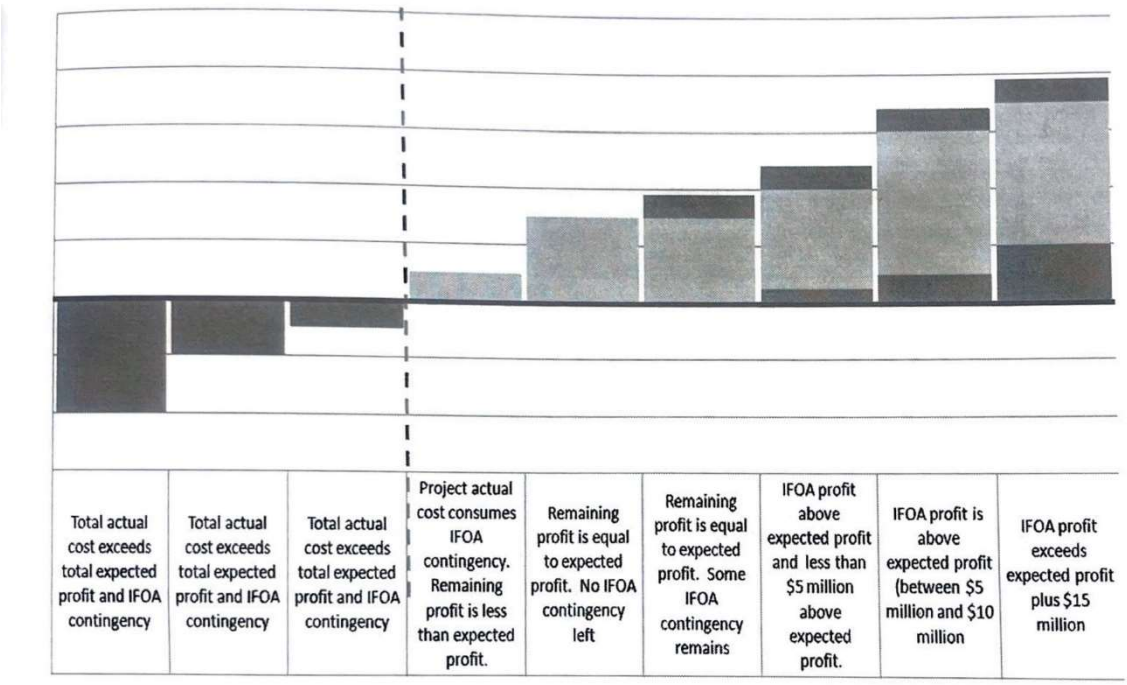


Figure 4 Example of a Shared Risk-Reward Concept (Forbes & Ahmed, 2020, p. 233)

While the aforementioned methods work to establish a concrete system by which to distribute incentives and disincentives in a relational contracting scheme, there are those who would suggest that incentives may not be the most effective means to encourage collaboration (Kent & Becerik-Gerber, 2010). Survey responses provided by industry professionals pointed to more subjective elements such as "trust, respect, and good working relationships" as being more salient to the successful execution of IPD (Kent & Becerik-Gerber, 2010). The result of using only financial methods of risk-reward allocation is further confounded by a 2020 survey of 49 construction professionals in Singapore wherein the researchers discovered that contracts which featured shared cost savings and shared cost overruns tended to have worse overall schedule

performance (Ling et al., 2020).

2.3.3 Distributed Governance

Central to the effort of generating a more collaborative project atmosphere is the distributed governance model found in most IFOAs. There are a variety of terms used to describe the primary team responsible for the project's ultimate delivery including Core Group, Core Team, and Project Leadership Team (PLT), and each can be considered interchangeable with another. This document uses the term Core Group as it appears to be the most common within the literature. The Core Group is charged with making final decisions with regard to subcontracts and guiding the overall processes and strategies necessary for project completion.

Membership of the Core Group is unique to each IFOA, but one constant requirement is that each member be an at-risk partner. As the size and complexity of a given project increase, coordinating the efforts of the Core Group can become increasingly challenging, especially when considering that most IFOAs require unanimity of decision amongst members of the Core Group. A strategy adopted by Sutter Health to ameliorate some of this difficulty on larger projects is an arrangement which limits the Core Group to five members: the owner, the architect, the contractor, one trade partner who represents all at-risk trade partners, and one design partner who represents all at-risk design partners (Forbes & Ahmed, 2020). As mentioned above, it is common for trade partners with larger scopes of work in the project to share in signing the IFOA and thus be included as members in the Core Group.

Deciding who is granted membership in the Core Group is not easy, and there is no single, systematic way for the task to be completed. A common challenge in the adoption and implementation of IPD has to do with stakeholders' interest in selecting the right team for the project (Ebrahimi & Dowlatabadi, 2019). However, research has shown that owner-driven IPD workshops prior to design concept proposals played a critical role in creating an appropriate

professional climate which served to engender further collaboration and facilitate the decision-making process (Townes et al., 2015). Additional effort is required on the part of owners and the Core Team to organize and maintain this method of distributed governance; however, it is worth the additional effort, since the model of integrated governance has been shown to improve value generation for all stakeholders (Tillman et al., 2012).

This section has provided a detailed review of some of the fundamental principles which form the bedrock of the Integrated Project Delivery method including relational contracting, shared risk-reward mechanisms, and distributed governance models. The next section will explore in depth the barriers and challenges identified in the literature which are currently preventing the adoption of the IPD delivery method.

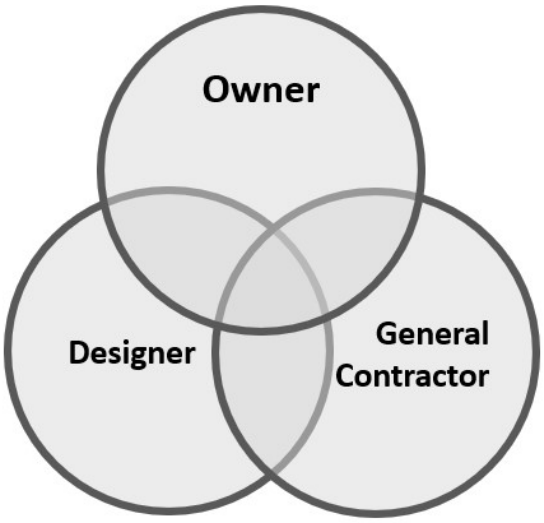


Figure 5 Integrated Project Delivery Relationships

2.4 Barriers and Challenges to the Adoption of IPD

This section arrives at the nucleus of the present research: the barriers and challenges which are preventing stakeholders from adopting more collaborative construction delivery methods, specifically IPD. There are many ways to categorize the barriers hindering the adoption of IPD; however, perhaps the most succinct is that provided by Ghassemi and Becerik-Gerber (2011), who outlined four broader categories into which the barriers could be sorted:

cultural barriers, financial barriers, legal barriers, and technological barriers. To this list, the author has chosen to append one further category, managerial barriers, as there is sufficient evidence to merit an additional category which is distinct from the four mentioned before (Ey et al., 2014; Kahvandi et al., 2019; Sherif et al., 2022; Simonsen et al., 2019). The following subsections review the barriers and challenges to collaborative project delivery methods discovered by previous researchers as organized into these five categories. It should be noted that these categories serve a general communicative purpose, are subjective in nature, and should be thought of as descriptive rather than prescriptive. Naturally, there will exist some amount of overlap between each of the categories. A summary displaying the frequency of barriers and challenges by category discussed in the literature is provided below in Table 1.

Table 1 Summary of Barriers and Challenges by Category, Findings from Literature

	(Ebrahimi & Dowlatabadi, 2019)	(Ey et al., 2014)	(Ghassemi & Becerik-Gerber, 2011)	(Kahvandi et al., 2019)	(Kahvandi, Saghatforoush, Mahoud, et al., 2019)	(Kent & Becerik-Gerber, 2010)	(Korb et al., 2016)	(Nanda et al., 2017)	(Pal & Nassarudin, 2020)	(S. Buk'hail & Al-Sabah, 2022)	(Sherif et al., 2022)	(Simonsen et al., 2019)
Cultural Barriers	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓
Financial Barriers	✓	✓	✓			✓					✓	
Legal Barriers	✓		✓	✓		✓				✓	✓	
Managerial Barriers		✓		✓							✓	✓
Technological Barriers	✓		✓	✓			✓		✓		✓	

2.4.1 Cultural Barriers and Challenges

Chief among the barriers cited most frequently by the literature pertains to those of a cultural nature (Ebrahimi & Dowlatabadi, 2019; Ey et al., 2014; Ghassemi & Becerik-Gerber, 2011; Kahvandi et al., 2019; Kahvandi, Saghatforoush, Mahoud, et al., 2019; Kent & Becerik-Gerber, 2010; Korb et al., 2016; Nanda et al., 2017; Pal & Nassarudin, 2020; S. Buk'hail & Al-Sabah, 2022; Sherif et al., 2022; Simonsen et al., 2019), and existing literature agrees that 'culture' is the most critical factor informing the eventual success or failure of a given IPD project with one study revealing that 80% of the outcomes were determined by cultural factors

and 20% by technical ones (Pal & Nassarudin, 2020). For the purposes of this study, cultural barriers and challenges are understood to mean, broadly speaking, the reluctance of the AEC Industry to update its traditional methods and systems. More specifically, regarding collaborative delivery methods and IPD, cultural barriers and challenges can be understood to include hinderances to, or a lack of, activities such as integrating project personnel, collaborative or IPD-specific training, and the inclusion of trust-building exercises and tools (Ghassemi & Becerik-Gerber, 2011). Furthermore, meta-analysis of existing studies has confirmed that the principles of teamwork and mutual trust were two of the more common barriers to the adoption of IPD (Kahvandi, Saghatforoush, Mahoud, et al., 2019).

Since it does not directly produce real work (i.e., material put in place), there can be a tendency on the part of some would-be IPD practitioners to avoid investments in activities like coaching, training, acculturation, and education (Ebrahimi & Dowlatabadi, 2019). This neglectful attitude toward proper preparation poses a considerable challenge to the adoption of IPD. It is clear that IPD requires a cultural change in the AEC industry which will require the rethinking of project planning and management (Ebrahimi & Dowlatabadi, 2019).

2.4.2 Financial Barriers and Challenges

As with many aspects of the construction industry, final decisions often come down to the bottom line. The choice of whether or not to adopt the IPD delivery method is no exception. For the purposes of this study, financial barriers and challenges are taken to mean those obstacles which pertain to one of the following: the IPD compensation structure, the sharing of cost savings and overruns, or profit pooling (Ghassemi & Becerik-Gerber, 2011).

In an investigation into the preparedness of the Middle Eastern construction market for the adoption of IPD, Sherif et al. (2022) identified both relative capital investment and the selection of compensation/incentive structures as among the constraints which are currently

preventing the construction sector from accepting the IPD delivery method. Similarly, Kent & Becerik-Gerber (2010) noted that industry professionals' circumspection regarding IPD revolved around risk-reward sharing and open book accounting practices. Ey et al. (2014) echoed this sentiment of reluctance surrounding financial transparency in their findings from a survey of the Australian construction market regarding collaborative construction delivery methods. Their combination of surveys and interviews revealed that experienced industry professionals were often reluctant to adopt more collaborative project delivery methods because, despite the known benefits, they had concerns regarding the loss of certain commercial or enterprise advantages to their competitors (Ey et al., 2014).

Though industry professionals are aware of the benefits of collaborative delivery methods, the concerns regarding risk, liability, and transparent accounting still persist leading many to continue waiting for further research to be done before adopting IPD as a project delivery method (Kent & Becerik-Gerber, 2010).

2.4.3 Legal Barriers and Challenges

Another roadblock for the adoption of IPD has to do with the lack of established case law and subsequent legal certainty with regard to more relational contracts which typify the IPD process (Cullen & Hickman, 2012). The increased uncertainty surrounding the judicial enforceability of these agreements poses an unpalatable risk for most players in the characteristically conservative AEC professions. Furthermore, even when parties elect to accept the associated risk of collaborative delivery methods, there exists the possibility that the increased costs associated with the complex administration and monitoring of these agreements directly detracts from their potential rewards (Handy, 1995). If monitoring is more costly than trust, the former will be abandoned for the later.

Kahvandi et al. (2019) identified 22 individual drawbacks to the adoption of IPD which

were sorted into four themes: contractual, environmental, managerial, and technical, with results showing drawbacks in the contractual category as being the most significant. This is in line with other studies which have shown that participants are often acutely cautious of the legal ramifications of the IPD delivery method (Ebrahimi & Dowlatabadi, 2019; Ghassemi & Becerik-Gerber, 2011; Kent & Becerik-Gerber, 2010; S. Buk'hail & Al-Sabah, 2022; Sherif et al., 2022). Furthermore, the two biggest impediments discovered by S. Buk'hail and Al-Sabah (2022) were an unwillingness to sign a contract with liability waivers and an unwillingness to submit to the hierarchical structure of an IPD project. In addition to discovering legal issues to be the most significant drawback to IPD adoption, Kahvandi et al. (2019) also found that "resolving contractual challenges [was] very effective in resolving environmental, managerial, and technical challenges." This suggests that, in many ways, contractual (legal) barriers often precede the other barriers and challenges.

2.4.4 Managerial Barriers and Challenges

Managerial barriers refer to processes and documentation necessary to lead people and teams toward completing specified project goals within designated constraints. While these challenges have perhaps the most overlap with each of the other categories, what separates them more distinctly would be their emphasis on the aspect of how rather than what. The requirement of many IFOAs which dictates open accounting among Core Group members could be categorized as a legal barrier; however, the pragmatic implementation of this clerical requirement (and subsequently whether it causes administrative delay) would be interpreted as a managerial barrier.

Highlighting the crucial role of managerial influence and supervision to the successful execution of IPD, researchers in Norway found that when information about the IPD process is not sufficiently disseminated from the executive level downward, those working in operations

will tend to revert to traditional ways of doing things when processes begin to lag (Simonsen et al., 2019). Additionally, they determined that if too many elements are attempted at once, there can be delays in work processes which also cause project participants to fall back on more familiar, traditional methods (Simonsen et al., 2019).

As part of an exploratory study conducted by Ey et al. (2014), a group of 17 senior construction industry professionals in Adelaide, Australia was interviewed regarding collaborative delivery methods. The participants included architects, contractors, subcontractors, and government officials, all of whom were screened for experience with collaborative delivery methods. The researchers in this study chose to divide the primary barriers to the adoption of collaborative delivery methods into two broader categories: commercial-related and human-related. The commercial-related barrier referenced most by respondents pertained to the commercial pressures which caused strain when trying to unite one or more organizations by way of a collaborative delivery method (Ey et al., 2014). The interviewees emphasized the "great difficulty in rationalizing and justifying systems, practices, and methodologies to partners in collaborative arrangements" (Ey et al., 2014).

In contrast to the themed categorical organization of barriers adopted by Ghassemi and Becerik-Gerber (2011), some researchers have elected to investigate barriers to the adoption of IPD by way of hierarchically ordered challenges Sherif et al., 2022). Sherif et al. separated their respondents' answers into three categories listed in descending order: very difficult to overcome, difficult to overcome, and conflicting viewpoints (Sherif et al., 2022). Within the "very difficult to overcome" and "difficult to overcome" categories were responses relating to risk assignment, future orientation, team orientation, and policies and regulations – all managerial in scope. This serves as reinforcement of the proposition that managerial barriers are distinct in terms of their role in the adoption of IPD as a project delivery method.

2.4.5 Technological Barriers and Challenges

There are obvious benefits to adopting Building Information Modeling (BIM) and other digital technologies which include increased collaboration between stakeholders, reduced rework, and cost and time savings (Fung et al., 2014). Despite these advantages, research often uncovers that, among the many barriers and challenges to the adoption of IPD, technology is one of the more frequently cited (Ebrahimi & Dowlatabadi, 2019; Ghassemi & Becerik-Gerber, 2011; Kahvandi et al., 2019; Korb et al., 2016; Pal & Nassarudin, 2020; Sherif et al., 2022). Given the critical role of integration to the overall success of collaborative project delivery methods, for the purposes of this study, technological barriers and challenges refer to the obstacles associated with the use or attempted use of any technology (i.e., BIM, visual dashboards, or otherwise) which was originally implemented with the intention of furthering collaboration amongst stakeholders.

Although somewhat counterintuitive, some research warns that increased harmony and integration among project stakeholders may actually contribute to a decrease in overall project quality. In a review of trends, benefits, risks, and challenges associated with the adoption of BIM technology, Azhar (2011) highlighted the lack of a traditional, adversarial relationship as being the potential catalyst for the erosion of overall project quality. The argument follows that in the context of more traditional, adversarial dynamics, contractors typically developed their own 3D models based off the architect's plans. This functionally redundant step allowed an opportunity for contractors to catch and correct errors in the plans during the modeling stage. With the increased collaboration among project stakeholders, and therefore the increased sharing of 3D models, this critical checking phase may become diminished or disappear completely, thus allowing errors to persist farther into the project lifecycle (Azhar, 2011).

While these are certainly valid concerns which all stakeholders should work vigilantly to

guard against on any project, Azhar's grim prognostications may have proven somewhat overstated. According to information provided in the Dodge Construction Network 2021 Smart Market Report, contractors who used BIM believed that it played an important role in increasing project quality – with an increase in overall BIM use came a concomitant increase in overall quality (Smart Market, 2021)

This chapter has provided a survey of the relevant literature. It established a context for the current investigation by providing a review of the research most relevant to current study. The following chapter outlines the research design, methodology, and data collection processes for the research.

Chapter 3: Methodology

This chapter addresses the methodology used in this research to explore the barriers and challenges experienced by project stakeholders in the construction industry when adopting collaborative delivery methods. The study employs a phenomenological strategy with a multiple-case study approach for data collection. The phenomenological approach seeks to explore the subjective experiences of participants and to understand the meanings they attribute to those experiences (Creswell & Creswell 2018). This approach is well-suited for the exploration of complex phenomena, such as the adoption of collaborative project delivery methods in construction projects, where individual perceptions and experiences play a crucial role in shaping the outcome. The multiple-case study approach allows for the exploration of the phenomenon across different cases, facilitating the identification of patterns and themes that can be analyzed with respect to one another. The multiple-case study design, as described by Yin (2018), provides an in-depth understanding of the experiences of different stakeholders, involved in projects using collaborative delivery methods. This approach enabled the researcher to identify commonalities and differences in the experiences of stakeholders in different cases, providing rich and detailed data for analysis (Yin, 2018).

The chapter will also discuss the rationale for selecting a case study approach as well as the benefits of using semi-structured interviews for data collection. It will then provide an overview of the data analysis process, including the use of thematic analysis to identify patterns and emerging themes within the data. Finally, the chapter will address potential ethical considerations and limitations that might have been encountered during the research process.

3.1 Research Design

3.1.1 Multiple-Case Study Design

This study used a multiple-case study design, which is an appropriate method for exploring complex social phenomena such as the barriers and challenges associated with the

adoption of the collaborative delivery methods in construction (Yin, 2018). A multiple-case study design allows for an in-depth examination of a phenomenon in a real-world setting and can provide a rich and nuanced understanding of the phenomenon (Creswell & Creswell 2018). In this study, the cases consist of current or recently completed construction projects that have utilized the collaborative project delivery methods, namely Integrated Project Delivery and Progressive Design Build. The subjects were stakeholders involved in these projects, including owners, designers, general contractors, and major trade partners.

3.1.2 Selection of the Case Study Population

The cases used in this study were arrived at by using non-random, purposive sampling. Purposive sampling is a common approach in qualitative research and involves selecting participants based on specific criteria that are relevant to the research question (Creswell & Creswell 2018). This sampling method allows researchers to select individuals or cases that have unique or varied experiences related to the research question, which can enhance the richness and depth of the data collected.

The subject participants in this study were selected based on their roles and experience within the construction projects which have utilized or are utilizing collaborative delivery methods. The subjects included individuals who represented owners, designers, general contractors, and trade partners. Interviewees had participated in projects which were located at two different geographic locations in the United States.

Overall, 26 individuals were contacted via email to participate in the study. Of the 26 who were contacted, 14 responded, and 13 participated in the study. One of the 13 was not formally interviewed, but rather, submitted their responses to the interview instrument in written form and returned it via email. For presentation's sake, this was converted into a transcript format consistent with the rest of the interviews. The transcripts of these interviews are available

in the appendices which accompany this document.

3.2. Data collection and Analysis

The primary method of data collection for this study was semi-structured interviews with project stakeholders, including members who represented owners, designers, contractors, and trade partners. The interviews were conducted and recorded via online video calls in a manner that allowed participants to freely share their experiences. The data collected through the interviews was then transcribed and analyzed using NVivo software.

3.2.1 Creation of the Interview Instrument

The interview questions were developed based on the review of the existing literature on IPD which was explored in Chapter 2. The questions were designed to elicit information on the stakeholders' experience and knowledge of IPD and collaborative delivery methods. Furthermore, the questions also sought to obtain information on their perceptions of barriers and challenges to the current adoption of IPD in the construction industry. After the initial questionnaire was developed, it was disseminated to three subject matter experts in the field of Lean Construction and Integrated Project Delivery. The feedback from these experts was used to revise and further refine the questionnaire by clarifying ambiguous questions and eliminating superfluous ones.

3.2.2 Reviewing and Transcribing the Interviews

The interviews were recorded and transcribed verbatim, except for filler words (such as "um" and "ah") and extraneous background noise. Common crutch phrases (e.g., "I mean" and "you know") have been included in parentheses. When speakers paused, this was represented by ellipses. For anonymity, identifying information has been exchanged inside of braces. For narrative clarity in consistency, edits were made quoting some of the participants in the Analysis chapter, but these instances were few and did not alter or otherwise distort the speaker's intended meaning. The transcripts were reviewed for accuracy and completeness by the

researcher. In total, there were 8 hours and 12 minutes of recorded interviews across the 12 interviewees resulting in an average interview time of around 41 minutes. In total, the document containing the detailed final transcriptions contained 147 pages and counted over 77,000 words.

The transcriptions of these interviews have been provided in the accompanying appendices (Appendix B through M). The nomenclature adopted for the categorization of the interviewees is as follows: the capital letter (e.g., C, D, O, or TP) designates the interviewee's membership class as either Contractor, Designer, Owner, or Trade Partner. The accompanying numbers designate first the case study to which the participant belongs and second the number the interviewee is within their membership class. Therefore, interviewee C 1.2 would be the second representative member of the Contractor class interviewed in case study one; TP 2.3 would be the third representative member of the Trade Partner class interviewed in case study two, etc. Table 2 in Chapter 4 details the interviewees titles and years of experience in the AEC industry.

3.2.2 Analyzing the Interview Content

The transcripts were analyzed using NVivo software, a qualitative data analysis software that allows for the coding and categorization of data. The transcripts were imported into NVivo, and the data was coded based on the themes and topics that emerged from the interviews. The coding process involved breaking down the transcripts into smaller units of meaning, and assigning codes to these units based on the themes and topics that were identified. The codes were then organized into categories and themes, which were used to develop the discussions and conclusions of the study which are presented in Chapter 5.

3.3 Quality of the Research

It is important to consider the validity and reliability of any study while designing the research method for it. Validity refers to the accuracy and truthfulness of the findings of a study, while reliability refers to the consistency and stability of the findings over time (Creswell &

Creswell 2018). To ensure the validity and reliability of the findings of this study, multiple measures were taken. First, the semi-structured interview guide was reviewed by multiple experts in the field of construction and IPD to ensure that the questions were relevant and appropriate. Additionally, the results of the study were compared to existing literature on the subject, which helped to increase the validity of the findings and provide a basis for comparison.

3.4 Ethical Considerations

The study was approved by the Institutional Review Board at the University of Oklahoma, and all participants were provided written informed consent prior to participating in the study. Confidentiality and anonymity were maintained throughout the study, and participants were informed that their identities would not be disclosed in any published reports or presentations. Additionally, the participants were informed that they had the right to withdraw from the study at any time without any negative consequences. These measures were taken to protect the participants and ensure that their rights were respected during the data collection and throughout the course of the study.

3.5 Limitations of the Methodology

The multiple-case study research design utilizing semi-structured interviews for thematic analysis is a frequently used qualitative research approach, but it is not without limitations. One significant limitation is the potential for researcher bias, as the researcher's personal beliefs and experiences can influence the interpretation of the data (Creswell & Creswell 2018). This issue can be addressed by following an explicit research methodology. Of note, rather than seeing it as a limitation, Braun and Clarke (2022) have actually shown that researcher subjectivity is a boon to the reflexive thematic analysis process.

Another limitation of multiple-case studies is that they may not be generalizable to other populations or settings. Since this study is focused on a specific group of individuals acting within particular organizations, the results may not fully apply to a broader population. Yin

(2018) recommends the use of replication logic to enhance external validity by comparing the results of multiple case studies with different settings or populations.

Furthermore, conducting semi-structured interviews for thematic analysis may limit the breadth of information gathered. This is because the researcher is only able to ask questions that they have prepared in advance, which may not cover all aspects of the research question. This issue can be addressed by incorporating other qualitative data collection methods such as observations or document analysis. Given the restrictions on the researcher both in terms of time and location, the former was not possible; however, the latter was achieved through several documents provided by various participants in both cases.

Finally, a limitation of using thematic analysis is the potential for subjectivity in data analysis. Braun and Clarke (2022) note that there are different ways to conduct thematic analysis, and the interpretation of themes can be influenced by the researcher's prior assumptions and theoretical perspective. To mitigate this issue, researchers have traditionally utilized multiple coders and establish inter-coder reliability to ensure consistency in data analysis. For the reflexive style of thematic analysis adopted for this research, having multiple coders would be seen as an impediment to the analysis and therefore only a single coder (the researcher) was utilized.

This chapter has described the methodology employed in this research study and emphasized the need for a thorough and rigorous approach to data collection and analysis that account for potential biases and limitations. In this vein, the upcoming Analysis chapter will employ a meticulous and nuanced strategy to elucidate the key themes and patterns that emerge from the data. Through the implementation of established qualitative data analysis methods, this chapter will provide an in-depth exploration of the data set that draws on the multiple perspectives of the research participants and underscores the complexities of the research

questions.

Chapter 4: Analysis

This chapter discusses the analysis and findings of this study. It begins with a narrative description of each case study, which were selected for this research. Following that is a description of the process used to clean and analyze the data. Finally, there is a presentation of two analyses and the accompanying findings. The first has to do with the cultural barriers and challenges faced by first-time adopters of collaborative project delivery methods. The second focuses on managerial challenges faced by all participants on collaborative projects. As mentioned in Chapter 2, there is a clear overlap between respective project challenges given that many of these project elements are interconnected and therefore work to inform one another.

As described in Chapter 3, the study utilized non-random, purposive sampling. The case studies consist of current or recently completed construction projects that have utilized collaborative project delivery methods, namely Integrated Project Delivery and Progressive Design Build. The subject participants were selected based on their roles and experience within the construction projects which have utilized or are utilizing collaborative delivery methods. The subjects included individuals who represented owners, designers, general contractors, and trade partners. Table 2 summarizes the relevant interviewee information. Of those interviewed, five (38%) had previous experience with collaborative delivery methods whether that be Design Build, IPD, or both.

Table 2 Interviewee Information

Interviewee ID	Current Position	Years of Experience in ACE	Previous Experience with Collaborative Delivery Methods?
C 1.1	Senior Project Engineer	2	No
TP 1.1	Project Manager	10	Yes
C 1.2	Project Manager	10	No
C 1.3	Superintendent	10	No
C 1.4	Vice President	22	Yes
D 1.1	Principle Mechanical Engineer	12	No
C 2.1	Project Director	18	No
C 2.2	Assistant Project Manager	8	No
TP 2.1	Senior Project Manager	8	Yes
TP 2.2	Project Exectutive	18	Yes
D 2.1	Senior Associate (MEP Designer)	6	No
O 2.1	Senior Project Manager - Owner's Rep	11	Yes
C 2.3	Assistant Superintendent	5	No

4.1 Description of Case Study 1

Case Study 1 describes the renovation of three non-consecutive floors (3,5, and 6) of an existing hospital located in a Mountain State of the Western United States. The existing hospital floors were demoed and transformed into a center for pediatric mental healthcare. The project took place over approximately two years. The overall project budget was $19.6 Million. This project faced several distinct challenges. One of those challenges was the departure of the Integrated Project Leader (IPL) partway through the construction process. Another challenge faced by this project was that it kicked off right as the Covid-19 pandemic intensified in the United States. Despite the circumstances, the project was delivered on time and on budget, and many of the project team members interviewed have expressed positive feelings regarding their time spent on the project.

4.2 Description of Case Study 2

Case study 2 included the demolition of an existing hospital facility and the construction of a new, 17-story patient tower. The project is located in a Midwestern US state. The overall project budget is $680 Million. The project started in 2019. After an eight month pause in 2020 due to the Covid-19 pandemic, construction resumed and currently it is expected to be completed in 2025. Though not an IPD project, the project team is highly integrated, and there

has been a dedicated team of design-assist trade partners who have worked with the general contractor starting in the Schematic Design phase. These include the enclosures trade partner, the civil engineering trade partner, and the mechanical, electrical, and plumbing designers. Key information about each of the case studies is summarized in Table 3.

Table 3 Key Information about the Case Study Projects

	Case Project 1	Case Project 2
Building Type	3-Floor Hospital	17-Story Hospital Tower
Builing Size	49,400 SF	680,000 SF
Project Budget	$19.6 Million	$680 Million
Construction Period	2020-2022	2019-2025
Contract Type	AIA C191-2009	Modified DBIA

4.3 Analytical Overview

The rich qualitative data collected through semi-structured interviews from the participants of the case study projects was analyzed to identify emergent themes. The emergent themes were demonstrated in the form of Ishikawa diagrams (also known as "fishbone" diagrams) which mapped salient nodes and themes pertinent to the research question along with in-depth analyses of the interview transcripts. The analysis process is detailed in figure 6 below.

Ishikawa diagrams are charts which provide a way of displaying causal connections visually. The diagram is meaningful because it focuses attention on the causes of problems, not just their symptoms (Forbes & Ahmed, 2020). The "problem" is placed in a box at the far right of the diagram (the "fish head"). The backbone extends as a horizontal line to the left of the problem box. Coming off of this backbone line are bones which represent larger overarching themes related to the core problem (e.g., "Methods," or "Learning"). To each of these larger theme bones is connected smaller branches of sub-causes. This process can be thought of as visual form of the "5 Whys" exercise and is a helpful tool for analyzing the core causes issues at a glance. Accompanying each of the Ishikawa diagrams is a narrative which helps to

contextualize the information provided visually.

The following analysis subsections will explore in detail the cultural and managerial obstacles experienced by the two case study projects. As shown in Table 1, cultural challenges were the most frequently cited challenge among the literature that was reviewed (Ebrahimi & Dowlatabadi, 2019; Ey et al., 2014; Ghassemi & Becerik-Gerber, 2011; Kahvandi et al., 2019; Kahvandi, Saghatforoush, Mahoud, et al., 2019; Kent & Becerik-Gerber, 2010; Korb et al., 2016; Nanda et al., 2017; Pal & Nassarudin, 2020; S. Buk'hail & Al-Sabah, 2022; Sherif et al., 2022; Simonsen et al., 2019). For this reason, it was selected as the focal point for analysis in Section 4.4. Chapter 2 revealed a need for research which is focused on the managerial barriers and challenges related to collaborative project delivery methods. Toward that end, Section 4.5 acknowledges this need and provides an analysis of the managerial barriers and challenges experienced by not just first time adopters, but all interviewees.

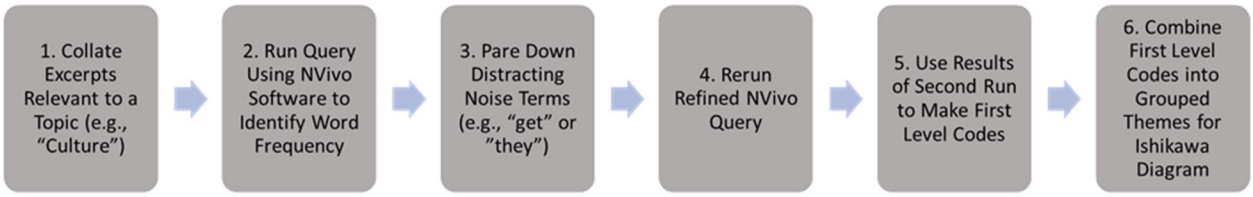


Figure 6 Analysis Process Map for the Development of Emergent Themes

4.4 Analysis 1: Cultural Challenges for First Time Users of Collaborative Delivery Methods in Construction

As discussed in Chapter 2, cultural challenges are chief as faced by those choosing to adopt collaborative delivery methods. The researcher reviewed the transcripts for passages related to cultural challenges. These passages were excerpted, and the interview excerpts related to project culture were run through the process outlined above. What resulted after multiple runs was a list which included the word "team" at the as the number one term referenced 23 times. Following that was "people" at 19 times and "culture" at 17 times. Farther down the list but still

within the top twenty were the terms “partners” and “everyone.” These five terms functioned as level-one codes which, when grouped together, formed what will be referred to as the theme *Right Team*. The terms “work” (11 times), “meetings” (9 times), “time” (12 times), and “communication” (4 times), we combined to form the theme labeled *Methods*. Finally, the terms “training” (5) and “experience” (4 times) were the first order codes that informed the creation of the theme labeled *Learning*. The terms selected as first level codes are shown along with their frequency of appearance below in Table 4.

Table 4 First Level Codes Related to Cultural Challenges and their Frequency of Appearance

The Results of Nvivo Query for Cultural Challenges					
Team	23	Work	11	Training	5
People	19	Partners	9	Communication	4
Culture	17	Meetings	9	Experience	4
Time	12	Everyone	8		

The level one codes were then grouped into corresponding themes which included *Right Team*, *Methods*, and *Learning*. The coding taxonomy of these themes is presented below in Table 5.

Table 5 Themes Related to Cultural Challenges and their Respective First Level Codes

Cultural Challenges Coding Taxonomy		
Right Team	Methods	Learning
Team	Work	Trainings
People	Meeting	Experience
Culture	Time	
Partners	Communication	
Everyone		

4.4.1 The “Right Team”

Although not a first-time adopter of collaborative delivery methods themselves, Interviewee O 2.1, an owner’s representative, highlights the importance of having the “right team” when describing the deciding factor that led the team of Case Study 2 to win the job over

their competitors: “It was bringing the right team at the right time and everybody seemed to have the right attitude towards it and that was really the difference maker” (Appendix K, 106-107). This sentiment was echoed by multiple interviewees including Interviewees C 2.2, C 2.3, D 2.1, and TP 2.1 (Appendix H, 724-730; Appendix I, 482-485; Appendix J, 332-333; Appendix L, 607-621). Furthermore, almost all interviewees had mostly positive things to say with regard to their respective teams. The importance of the overall team was even noticed by the Project Executive of the enclosures trade partner for Case Study 2 who said “… the team that [Interviewee C 2.1]’s put together there is one of the more, if not the most impressive, team that I’ve seen” (Appendix M, 257-258).

It’s evident that the formation of a cohesive team is critical to the success of collaborative project delivery methods. That said, the creation of the “right team” is not without its challenges. These challenges appear to result from one of two causes: conflicting personalities and improper alignment. Regarding conflicting personalities, even two years into the Case Study 2 project, the Assistant Project Manager (Interviewee C 2.2) had this to say:

> *One of the biggest challenges I’ve felt like we’ve dealt with through the design and build phase and continues today is just personalities, right? It’s like some people just have the attitude where they individually believe in the collaborative approach and they are approaching problems with a collaborative nature and some people just* don’t *have that mindset. Some people are just naturally adversarial. … And like that energy can be very toxic in the Design Build relationship where you’re constantly preaching about the importance of collaboration…* (Appendix H, 724-731, emphasis in original)

The above description of individual attitudes is reminiscent of the overall stubbornness

evident in the AEC industry described in Chapter 1. In line with this characteristic obstinance of the AEC industry, TP 2.1 said, "…some older guys who really are… they *do* struggle to wrap their heads around it…" (Appendix L, 321, emphasis in original). Even with this acknowledgment, TP 2.1, a veteran electrical project manager with a track record of having worked on multiple IPD and Design Build jobs, was able to offer this as a suggestion regarding reluctant participants "…when done *correctly*, you will see it, and they will see it, and they will start to buy in" (Appendix L, 346-347, emphasis in original).

Regarding the alignment piece, Interviewee D 2.1 emphasized the importance of everyone "being on one page" and having "*one vision*" (Appendix J, 335-336, emphasis in original). This can be challenging, especially on very large projects like those represented by Case Study 2, which may have upwards of one hundred project staff working on it at the peak of project activity. However, getting everyone to have "one vision" is easier said than done. One reason for this is provided by Interviewee C 1.4 who thinks that owners are unwilling to spend the time at the beginning of the project to focus on alignment because it doesn't directly contribute to the physical progress of the project (Appendix E, 163-169). Despite owners' reluctance to utilize time at the frontend to solidify overall project alignment, this was something that was mentioned by several interviewees as being something which they thought would improve the project. Figure 7 shows the *Right Team* segment of the Ishikawa diagram related to the cultural challenges for first time users of collaborative project delivery methods.

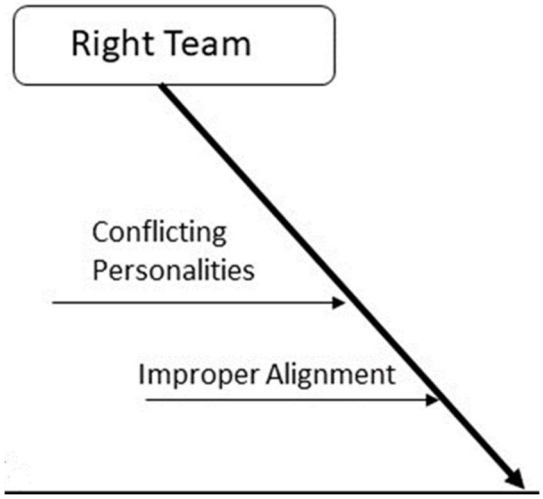


Figure 7 Right Team Segment of the Ishikawa Diagram

4.4.2 Methods

If the theme addressed in the previous sub-section was the "who" of the project, the topic of this sub-section could be considered the "how." More specifically, the theme entitled *Methods* is concerned with 1) overall project communication and 2) project transitions/hand-offs. When coordinating projects as complex as either of those presented in Case Study 1 or 2, communication is critical. To avoid overlapping content, the communication portion will be addressed more directly in the following analysis section on managerial barriers. For now, the focus is on project transitions and hand-offs and their associated challenges.

Much like frequently changing project staff was the recurring challenge evinced in Case Study 1, working through the challenges of project pivot points was the recurring theme of Case Study 2. With such a large project taking place over half a decade, it is easy to see where properly shifting the entire Design Build project team through the subsequent phases of such a large construction project could prove difficult, especially with regard to the proper delegation of both workforce and resources. Multiple interviewees from Case Study 2 underscored the challenges they had faced with moving through the various developmental stages of the project. The following three quotes spotlight the struggle faced by members of the project team working

through these stages:

> *Like during design, our role was to support the designer and make sure that they can deliver the highest-quality deliverable as possible … as we transition ourselves into construction, it changes a little bit as now the designer's role is to support us to deliver the highest-quality deliverable as possible. And… that communication becomes really important, and… that shift is difficult on a team, right?* (Interviewee C 2.1, Appendix H, 331-336)

> *The other thing that was challenging I would say is with this* super long front *end of the job... Like the project always felt so far away during the design-assist phase, that we didn't get the attention always that we needed to make decisions at the right points in time.* (Interviewee C 2.2, Appendix H, 739-744, emphasis in original)

> *If we could have kept those deadlines [design assist deadlines] and had more time, I think* more time *… more time and like more checkpoints along the way, would've helped.* (Interviewee D 2.1, Appendix J, 393-394, emphasis in original)

Driving home the point of how difficult design stage transitions can be for a project team, TP 2.1 (the Senior Project Manager for the electrical trade partner) who had several previous experiences on IPD jobs with which to compare the Case Study 2 project had this to say:

> *I think Design Build is very collaborative on the* upfront *but doesn't necessarily*

transition over to the execution side as well. Whereas an IPD is a collaborative approach from the beginning to the end. Everyone has skin in the game. I can't have my trade partner, my fellow trade partners, fail because that's gonna (sic) impact me financially. (Appendix L, 398-401, emphasis in original)

With all of that said, transitions are only difficult, not impossible. After describing the struggle faced by the project team moving through the different phases of design and construction, the Project Director of the Case Study 2 project reflected "…getting the whole ship to change direction it was a big trick for us, but we're there now" (Appendix H, 338-339). Figure 8 shows the *Methods* segment of the Ishikawa diagram related to the cultural challenges for first time users of collaborative project delivery methods.

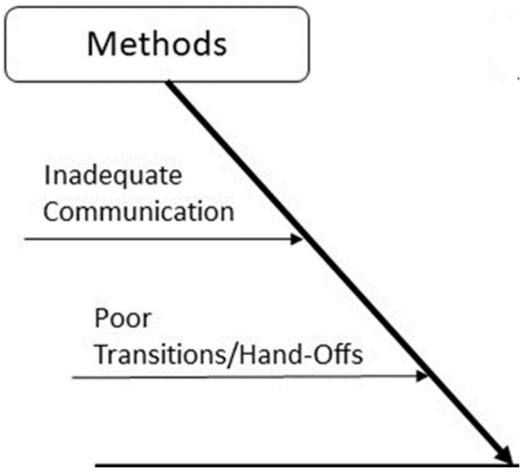


Figure 8 Methods Segment of the Ishikawa Diagram

4.4.3 Learning

The final theme addressed in this section about the cultural challenges faced by first time adopters of collaborative project delivery methods has to do with *Learning*. Whether by formal instruction or through experience, a recurring theme throughout these interviews revolved around a lack of experience with collaborative project delivery methods (Appendix C, 190-196; Appendix F, 83-88; Appendix H, 388-395; Appendix H, 719-720; Appendix I, 385-395). In the

following passage, Interviewee C 1.2 describes their experience as a newcomer to the Case Study 1 project when it was already underway:

> *I'll put it this way: theoretically. I'd heard about it; I'd learned about it; I learned about it in school. You know… you hear about it in passing. Theoretically I kind of had a grasp on it, but seeing it put in practice was a lot different. I think, if you're not versed in IPD, you assume that it's sort of like a theoretical practice. When you go to these jobsites, yeah, maybe people act a little differently. They have different contractual obligations. But in practice, there were a lot of tools that were IPD-specific that I had no clue about. So, it was sort of a learning experience for me to get thrown into it.* (Appendix C, 190-196)

However, the absence of collaborative project training present on Case Study 1's jobsite may almost entirely be due to the Covid-19 pandemic which occurred right at the beginning of the project start. Concerning Case Study 1's project, the Vice President overseeing the job had this to say with about training and team-building exercises:

> *When we got kicked off, the challenge, a little bit of a challenge we had was there was some people…who were very familiar with IPD and some people who were less…this was their first project. The project started right when Covid hit, so…* (Appendix E, 77-79)

> *While we had a bunch of team building planned at the beginning, it became very challenging because we couldn't get together in person, and so there was some team*

building done virtually, but not to the full extent that we should have or wanted to due to that constraint. By not having that, we did start off and I think the project duration was a little rocky because we never had that opportunity to build those bridges and teach the folks that had not been exposed to an IPD project the full intent of process…of the culture. (Appendix E, 83-88)

Throughout the interviews there was a recurring motif of project participants participating in training and team-building activities within their respective classes and trades (i.e., the electrical subcontractor would organize a team-building exercise for their employees, or the design team would have a training day), but rarely, if ever, was their training available for project participants of different classes to interact with one another. When asked about possibly including something to this effect, the Project Executive of Case Study 2 had this to say: "That's another *good idea though*. If we ran like a monthly Design Build training… Man, that would really help some stuff. That's a really good idea…" (Appendix H, 417-419, emphasis in original) Figure 9 below shows the *Learning* segment of the Ishikawa diagram. Figure 10 shows the complete Ishikawa diagram related to the cultural challenges for first time users of collaborative project delivery methods.

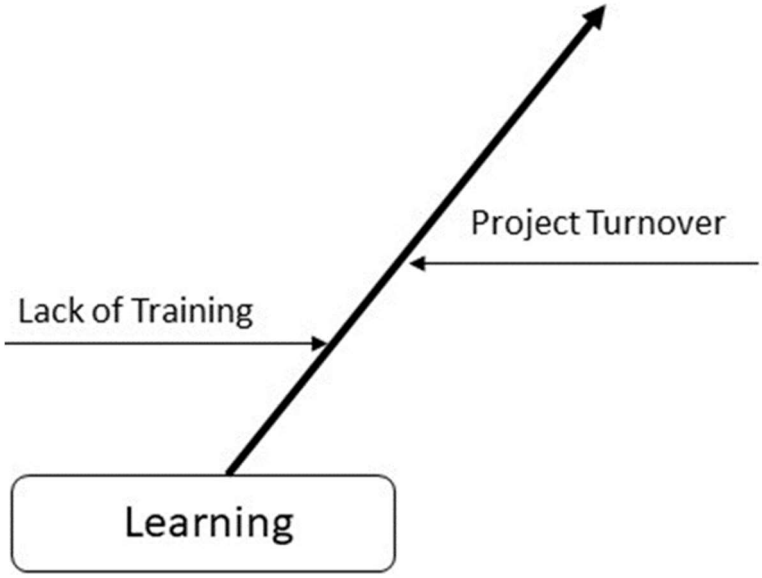


Figure 9 Learning Segment of the Ishikawa Diagram

The complete Ishikawa diagram related to cultural challenges for first time adopters is presented below. The problem statement is place in the segment at the far right (the "head" of the fish). A large "spine" arrow connects the head to the respective themes associated with cultural challenges for first time adopters: *Right Team*, *Learning*, and *Methods*. Each of these themes has connected to it associated branches which work to arrive at the root of the issue. The matter of cultural challenges on a collaborative construction project is naturally complex subject, and the Ishikawa diagram helps to provide visual clarity to some of this complexity. With the diagram, it is possible to see how the subthemes flow into the themes which in turn influence the overall problem.

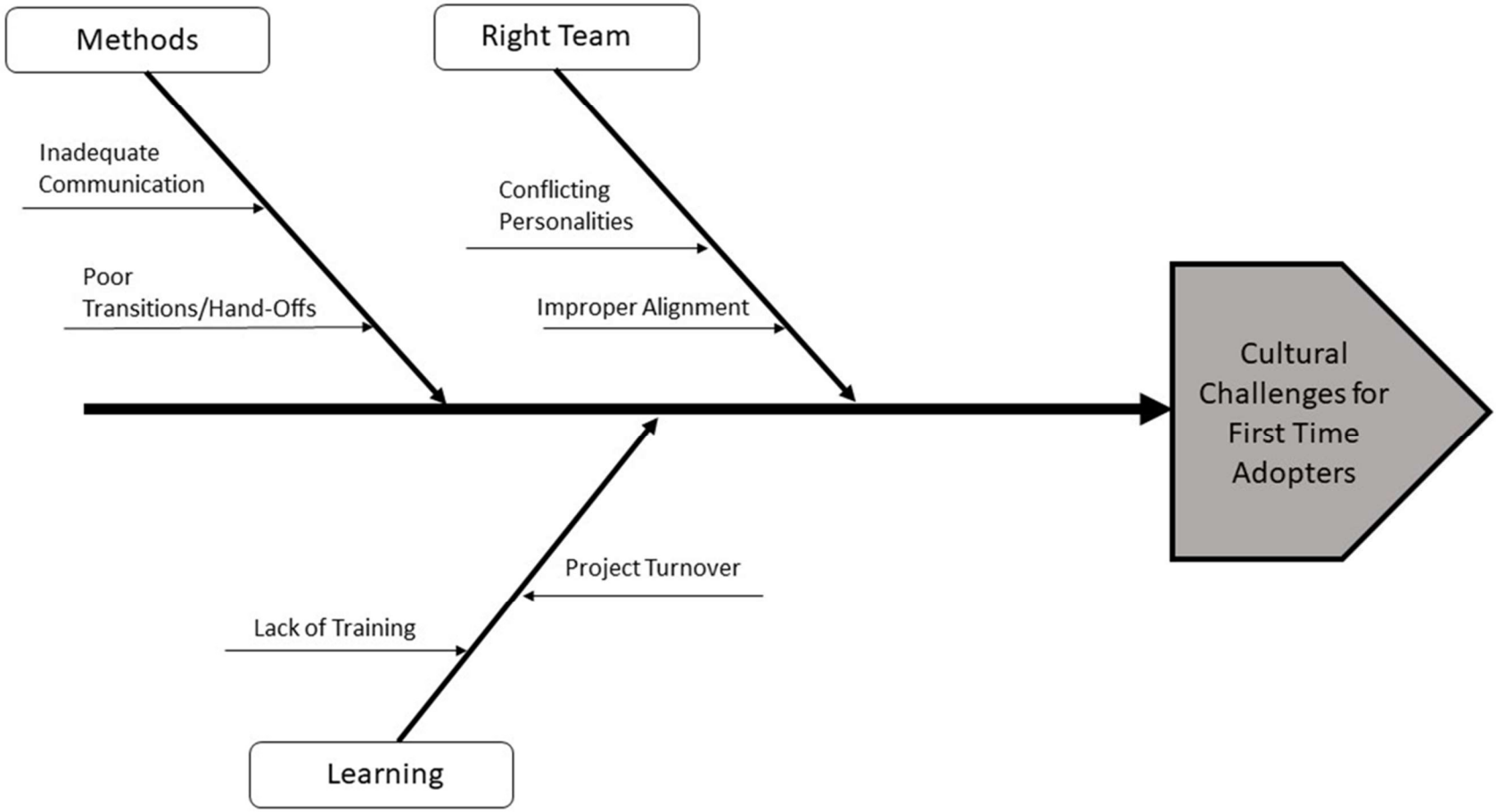


Figure 10 Complete Ishikawa Diagram Related to the Cultural Challenges for First Time Users of Collaborative Project Delivery Methods

4.5 Analysis 2: Managerial Challenges Faced by Users of Collaborative Delivery Methods in Construction

As presented in Chapter 2, the term managerial challenges refers to processes and documentation necessary to lead people and teams toward completing specified project goals within designated constraints. As in the previous section of this chapter, the researcher reviewed the transcripts for passages related to managerial challenges. Such passages included segments from discussions ranging from project team organization, chain of command, and stakeholders' roles, to RFIs, submittals, and quality control. These passages were excerpted, and the interview excerpts related to project management were run through the process outlined above in section 4.3. What resulted after multiple runs was a list which again had the word "team" as the most frequent word appearing 28 times. The terms selected as first level codes are shown along with their frequency of appearance below in Table 6.

Table 6 First Level Codes Related to Managerial Challenges and their Frequency of Appearance

The Results of NVivo Query for Managerial Challenges							
Team	28	Process	17	Collaborative	10	Control	6
Design	26	Changes	15	Meetings	10	Decision	8
Time	20	Owner	13	Communicate	7	Drawings	6
RFI	18	Architect	12	Contructability	6	Agreement	6

The level one codes were then grouped into corresponding themes which included *Organizing*, *Administration*, and *Planning*. The coding taxonomy of these themes is presented below in Table 7.

Table 7 Themes Related to Managerial Challenges and their Respective First Level Codes

Managerial Challenges Coding Taxonomy		
Organizing	Administration	Planning
Agreement	Changes	Architect
Collaborative	Meetings	Constructability
Communicate	Process	Decision
Control	RFI	Design
Team		Drawings
		Owner
		Time

4.5.1 Organizing

Both Project teams were organized in a structure of clustered teams. Case Study 1 referred to these as "innovation teams" whereas Case Study 2 called them "functional teams" (Appendix E, 213; Appendix H, 350-351), but the structure and functions were both similar to one another. The intention was to create a system of simultaneously networked and hierarchical connections for team decision making. The mechanical electrical design partner (D 2.1) expressed the value they found in the efficiency these teams provided (Appendix J, 108-114). Earlier in the interview, however, that same designer cited not fully knowing their place in the overall chain of command as being one of the challenges they experienced as a newcomer to the Design Build process (Appendix J, 39-52). This shows that no organizational structure is without its drawbacks, and further clarification of these inventive arrangements will be necessary for some participants. The thoughts and feelings of Interviewee D 2.1 were similarly shared by the project superintendent of Case Study 1. When discussing certain project changes that occurred in the field, Interviewee C 1.3 disclosed "In certain situations, it dragged on way longer than I think it would have normally if there was a more *defined* chain of command on making final decisions…" (Appendix D, 407-408, emphasis in original).

As examined in Chapter 2, project teams have a tendency to revert to more traditional

methods and procedures when circumstances of a project become challenging, and the projects presented in Cases 1 and 2 were no exception. This return to familiar practices, however, does not have to be the result of struggles faced on the operations side. At Case Study 1, the Project Manager described how this phenomenon presented itself by way of owner expectations when they said "[I]t was kind of a weird relationship for a general contractor because you're expected to still do everything that you would do, but you don't have the control" (Appendix C, 262-264). When addressing how this might be avoided, the Vice President for Case Study 1 noted "[Y]ou can do it without a contract, but it's easy for people to fall back into a traditional method if the contract terms aren't fair. Especially if not everybody is bought into the process and understanding it" (Appendix E, 62-64). The project superintendent summarized the stakeholders' attitudes and behaviors of the Case Study 1 project when they groused "you shouldn't have to CYA because '*everybody's a team*' and it's all hunky-dory… And it's like 'Nah, I'm still gonna protect myself here.' ...everyone *felt* like it was a collaborative approach, but there *seemed* (to me at least) be an underlying tension" (Appendix D, 471-474, emphasis in original).

This default into more familiar roles was also experienced at Case Study 2, but in a much more expected manner. "I see it a lot on this project…everybody's in their silo still," commented the Owner's Rep (O 2.1), "…even the architect coming back to us for questions or information when really they shouldn't be coming to me, they should be going to [General Contractor]" (Appendix K, 323-325). A similar observation regarding the architect's behavior was observed by the Assistant Project Manager of the same project who said "[the part of] Design Build that I thought would feel different would be the relationship between us and our architect and it doesn't really feel different. The architect still *behaves* normally, as if they work for the owner and not for us…" (Appendix H, 891-894, emphasis in original).

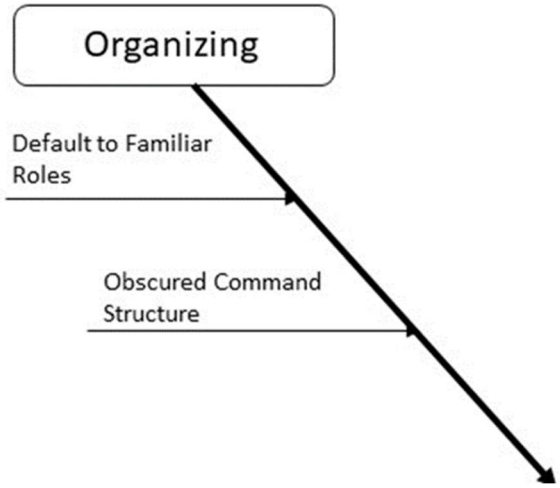


Figure 11 Organizing Segment of the Ishikawa Diagram

4.5.2 Administration

The theme *Administration* includes the codes "changes," "meetings," "process," and "RFI." The first challenge under the *Administration* theme is novelty of process. New ways of doing things will bring with them associated learning curves. These growing pains were felt by team members of both projects, and some of them have already been explored in the above subsections on *Learning* and *Organizing*. If the subsection above explored participants returning to roles in which they were comfortable, the next example describes a situation in which a stakeholder found difficulty in departing from that comfort to begin with. The Owner's Rep for Case Study 2 who observed that team members were still operating within their silos could have been describing themselves when they said:

> *[F]rom an owner's perspective, a challenge [is] trying to get buy in from everybody on an owner's* team*... you're giving up control of the project.* Quality *control,* quality *assurance… [E]verybody's used to hiring your own architect, your own engineer. They work for you, and they are your eyes and ears on the project that the contractor's building what you paid for. … [T]hat is a barrier to a lot of owners getting… over that*

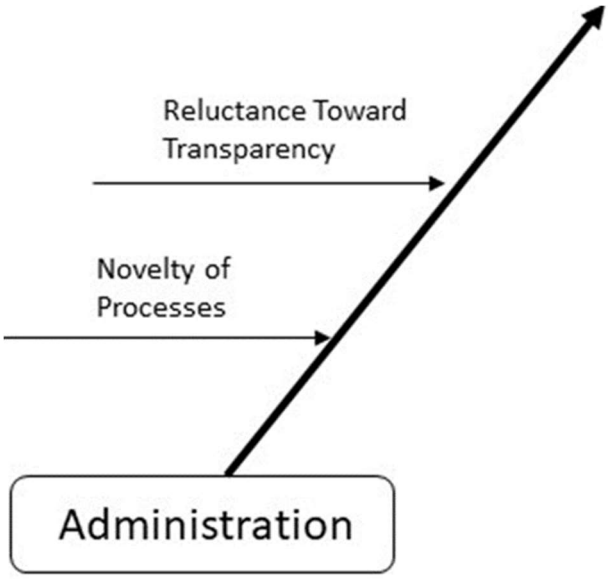
hump to [the] Design Build model. (Appendix K, 303-310, emphasis in original)

Another instance of novel processes being the source of headache was present at Case Study 1. At Case Study 1, in lieu of a project changelog, the team used what was called a "VAP" log. VAP is an acronym which stood for "Value Added Process." The VAP log lived in a spreadsheet shared in MS Teams and members of the Project Leadership Team (PLT) could edit it when necessary. There was regular turnover at the Case Study 1 jobsite, and the Project Manager interviewed for this study was only there for the last six months or so of the project (Appendix C, 191-192). When they arrived, there were already well-established procedures; however, even longtime project team members were not entirely certain why or how particular things were done (Appendix C, 335-342). Interviewee C 1.2 had this to say regarding the VAP logs described above: "…this sheet [the VAP log] had existed for two years or two-plus years, and so many different people have touched it, there's a lot of weird stuff on the fringe everywhere on all of these different sheets. …you just don't know who wrote it or why and what it means, so we just keep kind of pushing along and we leave it there just in case it's important." Ironically, this system which was designed for efficiency ended up being a source of clerical strife.

A salient difference between the two Case Study projects had to do with transparency of accounting. Stakeholders at Case Study 2 had a more conventional separation between parties when it came to accounting. The situation at Case Study 1 was different. Since the members at Case Study 1 were contracted to perform an IPD project, the contract contained a shared-risk/reward element which included the requirement to participate in transparent accounting between project stakeholders. The Vice President for Case Study 1 (Interviewee C 1.4) described the willingness to share this type of information as a key ingredient to the success of

IPD projects (Appendix E, 139-148). They defended this position further by adding "…the expectation that I would have is… you share *everything*. You know? There's no secrets… good or bad" (Appendix E, 149-158, emphasis in original).

This appeal toward radical transparency was a tough sell for some project team members. The Principle of the MEP design firm for Case Study 1 (Interviewee D 1.1) appeared uneasy when recalling this aspect of the IPD process and regarded it as "*super* uncommon" to be sharing this otherwise very private information (Appendix F, 346-354, emphasis in original). Their sense of unease is felt in the recollection of one of the many meetings wherein such information was shared: "When we're sitting there sharing our fees and hanging that all out there in front of everybody… You know, it's kind of a look behind the curtain that we don't usually see" (Appendix F, 358-360). Though some were skeptical about this feature of IPD, others found it to be a practical addition to the list of project controls. "There were quite a few instances where one specific partner made a mistake and it could have been significant," explained The Project Manager for Case Study 1. "[T]he rest of the team could have suffered from it. So, it just held accountability for everybody to stay involved and on top of each other"



(Appendix C, 501-503).

Figure 12 Administration Segment of the Ishikawa Diagram

4.5.3 Planning

The final theme addressed in this section about the managerial challenges faced by adopters of collaborative project delivery methods has to do with *Planning*. The *Planning* theme is informed by challenges associated with the fast-tracking of collaborative projects and the differences in value assigned to the design-assist process by various stakeholders.

At Case Study 2, the Assistant Project Manager (Interviewee C 2.2) expressed frustration at some stakeholders' unwillingness to participate fully during the design-assist phase of the project describing it as a "missed opportunity" (Appendix H, 747-757). That opportunity was not missed by their enclosures trade partner, Interviewee TP 2.2. The Assistant Project Manager regarded TP 2.2 as "…an example of a person who really took advantage of the design-assist approach and really tried to influence the design and make it as good as possible for the limitations of the system that [they were] gonna provide" and as a "consultant in that role" (Appendix H, 769-773). Interviewee TP 2.2 affirmed this statement saying, "We prefer to do design-assist when possible," and "Communication is key… and design-assist upfront only improves that across the board" (Appendix M, 322-323 & 470-471).

From conceptual design to punch list, every member of a project delivery team will want more time. Whereas the *Methods* section above addressed how project team members executed transitions, this portion of the analysis is concerned with examining when they choose to proceed with said transitions, more specifically, when should fast-tracking begin on a collaborative project delivery? This was a sticking point for some of the members of the team working on the hospital tower in Case Study 2.

The overall project was divided into phases. Phase 3 included the core and shell of the

entire hospital tower including the fit out of several of the lower floors of the patient tower and Phase 4 included the fit out of the rest of the floors (Appendix I, 451-465; Appendix J, 132-136). Some of the fit out included in Phase 4 concerned areas on floors one through three. Because the project was fast-tracked, construction was already underway on floors one through three before Phase 4 had even been bought out. This proved challenging for the Assistant Superintendent of Case Study 2 (Interviewee C 2.3) who was tasked with ensuring the self-perform concrete work for Phase 3 was completed on schedule while simultaneously coordinating the construction with some members of the design team who were working on the Phase 4 fit out of that same area currently under construction. When asked if the fast-tracking was perhaps too fast, their response was an unimpeachable "Yeah" (Appendix I, 467-469).

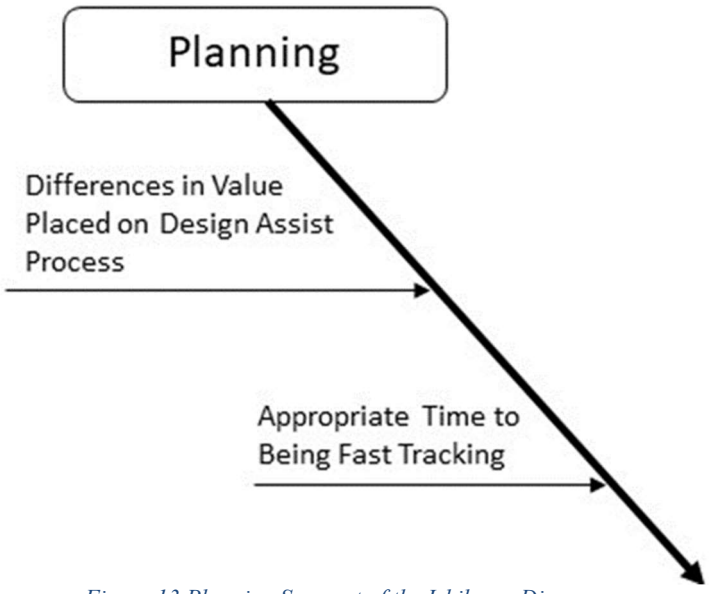


Figure 13 Planning Segment of the Ishikawa Diagram

The complete Ishikawa diagram related to managerial challenges for adopters of collaborative delivery methods is presented below in Figure 14. As with the first diagram (Figure 10), the problem statement is place in the segment at the far right in the "head." The

spine arrow connects the head to the themes associated with managerial challenges: *Organizing*, *Administration*, and *Planning*. Each of these themes has connected to it branches which work to arrive at the root of the issue. Much like the matter of cultural challenges on a collaborative construction project, managerial challenges are also complex in nature. The Ishikawa diagram helps to simplify some of this complexity. The diagram makes it possible to see how the subthemes flow into the themes which in turn influence the overall problem.

4.6 Conclusion

This chapter has provided an analysis of the interviews of stakeholders participating in collaborative project deliveries in the construction industry. Using the predominant themes discovered in the literature, the researcher excerpted relevant passages from the interviews for examination using NVivo software. Word frequency analysis was performed on the excerpted materials related to Cultural Challenges for First Time Adopters of Collaborative Delivery Methods in Construction and Managerial Challenges Faced by Users of Collaborative Delivery Methods in Construction. These word frequency analyses were used as first level codes which were then combined to create larger overall themes. These themes were displayed on Ishikawa diagrams along with their accompanying causal sub-themes. This structure supplied the researcher with a meaningful lens for review of the transcripts. The newly developed themes provided a ready structure for the narrative presentation provided in this chapter. This narrative description delivered an incisive and nuanced look into the challenges faced by project stakeholders. The following chapter includes the discussion and findings of the present study and concludes the paper.

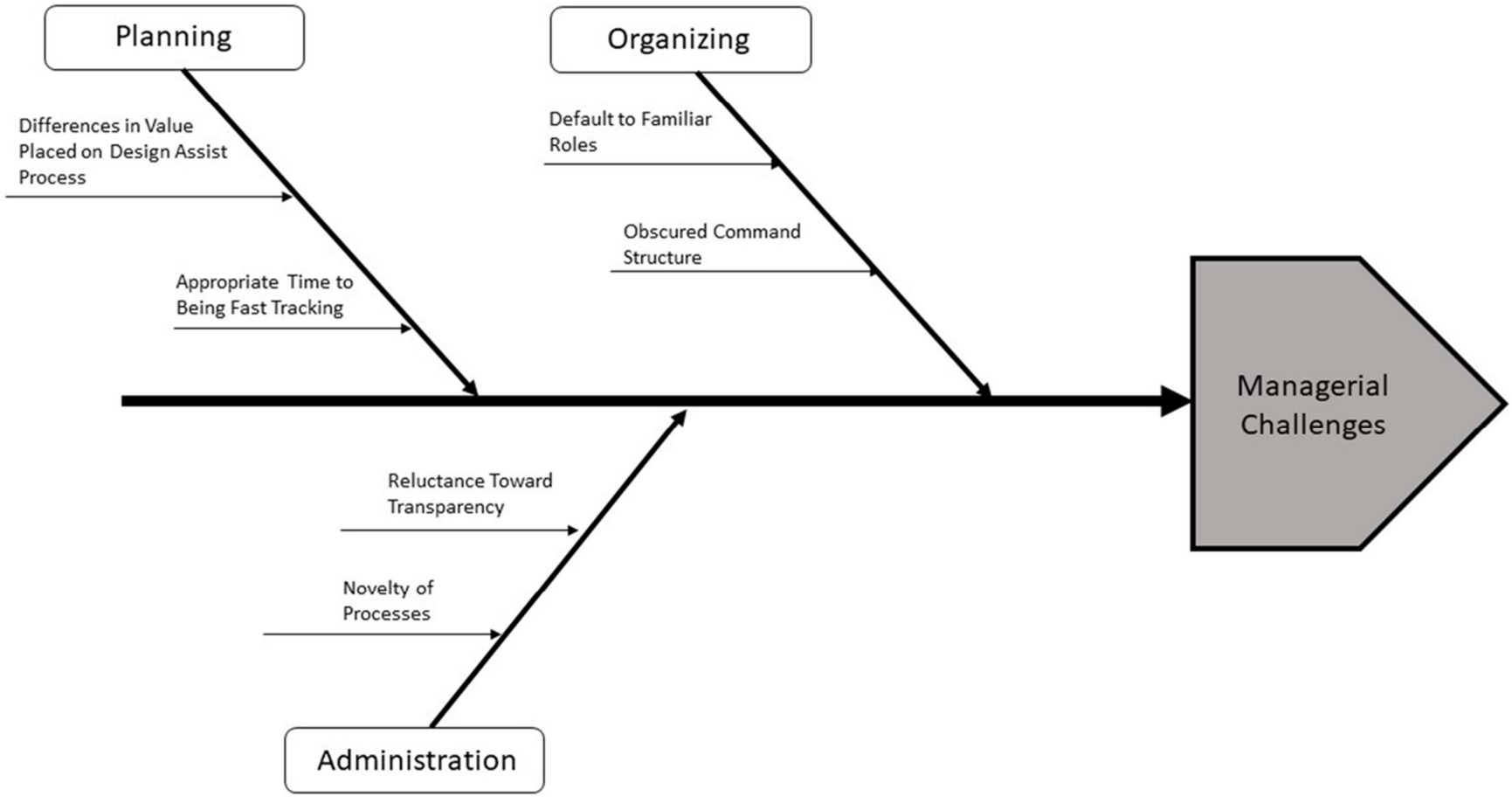


Figure 14 Complete Ishikawa Diagram Related to the Managerial Challenges for Users of Collaborative Project Delivery Methods

Chapter 5: Conclusion and Recommendations

This research examined the barriers and challenges faced by adopters of collaborative project delivery methods, namely IPD and Progressive Design Build. This was achieved by conducting semi-structured interviews with multiple stakeholders located at two different projects. The interviews were recorded and transcribed. Following transcription, the data was further cleaned and analyzed using NVivo software to develop themes which provided a means of insight into difficulties faced by current adopters of collaborative project delivery methods in construction.

As is to be expected with case study research, the investigation was required to adapt throughout the process (Yin, 2018), but it did not transform in any material way sufficient to warrant revision or review of the original research design outlined in Chapter 3. At outset of the research, the specific objectives of the study were:

- To clearly define what the barriers and challenges are to the adoption of collaborative delivery methods (specifically IPD) in the construction industry in 2023.

- To better understand and catalog, when possible, the barriers and challenges which are unique to first time adopters in the construction industry of the IPD delivery method – both vertically and horizontally.

To the first objective, this research has provided adequate response through the mapping of root causes using Ishikawa diagrams in Chapter 4. The analysis revealed a collection of six specific themes related to the barriers and challenges faced by adopters of collaborative project delivery methods. Regarding the second objective, this research provided unique insight into the

barriers and challenges which are unique to first time adopters in the construction industry of the IPD delivery method – both vertically and horizontally. This was examined in depth in Section 4.4.

5.1 The Findings and the Current Literature

The findings in this study are in line with the existing literature on collaborative delivery methods in general and the IPD method in particular. There were elements which participants found preferable to traditional project delivery methods and those which they disliked. Akin to the findings of Nanda et al. (2017), interviewees reported experiencing the benefits of learning during the project (C 1.2, C 1.3, C 1.4, C 2.1, & C 2.2). Interviewees also made an effort to highlight the values of trust and respect when it came to the overall success of project goals which is in line with Kent other research into factors which contributed to the success of IPD projects (Kent & Becerik-Gerber, 2010). In line with previous research, Subsection 4.5.2 revealed some trepidations surrounding the practice of transparent accounting; however, it also presented those who were pragmatically in favor of the practice.

Whereas previous research has shown that project participants reverted to more traditional ways of doing things when either processes began to lag or when too many new elements were implemented at once (Simonsen et al., 2019), this study saw a different catalyst for such behaviors. In Subsection 4.5.1 it was revealed that the driving factor behind parties assuming more familiar roles had more to do with stakeholders' assumptions and expectations than with either operational difficulties or the adoption of too many collaborative elements.

Given the importance of trust to the eventual success of IPD relationships (Kent & Becerik-Gerber, 2010; Kahvandi, Saghatforoush, Mahoud, et al., 2019), it is likely that many of the challenges encountered by the team members of Case Study 1 were directly related to the frequent turnover experienced at the jobsite rather than any specific operational or contractual

elements. Since project team members did not have the opportunity to build robust relationships with one another over time due to personnel change and the Covid-19 pandemic, they did not have a chance to develop the *trust* which is so crucial to the successful execution of collaborative project deliveries. This directly highlights the importance of the role trust plays in the successful performance of collaborative project deliveries in construction.

5.2 Implications of the Findings

The emphasis on the role concerted teaming plays in the eventual success of collaborative delivery projects was made evident by Subsection 4.4.1, and potential adopters of these delivery methods would be shrewd to focus their efforts and resources toward fostering better team dynamics both internally and between different stakeholder classes. Furthermore, aspiring adopters would benefit from proactively working to streamline eventual project hand-offs and design stage changes to help avoid some of the discomforts experienced by interviewees in Subsections 4.4.2 and 4.5.3.

Subsection 4.4.3 highlighted the tremendous role that learning played for all project stakeholders. The theme of how valuable learning is to the project's success appeared repeatedly throughout the interviews. More often than not, however, this learning gained by project stakeholders appeared to be an afterthought at best and coincidental at worst. In order to fully harness the benefits of the IPD process, it is crucial that would be adopters place an emphasis on learning by making it a unified piece of the project, rather than simply a side effect. This learning should happen early, it should happen often, and it should include full range of project team members: from Owners and Designers to General Contractors and Trade Partners and from Executive Vice Presidents to Field Engineers. Only with a concentrated effort directed toward educating project stakeholders will some of the challenges associated with collaborative project delivery methods begin to be remedied.

5.3 Limitations & Future Studies

5.3.1 Limitations

Audio recordings are imperfect, and transcriptions can also be imperfect. Though an effort was made to maintain the integrity of the original words, errors may have occurred during both the recording and transcription processes. In general, some participants may have been reluctant to share their more candid thoughts due to fear of possible repercussions, despite the measures in place to anonymize the data and the effort made by the researcher to inform Interviewees of such measures. This possibility exists in the interview transcribed in Appendix H where Interviewee C 2.1 was the direct superior of Interviewee C 2.2.

Obviously, in-person interviews are preferred when possible. However, this was not feasible for the completion of this research which is why the method of online video conferencing was chosen for hosting and recording the interviews. The format of online video chatroom interviews can be awkward for both the interviewer and interviewee. This awkwardness or discomfort can be compounded when some interviewees choose to participate by phone only and not video. Reasons for this were either technical in nature or personal preference. Interviewee 1.4 experienced technical troubles with the video during their call which meant they were participating only by audio. At least two interviewees (C 1.3 & TP 2.1) were driving while being interviewed, and this environment of possible distractions may have affected their responses. Furthermore, most other interviewees were in office settings where distractions may have also been present sufficient to have affected their responses.

Case Study 1 was a small project (total budget of approximately $20 Million) and a reappearing challenge mentioned by project team members revolved around the frequent project turnover. These personnel changes likely contributed to some of the challenges faced by interviewees and may have done more to inform their experiences than the IPD method or

practices themselves. Additionally, the project occurred during the unprecedented events of the Covid-19 pandemic making it impossible to know which challenges were the result of this extraordinary circumstance or were due to the delivery method directly.

The difference in size and scope of the two case studies included within the research is manifestly evident. Case Study 1 was approximately two years long and around $20 million whereas Case Study 2 is projected to take approximately six years to complete and has a current projected budget of $680 million. In this way, these case studies likely do not represent the mean of collaborative construction project deliveries, but rather, highlight experiences of those projects which are more than one standard deviation from the mean. Project hardships are experienced at scale, and challenges which may have proved onerous for Case Study 1 could likely have been absorbed unnoticed by Case Study 2 simply by virtue of increased resources and personnel.

Finally, at the time of the research, the Case Study 1 project had been completed for almost a year. There exists the possibility that interviewees had imperfect and incomplete memories of the project. Of note, Case Study 2 was also put on pause for approximately six months due to the Covid-19 pandemic, but this appeared to have less of an impact given both the size of the project and the stage of development it was in at the time.

5.3.2 Future Studies

Both Subsection 2.2.4 and Section 4.5 have shown the demand for further research which is sensitive to the managerial challenges faced by stakeholders of collaborative project delivery methods. Using this lens during future investigations into both IPD and Progressive Design Build should provide not only better insight to the difficulties experienced, but also a framework for the potential solutions.

A bounty of data was collected during the interviews conducted for this study. Over 10

hours of recordings were collected in total, and multiple interviews were captured but not transcribed. Further research could benefit from conducting a more in-depth comparative analysis both vertically and horizontally with regard to the interviewees. Such analysis would work to provide an even richer and more nuanced understanding of the challenges faced by stakeholders of collaborative project delivery methods.

Finally, both cases studied in this research were healthcare projects. There were no non-hospital, non-medical IPD projects discovered by the researcher during the time in which the study was conducted. This asymmetry regarding examples of healthcare construction projects has been a common theme in the literature about IPD. The current literature would be benefited by further research into non-healthcare IPD projects in commercial construction.

5.4 Conclusion

This research has contributed to the body of knowledge by providing direct insight into the challenges faced by first time adopters of collaborative project delivery methods in the construction industry. Heretofore, most research was indifferent to whether or not someone was adopting the method for the first time. This overlooks the challenges that are likely unique to those individuals. By completing this study, there is a much more fleshed out understanding of the issues and concerns facing those who are participating in collaborative project delivery methods for the first time.

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Appendices

Appendix A: Interview Questionnaire

Project Information

Interviewee Specific

What is your position/title (e.g., Construction Project Manager, Owner's Rep., Lead Designer)?

How long have you worked within the AEC industry?

How long have you done work with projects involving collaborative delivery methods*[1]?

What is your understanding of and familiarity with collaborative delivery methods?

Was this the first time you or your team had participated in a project with collaborative delivery method?

Contract

What was the contracting style used? (AIA 195-295, Modified AIA, DBIA, Modified DBIA, IPDA or IFOA)

What was the compensation structure? (GMP, Lump sum, Fixed fee, EMP)

General Information

What was the overall budget of the project? How was this determined?

What was the duration of the overall project? How was this determined?

Who was the driving force behind adopting an integrated project method?
(Owner, Designer, Contractor, Other)

What, if any, do you believe are major barriers and challenges to the implementation of collaborative delivery methods?

Do you believe are common reasons for challenges within collaborative delivery methods? If so, what are they? What are some opportunities to remedy them?

Financial

IPD Compensation Structure

[1] *For the purposes of this research, "collaborative delivery methods" means a project delivery method which contains, at a minimum, all of the following elements:

- Continuous involvement of owner and key designers and builders from early design through project completion
- Business interests aligned through shared risk/reward, including financial gain at risk that is dependent upon project outcomes
- Joint project control by owner and key designers and builders
- A multi-party agreement or equal interlocking agreements
- Limited liability among owner and key designers and builders

Was there a shared risk reward mechanism? (Profit pooling, sharing savings/overruns)

Were there challenges unique to agreeing upon the compensation structure? What were they?

Sharing Cost and Savings Overruns
When project team members collaboratively agree on a target budget and share savings on the project. Typically, this involves an EMP, a GMP, or a TVD.

Profit Pooling
Was a profit pooling method established as an incentive mechanism? If so, what were its mechanics and how were they established?

[Note: If you have a visual example of either of these mentioned above, that would be greatly appreciated.]

Cultural
Was there a "core group" ("IPD Team," Core Team, or Project Leadership Team [PLT]?) If so, who all did it include? How was it assembled? Was everyone involved from the very beginning, or did other members arrive and sign on to the core group in a more lateral fashion?

Integrating Project Personnel
How did you go about integrating project personnel? (e.g., Integrated subcontractors, referring to subcontractors as "trade partners," collocating, use of a singular shared BIM model)

Did you have established procedures for conflict resolution? What were they? Were they contractual?

Did the contract/agreement require a liability waiver on the part of the "core team" participants?

IPD Training
Was there IPD specific training involved? If so, what did this consist of?

Was there an IPD Team Leader or "coach"? How was ongoing support provided?

Trust-Building Activities and Tools
Was there a preexisting relationship between any of the contracting parties?

Was there a type of continuous learning plan implemented on the project? If so, how was it structured and who spearheaded its implementation?

Legal
Were there any legal barriers to integrated project delivery? (e.g., limitations presented by insurance, bonding, or municipal requirements)

What was the formal process for dispute resolution?

Insurance, Bonding, and Legal Limitations
Was bonding required?

If bonding was required, what did that look like for the project? (Was each individual party bonded separately, or did one party elect to bond the project as a whole?)

If bonding was required, were any contracting parties able to have liability indemnification waivers?

Was Subcontractor Default Insurance (SDI, "Subguard") Utilized on this project? If so, who bore the cost of the insurance?

Was this project able to fit within a more traditional product offered by the insuring party?

IPD in Public Projects
If the job was a public project, were there any state or local laws which prohibited elements of IPD (e.g., early collaboration of Owner, Architect, and Contractors)?

Technological
What were the primary technologies utilized for achieving collaboration?

BIM Technology
Was there a singular shared BIM model used on the project for coordination?

Who owned the BIM model? Did all the parties have equal privileges in the BIM model?

Was there anyone for whom BIM technology was new on this project.

If project teams were using different platforms to create their models, who took ownership of integrating and controlling the model? (Owner, Contractor?)

Did any parties express reluctance toward the use of BIM?

Was the use of BIM technology unfamiliar to members of your team?

Visualization Tools
Were there any collaborative visualization tools used on the project for coordination? If so, what were they?

Was there a regularly updated project dashboard available to all project participants?

If so, what Key Performance Indicators (KPIs) did it include?

Appendix B: Transcript of Interview C 1.1

The date of this interview was February 2, 2023. The venue of the interview was over a Zoom meeting. The interview started at 2:02 PM CST. Interviewee C 1.1 is a Senior Project Engineer for the General Contractor who worked on an IPD project located in a Mountain West state of the Western United States. Interviewee C 1.1 has worked in the AEC industry for a little over two years and had some familiarity with the Design Build method (but not *IPD) prior to working on the project at the focus of Case Study 1.*

Interviewer: It is February the second at 2:02. We are starting our interview. This is with [interviewee's name], [General Contractor], project engineer, [Case 1 project name]. So, very specifically what is your position and title?

Interviewee C 1.1: I am a senior project engineer.

Interviewer: Then, how long have you worked in the AEC industry?

Interviewee C 1.1: So, I graduated from [university name] in 2021. And then I've been out of school for the past almost over two almost two years.

Interviewer: Alright. Let's see, how long have you done work with projects involving collaborative delivery methods. I imagine this is maybe your first project, yeah?

Interviewee C 1.1: Yes. So, this is my first IPD project. I have touched a little bit of Design Build and the rest have all been Design Bid Build projects.

Interviewer: Okay. Let's see. What is your understanding and familiarity with collaborative delivery methods? Is this something you guys, like, probably talked about in school a little bit but that might have been it?

Interviewee C 1.1: Yeah. As far as the more IPD. But we tend to as far as the procurement goes, we like to collaborate with the owner and architect as soon as possible.

Interviewer: By that you mean [General Contractor] likes to do that?

Interviewee C 1.1: Yes. Yeah.

Interviewer: And, this is not really on the script, but-to your understanding-is something like IPD more common or less common when it comes to types of contracts that [General Contractor] does?

Interviewee C 1.1: I would say it's *less* common.

Interviewer: Okay.

Interviewee C 1.1: But it's not the first project I've known for [General Contractor] to do. So, I

think it tends to be more if an owner wants to do IPD or if it, if the project fits the, I guess, "resume" of IPD and project teams of subcontractors that do IPD.

Interviewer: And then..

Interviewee C 1.1: …if that makes sense.

Interviewer: Yeah, for sure. I mean, was this the first time your or your team had done an IPD project, a project with collaborative delivery method? I think, yes?

Interviewee C 1.1: Yes, I believe so. Our vice president, [Interviewee C 1.4], they've been on multiple IPD projects including other hospital projects.

Interviewer: And then, next up is "what was the contracting style you used"?

Interviewee C 1.1: So, we had, like, a target cost.

Interviewer: Just like an…estimated maximum price? Or…

Interviewee C 1.1: Let's see. I came in a year and half into this project. So it was very… A lot of it was set up when I came in, so I'm not *as* familiar. I don't know, honestly, if we had a GMP set up for this project. Yeah.

Interviewer: Do you know…

Interviewee C 1.1: But I do know, we did, it was more of a target cost. And I don't know if you've heard of like a VAP log. We had a whole VAP log set up. Whether we went… I don't know if [interviewee C 1.2] has talked to you at all about this…

Interviewer: No.

Interviewee C 1.1: …or shared anything. So, essentially, with our estimates, they probably set up… They probably did set up, the established a GMP to set a baseline in their estimate. And then, typical projects you have the RFI changes, and then determine whether they take them out of contingency or not. And, I'm sure this might hit some of your other questions…

Interviewer: Yeah.

Interviewee C 1.1: …too. So, they-the owner-brought us a change on the project. We determined whether it would hit the team as far as risk, or if it was a design risk, then it would all come out of team as far as contingency within target cost. If it was a change to the owner, it'd be a change to target cost. Things like that. So, it would either be added to the project, or it'd be a hit to the team. Things like that.

Interviewer: So, I think this does kind of dovetail into, like, what was the overall budget and how was that determined? And it sounds like what you're saying…

Interviewee C 1.1: Yeah, so… I guess the overall budget I would assume we established our initial cost estimate and then we had all of these changes. Let's see, I actually have them pulled up now. We had essentially one point, almost one point seven million dollars in changes. So, within it, we separated our costs out from the third-floor buildout and then fifth- and sixth-floor buildout was the entire project. It was separated into six phases of work over three years. And over three floors of work. And so I think they initially-I could be wrong about this-they might have established a cost estimate for the third-floor buildout, and then the fifth and sixth buildout. And so the third-floor buildout was, like, around five point five million dollars and the fifth and sixth was around fourteen million dollars. This might have included OCOs to date as well. And then totaling nineteen point six million dollars.

Interviewer: Okay. So, around nineteen million dollars and then also three years?

Interviewee C 1.1: Yes.

Interviewer: Okay.

Interviewee C 1.1: Yup. We started, I believe we started in July of 2020 and we ended construction in May of 2022.

Interviewer: Okay, so this is *finished.* I'm sorry.

Interviewee C 1.1: Yes…

Interviewer: That…

Interviewee C 1.1: We still have a few changes left over actually. So, we're going through warranty right now. As a pediatric mental health unit, these patients are…they like to test out the space. So, warranty has been an ongoing issue. We turn over the space, we test it out. They've damaged doors. They've broken a door in half. We go into the space, they…we turn stuff over. We will be redoing the floor, the flooring on half of the… half of five. So, one of our phases of work on the fifth floor we'll be going in and redoing the flooring and then adding some wall protection in there in May. A couple things like that. So…

Interviewer: Okay. What was it about the flooring that needed a warranty address?

Interviewee C 1.1: There's… So, when the flooring was done, they noticed some of their furniture… It was taking a beating within the first six months of its life. So, they noticed that was abnormal, because it was a flooring had been recommended for pediatric spaces and high-traffic spaces. So, we went through warranty claims on it and got a different selected flooring and tested it out and did a mockup in a high-traffic room that the patients would be using with furniture in there and got it approved and we'll be redoing the flooring.

Interviewer: Very cool.

Interviewee C 1.1: Yeah.

Interviewer: So, you mentioned earlier about the contingency. Is that… I mean-as far as we're concerned-would you say that that is like the "shared risk-reward mechanism" for this project?

Interviewee C 1.1: Yeah. We did have a shared risk-reward. And we… So, at the end of the project, we were trying to I guess technically close out the project. We kind of figured out did we hit this mark and will we get this reward or not.

Interviewer: Okay.

Interviewee C 1.1: And so, was this, let's see… How exactly, if you know, did they come about like this particular reward sharing mechanism?

Interviewee C 1.1: We had a meeting essentially between all of the trade partners, owners, architects. Whether some of them was schedule-related, design-related, things… Let's see, open up the page… [Indistinguishable] And so, kind of like the profit-sharing and risk-sharing, we kind of determined some of it was performance-based. And it was kind of team-decision-based. Well, did we hit our performance mark based on schedule, or-I guess-what they thought was performance-based in that level. And 30% of that cost was "disruption." Did we disrupt the patients at all based off of, like, did we set off the fire alarms a bunch of times. Things like that. Some other things were firestopping, sprinklers, electrical, ceiling tiles. Did we hit milestones. Did we hit our inspection dates as well. Things like that.

Interviewer: Okay, very cool.

Interviewee C 1.1: And I think if we missed it then we didn't get our profit-sharing on that. And, if we hit it…

Interviewer: Okay. So, you mentioned this was kind of decided on with like the owner, the architect, the trade partners. Was there like a "Core Group" or "IPD Team" that was like [General Contractor], and the owner, and some specific trade partners? And if so, like, who all was included in that?

Interviewee C 1.1: Yeah. So, we had like the "PMT team." So, our trade partners were… I mean, it was, I mean the hospital, [hospital name]. Our architect, which was [Designer name]; our engineers, which was [engineer name]; and then we had [General Contractor]. Let's see, [trade partner name] which was our painter and our drywall sub [Interviewee TP 1.1]. Our mechanical subcontractor, which was [trade partner name] – they're also plumbing as well. And our electrical subcontractor, which is [trade partner name].

Interviewer: And in the painting subcontractor you mentioned, was that also the framing?

Interviewee C 1.1: Yup!

Interviewer: Okay, framing, drywall…

Interviewee C 1.1: …Framing, drywall, and painting. And they did ceilings. Ceilings, ceiling tiles.

Interviewer: And then you mentioned I think it was the architect. Will you say that again just ‘cause it like, kind of broke out?

Interviewee C 1.1: Our architect, [Designer name].

Interviewer: Okay. Cool cool.

Interviewee C 1.1: And so, was everyone involved right from the beginning, do you know? Or was it, like owner, architect, contractor and then you guys brought in some other… Or was it like all six or seven from the very beginning?

Interviewee C 1.1: I think we were probably chosen. Maybe we went through like a selection interview period. Based off of our schedule pulls that I’ve seen. The history of our schedules, it looks like we might have went through an interview process. I could be wrong. I know we use those subs frequently as well, so we do have a good relationship with some of those subcontractors as well.

Interviewer: Okay. Let’s see…

Interviewee C 1.1: …It could be a mixed-use of both.

Interviewer: Yeah. For sure. And again, some of this stuff is like, absolutely, way too high-level. Definitely some stuff that I don’t expect you to know all of this and it’s fine that you don’t.

Interviewee C 1.1: Yeah, it’s early on. I came in in October of 2021 and this project started in July of 2020.

Interviewer: Uh, let’s see. So, how did you go about integrating project personnel, like, did you guys, you know, have specific, I guess, culture-building activities or regular meetings-things like that that you’re aware of?

Interviewee C 1.1: So, I came in to the project right when [General Contractor]’s main, like, IPD leader was leaving [General Contractor]. So [they] kind of, from what I heard, they had some, like, team-building activities *before*. Like when the project started, they had a couple of team-building activities and trainings on IPD and things like that. And then when I came on… And then we also had a superintendent switch and a couple PM switches on [General Contractor]’s part. There’s another [person] at our company who’s kind of been like a design-phase… she’s a design-phase manager at our company, so [they] know a lot about the IPD project delivery method. [They] ha[ve] come in and has given a refresher to how the IPD delivery method has worked within the project.

Interviewer: And then, let’s see… Again, some of this might be stuff you don’t know, but did

they have, like, established procedures for conflict resolution? Or like a requirement that Core Team members sign a liability waiver?

Interviewee C 1.1: If anything, there was a couple big incidences that came up where…with a couple patients... that came up and the hospital had to get involved potentially. We all sat down in a meeting with the PLT team which was like more the higher-ups in the company would come in, so [General Contractor]'s…*our* vice president sat in, [Interviewee C 1.4]. [They] sat in on the meeting and every other trade partner had somebody else from their leadership of their company would all sit in on that meeting as well. So, as far as big conflicts that would happen that would've involved… they would all sit in. But if it was like a small conflict, as changes of the project, then we would just have a meeting and we could come to a solution based off of that.

Interviewer: And just for clarity's sake, "PLT Team" means like "Project Leadership Team"?

Interviewee C 1.1: Yup.

Interviewer: Okay. Again, this one was addressed a little bit, but was there like an IPD Team Leader or Coach? You said that there *was*, but [they] may have *left*?

Interviewee C 1.1: Yup.

Interviewer: And then, kind of to that, were there any like trust-building exercises and activities? Again, some of this stuff you said may have happened before you got there. So…

Interviewee C 1.1: Yeah, I think it all happened before I got there. And then once [they] left, it kind of fizzled out.

Interviewer: So, and then also, regarding preexisting relationships, you mentioned that a lot of these trade partners are people [General Contractor] has worked with previously.

Interviewee C 1.1: Yup. Yeah, we use [drywall and framing contractor] and [mechanical contractor] on a lot of projects, and we have previous relationships with them. Same with the architect. And we've been at [the hospital] multiple years as well.

Interviewer: This is just for my own education: your mechanical contractor that you mentioned, does that also include pipefitting in that? So, if you guys have like a chilled water system, they're doing that too?

Interviewee C 1.1: Yes.

Interviewer: Let's see… Legal. Were there any legal barriers to this integrated project delivery? And specifically, I think this is like talking about like barriers related to things like insurance, bonding, or even municipality requirements. And again, this is stuff that might be outside of your purview and that's totally fine.

Interviewee C 1.1: I don't think there were any *barriers*…

Interviewer: [Hospital name], is that public or is that a private entity?

Interviewee C 1.1: I'm not 100% sure. Yeah, not 100% sure whether it's public or private.

Interviewer: No, you're good.

Interviewee C 1.1: Yeah.

Interviewer: And then, there's a question about a formal process for dispute resolution, but you mentioned that it seemed like if something was severe enough that typically there was a quorum of everyone who was a higher-up. So, I think that kind of addresses that.

Interviewee C 1.1: Yup.

Interviewer: Was bonding required? Like, by any party? Like did the owner require…

Interviewee C 1.1: I believe they *did*. I was digging through our contract earlier. I can't open it right now. But, yeah…

Interviewer: Okay.

Interviewee C 1.1: I thought I saw something here [Interviewee C 1.2] should be able to go dig deeper when you talk to him.

Interviewer: Yeah, for sure. A lot of this like bonding and insurance stuff is… Let's just go ahead to… Well, we talked about whether or not [the hospital] *is* public, and you said you don't know. Let's see… Technological. Do you know what the primary technologies were for like achieving and maintaining collaboration?

Interviewee C 1.1: Let's see, I know the engineers used BIM. I mean they have BIM and CAD and all that stuff. We mainly used Bluebeam as far as software and technology like that. And all of our meetings… A lot of our meetings… So, the whole team was sharing a Teams file that had all of our files on it. We had a collaborative VAP log, so like our cost change log. We would all be able to input a change in there, and the owner would put in a request for pricing, and the trade partners could add in their pricing. [General Contractor] could put in pricing in for our other subcontractors that were contracted under us. It would have our budget summaries, add-in schedules, pictures, things like that. Essentially, it was like… So, for all of [General Contractor]'s jobs we have a job file with all of our record documents. It would be put into Teams, or we also had a Bluebeam Studio project that had the approved submittals, schedules, photos, and project drawings as well.

Interviewer: Yeah, that sounds pretty familiar to me.

Interviewee C 1.1: Yeah.

Interviewer: That actually is interesting that you mentioned, was it the "VAP" log? What does that stand for specifically? Again, just for…

Interviewee C 1.1: Value… Value Analysis…? Something, like… yeah. There's been a bunch of terms mixed around.

Interviewer: Yeah. No, I mean, I get it. Sometimes you use acronyms all the time and then someone's like "what does that mean?" and you're like "I don't know - it's the… it's the 'VAP' log!"

Interviewee C 1.1: Yeah, it's the cost log.

Interviewer: Yeah. I mean, that kind of harkens…

Interviewee C 1.1: …If you need follow up, I can give you follow up on that.

Interviewer: For sure. And if you don't know it specifically, someone that I interview will likely know it.

Interviewee C 1.1: Yeah.

Interviewer: Yeah, that kind of harkens to that like transparent accounting element of IPD that sometimes happens, so that's good to know. Was there a *single* BIM model that you guys used for coordination? Like, you mentioned the engineer and the architects had one. Was that *the* BIM model that then everyone else worked off of?

Interviewee C 1.1: I never saw a BIM model. That doesn't mean that it was [sic.] used like early on for any clash detection with [General Contractor] and the other trade partners got to use it. Yeah. It could have been used early on, but also it also could've just been used by the engineers as well.

Interviewer: And your Bluebeam Studio session, that was *just* for [General Contractor] employees?

Interviewee C 1.1: Nope. We used… We sent it out to all of the subcontractors, trade partners, engineers, everybody involved in the project.

Interviewer: It's very handy to know that everyone is (at least theoretically) has the opportunity to be looking at the same pieces of paper.

Interviewee C 1.1: Yes. Hospital had…had it. Hospital architect. Everybody like that. Also had it.

Interviewer: Let's see… It says "who owned the BIM model?" You said you didn't even *see* the BIM model, so you probably did not…would not know that.

Interviewee C 1.1: Yeah.

Interviewer: And then "did all parties have equal privileges to the BIM model?" You said you've never *seen* it, so…

Interviewee C 1.1: Yeah, I never saw it, so…

Interviewer: They may have equal privileges, we don't know. "Was there anyone for whom BIM was new?" You said you didn't even use BIM, so you probably wouldn't know. Unless, I mean… Unless you were like talking to a trade partner and they were like, "oh my gosh, I've never used BIM before!"

Interviewee C 1.1: Yeah. I mean, I've used it… I've used it before, but… I mean, it's a… It *could've* been new to someone else, so…

Interviewer: Let's see… A lot of these you may not be able to have answers really. Were there any, like, collaborative visualization tools? Again, I know you mentioned that your sort-of-IPD-coach had already left, but do you know if there were things like (I don't know), "dashboards" or stuff like that that was up in a common area?

Interviewee C 1.1: I don't *think* so. At least, when [they] transitioned out, [they] didn't share any of it, so I don't think there was.

Interviewer: Okay, so it's not like you were visually tracking Key Performance Indicators or something in like a common area.

Interviewee C 1.1: Yeah, I don't think so…

Interviewer: Though you did mention, I guess, regularly there was the reward mechanism that would get updated based on whether or not you had achieved certain milestones, so…

Interviewee C 1.1: Yeah. I don't think it was regularly updated besides at the end of the project we determined if we hit it or not.

Interviewer: Oh, okay.

Interviewee C 1.1: Yeah.

Interviewer: And now, we'll just go "off script" for a little bit, but you mentioned that you've worked in other both Design Build sort of projects and then also Design Bid Build projects, and now this IPD-specific project… What do you think (and this your opinion, that's why we're doing this. It's terrific. I love it.) What do you think is maybe something that… Because you can compare your experiences between all of these things, like… What do you think may be preventing people from adopting this kind of delivery method on other projects?

Interviewee C 1.1: I *think* maybe almost the *risk* involved in a way - especially the trade partners.

I feel like with this project there was more risk involved with the trade partners versus like Design Bid Build or Design Build that I'm on right now a lot of the trade partners are just contracted under [General Contractor] and they don't hold as much risk in the project. Like, [Case 1 project name], our electrician held a lot of the risk in this project. And so, a lot of the driving factor in the project was in our electrical sub and still kind of is with a couple of the changes left, so…

Interviewer: And so, you mentioned risk. What do you mean by that more specifically?

Interviewee C 1.1: I guess I'm kind of thinking more so… I don't know. Just like more *tied* to the project I would say as far as they're directed with the owner and not as far as with the contractor. If that makes sense.

Interviewer: Yeah.

Interviewee C 1.1: In a way.

Interviewer: So, you think that it maybe is just trade partners' reluctance to adopt this increased risk for what maybe they don't see as being a worthwhile benefit?

Interviewee C 1.1: Yeah. In a way.

Interviewer: So, I mean, from your sort of project engineering perspective, do you have a preference toward different delivery methods or…?

Interviewee C 1.1: I guess not really. This one was *interesting* because I felt like IPD got a little bit lost in the middle of the project just 'cause a lot of turnover happened or the trade partners kind of lost that sense of holding their own because they felt like they were more… They should've felt more under [General Contractor] holding them accountable versus holding theirselves accountable. Things like that. They should have… They felt like they wanted to be managed more by [General Contractor] instead of managing them theirselves. Which I guess in a normal project we *like* to manage subcontractors and help the project be successful in that way. Yeah, but..

Interviewer: So there's almost like this element of individual accountability?

Interviewee C 1.1: Yeah. There was that. In that way that was kind of part of IPD that's more unique with our trade partners. They're under their own accountability versus Design Bid Build where they're all, or… They're all contracted under us.

Interviewer: I guess in a way it's sort of…

Interviewee C 1.1: …So, that was kind of lost.

Interviewer: Yeah, it's like a mental shift, right? Because, I mean…

Interviewee C 1.1: Yup.

Interviewer: …You go from a lifetime of "well, the general contractor told me to do this" or "the general contractor is pushing work to me" to "Oh, I have to problem solve some of these things, like *I have* to do this."

Interviewee C 1.1: Yeah. Yeah.

Interviewer: And especially…

Interviewee C 1.1: And I think…

Interviewer: Oh, go ahead.

Interviewee C 1.1: And I think that was just 'cause the project was so *long* and they kept adding changes. And things like that. So, it was a challenge, but… Yeah.

Interviewer: And again, the project was just essentially redoing the interior of those six floors of the children's hospital?

Interviewee C 1.1: Yeah, it was redoing *three* floors, but we had to phase it out into six phases to keep each floor operating still.

Interviewer: Three floors, six phases.

Interviewee C 1.1: Yeah.

Interviewer: Okay. And this was, I guess, all sort of during peak Covid too?

Interviewee C 1.1: Yeah. Yup.

Interviewer: That's sounds *exciting.*

Interviewee C 1.1: Yeah.

Interviewer: Would you say that there was any sort of day-to-day difference for you versus being on like a Design Bid Build or a Design Build project?

Interviewee C 1.1: I don't *think* so besides the…like RFI process. Like in a normal project you get a question and you either figure out an answer and discuss it with the team as far as the architect, owner, sending the confirming RFI…questions like that. Or, you just send them the question and formally document it like that as an RFI. Or… Versus this project and essentially an RFI was you emailed the architect, you emailed the owner and you get an answer like that or it was just solved in the field. If it was like a change that *had* to be documented, it was a VAP. And we would price it out and then it could be a week, two weeks, maybe a month to get pricing formally approved. Maybe even longer. Some changes have been (some big changes) have been

longer ‘cause our owner had to get pricing approved through the hospital. Stuff like that.

Interviewer: And would you say, on the whole, that the RFI process was longer or shorter than you’re used to?

Interviewee C 1.1: I would say that depends on the project and the architect. So far I’ve experienced the RFI process to be really long and I’ve had a school project be really short and then I’ve had a school project be really long, longer than the week that we typically give them as far as the RFI process. Typically like an easy request here [current project] or a simple question in the field could we could get an easy answer back within a few hours…

Interviewer: Oh wow, yeah.

Interviewee C 1.1: Essentially the IPD process there’s no RFIs and we get answers back within a day and it’s a simple documentation like I wouldn’t have to document it on Bluebeam and everybody could see the change. Or if it’s a VAP, then we go through a formal cost. I would say the cost of changes are more simpler in IPD project delivery than it would be in a Design Bid. That I’ve experienced.

Interviewer: Okay. And then… I’m just trying to, like, think through my own ideas here. And like what you might be doing in a day. But this didn’t… Being in an IPD project, specifically, didn’t change sort of your daily tasks of essentially like dealing with trade partners, right? Like, did you have like, morning huddles with them or like pull planning sessions once a week or something like that?

Interviewee C 1.1: Yeah, so we still had our morning huddle and morning stretch-and-flex plan of the day. And then we had weekly… When I first came on the project, we had twice a week did a pull planning scheduling meetings. We made the first meeting more of a pull plan type of scheduling meeting and then the second scheduling meeting we made more of like a check-in, hour long, check-in slash “this is where we came at in our pull plan, are we following along, and then do we need to make changes?”

Interviewer: And was that… Did you guys have an office just on one of the floors there? Or did you have a jobsite trailer where people met?

Interviewee C 1.1: Yeah, they were… They gave us a little office on one of their floors that were more offices versus patient rooms. So, I think the first floor of their building (I guess to give you a reference) was kind of offices and a couple patient [indistinguishable] areas, maybe a couple gyms. And then the second floor… (Let’s see, what was the second..?) I can’t even remember what the second floor is - I think it was still offices. The third floor was eating disorders. The third floor was… Yeah, the third floor was eating disorders. The fourth floor was offices slash in-patient, er, *out*-patient services and counseling services. The fifth floor was an [indistinguishable] which is high-acuity patients that more so have the padded rooms … or locked in their rooms almost every day, in-patient units. Sometimes parents will come and visit but they come and visit for an hour a day things like that. And then the sixth floor was a little bit *less* high-acuity, but they still had high-acuity patients that would stay in there and the main

renovated, those bedrooms, they had where parents could come and stay and learn how to be with their kids day-to-day.

Interviewer: So, you've mentioned sort these like high-acuity patient areas and like some of their specific requirements and like *unique* requirements, did you guys… Was there anything unique in the procurement of *those particular* like interior buildouts or was that all on [drywall/framing trade partner]? Was there like another third-party trade partner who did like *just* room padding or something?

Interviewee C 1.1: As far as like, we didn't *add* them as a "trade partner," but I mean we had subcontractors to do (that were contracted under [General Contractor]) to do like all the millwork, the fire suppression, the flooring, glazing, wall padding, the P2 stations for their medicine, the window shades. We had [specialty subcontractor] bring in like wall padding, bathroom fixtures, specialties like that.

Interviewer: So, the same people who would do like, bathroom demisement maybe, were doing like these wall specialties.

Interviewee C 1.1: Yes, yeah. The same people who did wall padding were able to provide corner guards and the bathroom fixtures as in grab bars and toilet paper dispensers.

Interviewer: Very cool. I guess I'll just circle back kind of to the risk-reward/profit-sharing thing really fast before we conclude here. You said this was something that was reconciled at the end. Providing that all of the milestones were met and like everyone got their (you know) profit-sharing reward thing, do you know how that was distributed? I mean, by the time it comes to you, like, a senior project engineer, are you getting any direct bonus to this, or is this something that like [General Contractor] is distributing across the company? Do you know how that works?

Interviewee C 1.1: I'm pretty sure that… I mean, there's no direct bonus to me.

Interviewer: Yeah.

Interviewee C 1.1: Or to [Interviewee C 1.2], or to our superintendents who were involved in the project. It'll just be… goes back into the project success and to the company.

Interviewer: And then this is, again, this is *my* ignorance, is [General Contractor] like employee owned?

Interviewee C 1.1: So, we just… Let's see (a year ago, maybe *less* than a year?) we sold to [construction company], which they are countrywide, and they are (I believe) employee owned. So, I guess we're in their…become their family of companies now. So, I guess, in a way, yes. So, we're going through kind of some changes.

Interviewer: Yeah. I just know that there are several like larger national general contractors who are employee owned and then like, whether you get some kind of direct or synthetic share (something to that effect) where all this is to say (kind of like you were mentioning): "[N]o, I do

not get compensated for this project specifically" but rather…

Interviewee C 1.1: Yeah. No. No, I do not.

Interviewer: …It's like a, you know. At the end of the year, they do all the math and do all the pluses and minuses and then divide that by everyone across the company versus project-to-project sort of thing.

Interviewee C 1.1: Yeah. So at the end of the year, if the company does well, then we'll go through a company, year-end everybody will get the bonus in the company. Versus "if your project did well, then you get this percent of the bonus" they don't do that – everybody will get the same percentage of bonus for the year.

Interviewer: Okay. Cool cool cool. Yeah, that kind of definitely makes a lot of sense and *feels* a lot better when it comes to things like that.

Interviewee C 1.1: Yeah.

Interviewer: So, I think we've hit everything. I know you said that it was okay if I followed up with you later.

End

Appendix C: Transcript of Interview C 1.2

The date of this interview was February 22, 2023. The venue of the interview was over an online Zoom meeting. The interview started at 8:00 AM CST. Interviewee C 1.2 is a Project Manager for the General Contractor who worked on an IPD project located in a Mountain West state of the Western United States. Interviewee C 1.2 has worked in the AEC industry for almost ten years and had some familiarity with the Design Build method (but not *IPD) prior to working on the project at the focus of Case Study 1. This was this interviewee's first IPD project.*

Interviewer: So I would like to (if it's alright with you) begin by going over the specifics of the project and this is mostly for my edification because… Talking about logins not working, I received the link for the Bluebeam, like the studio, and for whatever reason, I can't get into it. So I haven't had an opportunity to look through the any of the contract documents and really familiarize myself with this other than, like, I know that it was a like a re-, a renovation of three floors in a hospital section. Like a pediatric ward maybe. And…

Interviewee C 1.2: Yeah.

Interviewer: …That you guys had some pretty complex MEP on that. And that was *maybe* about the extent of what I really *know* about this project.

Interviewee C 1.2: Gotcha. So, it's actually… It was called PMHI which is Pediatric Mental Health Institute. So it's a behavioral health suite essentially and yeah it was spread out on the third, fifth, and sixth floors in various states. So, it wasn't like… I think the third floor was the entire floor. The fifth floor was a good portion. And then the sixth floor was only about a quarter to a half of the floor.

Interviewer: And what is that total square footage?

Interviewee C 1.2: Shoot. I wanna say it was about 17,000 but I may have to double check that one.

Interviewer: And what was your, like, completed contract value on this?

Interviewee C 1.2: So, give me one sec. I'm pulling up our budget tracker here.

Interviewer: So, our… (oh, weird, it says that I can sign in now). Our total (which on is it… target cost..) total contract value at completion looks like it was $19,608,839 (is that right?).

Interviewee C 1.2: This is very relevant to me because we did our ASC Region Five, like, student competition this last weekend.

Interviewer: Oh nice.

Interviewee C 1.2: And we had to do an adaptive reuse of like an anchor store in a mall into, essentially, like a behavioral health medical center.

Interviewer: Interesting.

Interviewee C 1.2: They gave us like a twelve-million-dollar budget, and it was like a 188,000-square-foot floor plate, or like ninety on each floor.

Interviewer: Yeah.

Interviewee C 1.2: And so the trick was like figuring out that right balance between like how many square feet and how much do you wall off permanently or at least temporarily. And I was thinking about *this* job specifically with [General Contractor], I was like "man, I really wish I had interviewed more people and I would have like something really good to say for this contest" 'cause I knew that you guys probably had some creative ways that you approached this. But, I was just like "yeah, we're gonna use Takt Planning, hope that's right."

Interviewer: Yeah. That's a pretty big square footage. Let me check here. So I actually lied: I was way off on the square footage for us. It was 49,400 is what we have on our tracker.

Interviewee C 1.2: Oh, okay.

Interviewer: So that gets you a little bit more in line. But yeah, that cost that you just said is pretty low considering that there's no infrastructure in place.

Interviewee C 1.2: Yeah, we had essentially just a cold shell, and they were like "okay, go put guts inside of it" and it was like "alright, let's do it."

Interviewer: Yeah.

Interviewee C 1.2: How many months did you guys do this in? Or I guess…

Interviewer: So, this was about two…two years.

Interviewee C 1.2: Okay.

Interviewer: And then your..your owner, is…is that [state name]? Or, did you have a private owner? I'm not sure how hospitals work out there.

Interviewee C 1.2: No, so it's… Most of them are private. It was actually [owner] is the owner.

Interviewer: Okay.

Interviewee C 1.2: You deal with the state in terms of inspections. So, I don't know how much you know about like the…the healthcare side of construction, but… So typically, you have Joint Commission. Kind of going big to small, right. You've Joint Commission that oversees all of the hospitals in the country. And they act as sort of a third party agent that comes through and basically does inspections to keep up the accreditation of the hospitals. And it could be (you

know) kind of unrelated to construction, but at the same time they do, like, if they come into the hospital to do a Joint Commission inspection, and there happens to be a big project going on, they may go and tour the project. Or they may just kind of see how that project effects patient care. But essentially Joint Commission is certifying that the hospital is ready to see patients. So, they'll follow like a patient around throughout the day and just see what their interaction is with the hospital and if any infractions come up. So, in a behavioral health setting, what they're looking for is things like: are there any ligature points, are there any pieces of material or equipment that aren't actually tested and certified to be in behavioral health settings? You know, if there's construction going on, is the construction temporary protection or temporary barrier *built* to standards that withstand a behavioral health suite? And then they look… A lot of times they'll look at stuff like air changes and (you know) capacities and different things like that. So they interact a little bit.

But then when you go down from there, you have your state department of health. Which is pretty typical for most states. And that's where you start to actually get into state inspections of the actual suite. So, they *would* come in and specifically inspect the construction portion of the project before you're signed off to start seeing patients. And then, moving more granular. Obviously, you have your local inspector, that in this case would be [municipal building department], and then you may even have a third party inspector depending on if the hospital wants to or not. So the state *own* any of the stuff, but it… You know, all of healthcare is heavily regulated between state, federal inspection agencies.

Interviewer: Yeah. So, I guess that kind of begs a question for me is like, what is the process of coordinating all of that? Like…

Interviewee C 1.2: It really depends. It depends a lot…

Interviewer: You know what I mean?

Interviewee C 1.2: Yeah. It depends a lot on where you are and the team and how you set that process up. So, it's something that you typically would set up up front. So usually, once the drawings are completed, the architect or the design team will submit for the regional and state permit. And then usually what'll happen is when their review is completed, the general contractor will pay for-and actually pick up-the regional and state permits. The state permit tends to vary a little bit more. Sometimes the architect just sees it all the way through and then they just hand us the permit card. But then the general contractor is in charge of actually doing the inspections for both regional and state. So, regardless of who pays for it, we end up becoming responsible as the owner's agent to complete those inspections throughout the project. Now, Joint Commission is separate. Back home in Pennsylvania when I was there, that process worked even a little bit differently and they would have sort of like a nursing licensing board come in before they could start seeing patients. I'm blanking on what they called that. I haven't seen that here yet, but that doesn't mean it doesn't exist in the state of [state]. So, it does kind of depend on the team that's in place, what you agree on upfront, whose responsibility is what, and then the actual location that you're in state…state wise.

Interviewer: And so, with this project… I mean, you mentioned being in Pennsylvania before. I

think we've talked about this previously… This is your first, like, *IPD* project, right?

Interviewee C 1.2: Correct.

Interviewer: And so, what other contracting styles had you used prior to this?

Interviewee C 1.2: We do some CM/GC, CM at Risk. We've done some Design Build. So, kind of the gambit. Usually, the contract is gonna be GMP in a healthcare setting. Kind of lump sum has been phased out over the years. Not that you won't see it, but a lot of the bigger hospital systems tend to stick to GMP-style contracts. So yeah, we've kind of done everything. IPD is just still, in…in my world, (being in special projects, doing smaller projects) it's still a newer process, and it hasn't quite trickled down yet. We haven't seen the… I guess the *positives* of it in our world where we do smaller projects like $10 million and under typically.

Interviewer: So, in a way, is special projects kind of like "incubating" the use of IPD or something with like these essentially lower risk sort of projects?

Interviewee C 1.2: This was a… This project *specifically* was an outlier for us since it was about $20 million dollars. We usually wouldn't do a project of this magnitude. It was because of the specific *team* that was selected, the specific *client* that was selected. At the time when we got the project, we had a project manager on board that was a quote unquote "IPD Specialist." So that's how we decided to pitch the team that we did being our special projects team. Normally, twenty million would go to our bigger construction company side.

Interviewer: And so, who was… You mentioned, kind of this like, I guess, constellation of different team members, but who was the driving force behind being like, "this *has* to be IPD" and not like CM/GC or GMP or something?

Interviewee C 1.2: That's usually the owner.

Interviewer: Okay, and that was the same here? It was like, [owner]?

Interviewee C 1.2: Yup.

Interviewer: Had they done other IPD projects before, or was this like their first one?

Interviewee C 1.2: No, I think they've done it before.

Interviewer: Okay, but it was maybe the first one with you guys?

Interviewee C 1.2: As far as *I* know, this was the first one we've done with them. At least, at least like our group, specifically special projects.

Interviewer: Okay. Have you guys… By you guys I'm saying has [General Contractor] done other stuff with [owner] before like had you developed a relationship?

Interviewee C 1.2: Yeah. [General Contractor] has a pretty long and good relationship with [owner]. And then [General Contractor] as a whole has done other IPD projects outside of [project] in the past as well. The whole group wasn't brand new to it, but our special projects team (like the project managers, the superintendents, kind of everybody who was boots-on-the-ground) pretty much was all brand new to it.

Interviewer: And so, did you come into the project from the *very* beginning? I know you mentioned there was another project manager originally. So like, lifecycle of the project wise, were you there start to finish or did you show up kind of in the middle?

Interviewee C 1.2: So, I actually ended up showing up probably like three quarters of the way though. We had… We actually went through two project managers prior to me. The first one, like I mentioned, was sort of a…an IPD expert and that's how [they] got on the project. [They] were there for about a year. [They] left the company, so a new project manager was put in place. [They] were there for about (I wanna say) six months. [They] decided to leave the company, and then that's when I was put in place to take over the project to try and see it through the end. So, I was there for probably about the last six months or so.

Interviewer: And, when they sold this to you, like what was kind of your understanding of IPD and collaborative delivery like before having ever done this?

Interviewee C 1.2: I'll put it this way: theoretically. I'd heard about it; I'd learned about it; I learned about it in school. You know, you kind of…you hear about it in passing. Theoretically I kind of had a grasp on it, but seeing it put in practice was a lot different. I think, I think if you're not versed in IPD, you assume that it's sort of like (you know) a theoretical practice. When you go to these jobsites, yeah, maybe people act a little differently-they have different contractual obligations. But in practice, there were a lot of tools that were IPD-specific that I had no clue about. So, it was sort of a learning experience for me to get thrown into it. Especially with everything already being established.

Interviewer: What are some of those (kind of) tools you were talking about?

Interviewee C 1.2: So… That was something that I was… I still can't get on here, but I wanted to show you this. So, we have a Teams environment created specifically for the project. And the Teams environment kind of contains a lot of different things: it gives us somewhere to chat, it gives us somewhere to save files. Every…every month I put my invoices in here and the owner can just pop in and download them. We put all of our (you know) financial change orders, all of our contracts are loaded up in here. So, this is something that [Designer] who's the architect owns. But as a team, we use this tool *mainly* to track our budget and our change orders or what we call "VAPs." We can go into that a little bit more. But it has like our fee calcs. It has a lot of information and it's a collaborative tool so that every partner on an IPD project can actually pop in here and make edits or view and just kind of stay involved. And then on a weekly basis, we would get together in what we called a Big Room. So it was basically an OAC meeting which is your typical Owner-Architect-Contractor meeting that you'd have on any project. We called them Big Rooms, and it was more of an informal version of an OAC meeting. So, like every… I think it was every Thursday we'd get together for like an hour and we'd go through a pretty

loose agenda: design updates, owner updates, contractor updates, schedule updates, if there's any upcoming MOPs, any hospital impacts, and then we'd go through our budgets. And then for our budgets, we'd pull up this Teams environment, and we'd be able to go through new change orders for the week, (you know) what our contingency's tracking as, how we're tracking to our target value. And then, as a group, if there was any change orders or what we called "VAPs," we would have to go in as a group and agree that we're either approving it or rejecting it and it's either coming out of our budget or it's coming as an owner change order and the owner would also have to agree before we tried to submit that change order.

Interviewer: Okay and so who all was at this quasi-OAC meeting or this Big Room meeting? 'Cause you've mentioned like you and the architect and the owner are obviously. But…

Interviewee C 1.2: So, it's all of the partners. So, the team is a team of partners. It's not just like the architect, the owner, and the contractor. And that… that's what really starts to create the IPD environment, right? You're not… It's not just an owner that's contracted with a contractor and an owner that's contracted to an architect and then the contractor subs out all of the trades. It's actually an owner that's contracted to several parties that are all on the same… It's almost… In reality, we have a single contract, right? I think you may have seen that. So, it's the owner that's contracted with a group of people that all have a symbiotic relationship with each other in the same contract. So, our team was: [General Contractor], the general contractor; [electrical trade partner]; [mechanical trade partner]; [interiors trade partner (Represented by Interviewee TP 1.1)] which is an interiors company (so they'll do anything… they'll do framing, painting, ceilings, drywall-pretty much anything that has to do with walls and ceilings and finishing). Sorry. [General Contractor], [electrical trade partner], [mechanical trade partner], [Interiors trade partner], and then the design team. So, [engineer] was the engineer and [Designer] was the architect. So, that is our (including the owner) that is our partner team. So, every one of those companies I mentioned are all contractually obligated to each other and to the owner via the main contract on the project. And they all have a stake in shared…shared profits, the contingency pool, warranty pool, (you know) participating in these meetings, approving change orders, everything like that.

Interviewer: So, in your just personal opinion, like how did these kinds of meetings compare to other maybe OAC meetings and stuff you've had in or life or other subcontractor meetings?

Interviewee C 1.2: You know, from a general contractor standpoint, it's a little more difficult to maintain control, right? We're used to always being the ones that run the meetings and sort of run the project in general. We tend to keep control of the schedule, we tend to keep control of the budget. Even from an owner's perspective, we don't like to give up that…that control. So, the hard part for me coming into this was learning to not try to control everything, but at the same time, being the general contractor out of the group, the owner expected us to help run the meetings, and help maintain an schedule. So, it was kind of a weird relationship for a general contractor because you're expected to still do everything that you would do, but you don't have the control to be able to go to, say, your drywaller and say "hey, you're behind schedule, we're putting you on notice, and if you don't perform, then we're gonna supplement you with another contractor or we're gonna terminate your contract," right? 'Cause we don't have that power in this situation.

Interviewer: Yeah.

Interviewee C 1.2: But in like an OAC meeting, we were still expected to sort of be the ones who are running the agenda. But if someone wanted to go off on a tangent, we don't really… We'd just say "hey man, let's focus on what we're talking about." But at the end of the day, we're all there and we're all equal, so it makes it a little bit harder to sort of, flex the general "contractor muscles" for lack of a better term, you know.

Interviewer: Did it *feel* to you like camaraderie, or did it feel maybe unusual? I mean, I know you…

Interviewee C 1.2: No.

Interviewer: …would maybe call it unusual in general, but I mean, I don't know… I don't wanna invite *too* many adjectives in here and like maybe [indistinguishable] your perception, but like on the spectrum of like "purely harmonious" to "antagonistic" like what's kind of your take on being in these meetings? Like the way that they were…

Interviewee C 1.2: No, they're… they're very much… they're very much towards that harmonious side.

Interviewer: Okay.

Interviewee C 1.2: I'd say the benefit of a project like this on the other spectrum (you know) thinking about cost, these aren't low-bid partners, right? You're not like hard bidding this out. You're not putting it out in the street and then taking the lowest bidder that comes back and then saying "okay, we're gonna partner up now!" The way that the owner went about this, I believe, is they first decided on a design team, the design team and the owner interviewed… Well, the owner interviewed design teams, they decided on a design team based on experience. The owner and the design team then interviewed general contractors, and they decided on a general contractor based on experience and relationship. And then that team of three (the owner, architect, and general contractor) interviewed the rest of the team and selected the rest of the team. So, it's not… It wasn't based on cost and value, right? It was based on a relationship and experience of who do we think is gonna be a best fit for the team and the project itself.

Interviewer: Yeah.

Interviewee C 1.2: So, I think *that* makes a huge difference in what you're asking about. If… If I was to tell you that this was a hard-bid scenario, and we got Joe Schmoe Electric, (you know) from out of town, just because they were the low bidder, it probably would have been a much different environment to work in which I don't think *any* IPD project is doing. And if there is one that has done that, it doesn't really make any sense.

Interviewer: Yeah, it kind of seems like if you guys had done low-bid approach to this it would have been maybe one and a half times as long and $25 million dollars.

Interviewee C 1.2: Yeah.

Interviewer: It would've been the "low bid." So… I can just imagine… Especially like trying to get all these MEP, like medical gas, and different wall demisements and things like that, I mean… Yeah, I can just see the kind of spaghetti of nightmares that would happen from that.

Interviewee C 1.2: Yup.

Interviewer: So, you mentioned these meetings and you kind of talked about like approving change orders and stuff. Did you guys have an official process for proceeding with like changes or conflict resolution, or was that just one of those like "we've got a conflict, we're gonna go to the Thursday meeting and figure it out"?

Interviewee C 1.2: So, we called them VAPs. I kind of mentioned that. So… I gotta be honest: I've been asking people ever since I started and no one knows what the Hell it stands for…

Interviewer: Oh, okay. That's cool because [Interviewee A] was like "yeah, we call them 'VAPs.' I know it stands for something" and I was like "okay, well, I'm sure [Interviewee C 1.2 1.2] or somebody will know" and so then…

Interviewee C 1.2: No! It's the… It's the weirdest thing. And that's… I'd say that was one of the tricky parts about this IPD process is there was a lot of turnover throughout the project, at least on the general contractor side. But there was, (I mean) at the same time, a lot of the other partners were the same people throughout the entire project, and a lot of those people when I asked questions like that that you'd think are very simple, didn't know the answers. So, I at one point literally just said "hey, I'm gonna be the guy that raises his hand because I don't…I'm new and I don't really know what's that?" And nobody knew the answer and they'd all been on the project for a year and a half plus. So, it was kind of funny. I think what we got down to is it's something like "Value Added…" I can't remember what the P was. It was like "Value Added…Planning?" It was something like that. "Value Added Planning," "Value Added Planner." Something… Essentially the goal is not to… It's… It's a spreadsheet that we maintain, same thing on that Teams environment. And when we maintain that, it's not meant to be a change order log, it's meant to be essentially like a decision and discussion forum, right? So, the owner says "hey guys, it looks like we might have missed something in the design, this is what I want, let's create a new VAP." So we'd create VAP 005, the next meeting on Thursday when we meet we'd go through and discuss the particulars about that VAP. So we'd say "okay, what is the general description about it, what is our thought on if it is within our target cost or if it's an owner change order, and then what do we need for pricing?" And then we'd go through and we'd highlight every contractor that we thought that we needed pricing from. And then the following week we'd come back and then at that point, hopefully, each team has been able to put their pricing in. We kind of have like a rollup section where it shows the total and then we could go through and say "okay we still agree, this is within our target cost, that means it comes out of contingency, or out of our overall project budget" which is essentially our profit if we don't have contingency, right? And then, at that point, each partner votes, if everyone… If it gets approved by everybody, we mark it approved, and then it goes into sort of a waiting pool. And about once

a month, [Interviewee A] and I would sit down… Again, being sort of the general contractor, we managed the…the contractual changes, even though everyone else had to sign off on them. So, we would kind of track a pool of approved VAPs, and then at the end of the month we'd have two change orders: one for the owner, if there was any owner-approved VAPs, and then one for the internal team if there was any within-target-budget VAPs.

Interviewer: So, that was kind of the change order process. Did you guys have, I mean I know you were only there for kind of the back end of it, but were there any like conflicts that required dispute resolution or anything like that?

Interviewee C 1.2: No. I mean, not in a legal sense. That was really our forum to discuss and go through misses and changes and issues and mostly cost-related, but that's… In this world everything is cost-related. We didn't have any conflicts that took us to the degree of having to like get a third party mitigator or anything in like that, you know.

Interviewer: Okay. Let's see. Did you guys have to have liability waivers between one another inside of the core team? Is that like a part of the contract?

Interviewee C 1.2: Liability waivers… I don't… I don't *think* so. You know, our contracts include liability insurance definitely. So, I don't know that we had like specifically waivers, but yeah, the contract was pretty lengthy…

Interviewer: Oh, really?

Interviewee C 1.2: Yeah, (I mean) it was a pretty… Might be able to pull it up.

Interviewer: 'Cause a lot of the research I've done and things I've seen, it tends in the other direction where you have like the Integrated Form of Agreement ends up being like 15 or 16 pages versus like 50 or 100 which is maybe more typical.

Interviewee C 1.2: Yeah. Here, I actually got my computer to work, finally. I got on with my personal Google account. So, I can start to actually share some things on my screen.

Interviewer: Very cool.

Interviewee C 1.2: Ope, actually it says that you have screen sharing disabled.

Interviewer: Let me see how I can fix that.

Interviewee C 1.2: There we are. Arlight. Let me pull up… [Indistinguishable Muttering]

Interviewer: Did that *change* anything?

Interviewee C 1.2: Let me try. Yup. Share screen two. Can you see my screen now?

Interviewer: Yeah.

Interviewee C 1.2: So… [Indistinguishable Muttering] Contracts… So, here's like all of our attachments. You can see how crazy it is just poppin' in the folder. And this looks like it's the executed contract.

Interviewer: So, this is a modified AIA?

Interviewee C 1.2: Yeah. So, our contract was 212 pages. And it was an AIA-C191. So, it was basically… It was… It was made for IPD, so it's a multi-party agreement for IPD. And like I said, this ties us with a group of people. So, it's the owner, the general contractor, the architect, the engineer, and then those couple of contractor parties that we added in as well. So, yeah, like I said, specifically like liability waivers, we didn't sign anything like *that*, but this contract does cover liability insurance, disputes, the whole bit.

Interviewer: Okay. Did you guys have to have bonding for this?

Interviewee C 1.2: That's a good question. I saw that on your list and I wasn't sure. I don't know that we did get bonded. I know that [General Contractor] didn't get bonded for this.

Interviewer: Okay.

Interviewee C 1.2: I don't know that anybody did on the pro… On like the *core team* that I know of.

Interviewer: Okay.

Interviewee C 1.2: Only because I usually have to fill out that paperwork, even if it's like one of our subcontractors. I have to fill out the paperwork for them every month saying they're on track and this is how much money they've put in place and that kind of stuff and I didn't do any of that for anybody. Or for ourselves, so I don't think that anyone was bonded on this project.

Interviewer: And did you guys have like sub default insurance?

Interviewee C 1.2: We *didn't*, only because that would only go down to our subcontractors and I don't believe anyone had a large enough contract and was a high enough risk that we really felt that it was necessary. And like… So, most of the trade partners held the biggest contracts, right? Mechanical, electrical, plumbing, med gas… All that was tied in with our electrician, our plumber, our finisher. They held the largest portions of the contracts, including us. So, none of them would qualify for subcontractor default insurance because they are a partner in the project, not a sub. So, probably, if those guys were all under us as subcontractors in a typical… in a typical method. Then, we would probably have either bonded or gotten SDI insurance on one or mo… multiple of them. And then…

Interviewer: And to your…

Interviewee C 1.2: And then here…

Interviewer: Go ahead.

Interviewee C 1.2: Nope. No, you're good. Go ahead.

Interviewer: To your knowledge, did you have any like weird insurance issues? Like, was your regular builder's insurance provider or anyone in that realm sort of like "oh, IPD I don't know if we want to insure that, or I don't know if we want to underwrite that"?

Interviewee C 1.2: No. No, I hadn't… At least not that I heard of.

Interviewer: Okay.

Interviewee C 1.2: It was our typical insurance provider. Everybody sort of just had their own insurance that they had to carry so… I didn't hear of any issues. Maybe I came on too late in the project though. So, just real quick. So, catch up on a couple of these visuals. So, this is like our…this is our Teams page, right? So, you can see there's that [Designer]. I'm gonna kind of skim through some of this. I don't know how much detail I can show you or not. You can see kind of like our files here we have our different Teams environments so, on the left is our project, and then you can kind of go through and… go through different teams. So, what that just means is (you know) if we had a pro…a specific meeting and a logistics plan for (you know) an MOP that has to do with shutting down an air handler so that we can tie in, we'd probably put that in to the MEP team, and they'd have a separate break off meeting where they could review that kind of stuff. But our *main* folder was our PMT team. This was basically just our Project Management Team and this has all of our tracking information in it. And then this file that I had up there at the beginning… It's just…It's just a basic kind of Teams Excel sheet, but it has all of our tabs at the bottom to be able to track different things regarding our budget. So, we kind of had our budget summary… It's acting a little slow, but…

Interviewer: So, with these items on the Teams drive, is this all like… Does everyone have read and write permission, or how does this work?

Interviewee C 1.2: Anybody who's a partner *does*.

Interviewer: Okay.

Interviewee C 1.2: Which can or cannot get a little…annoying. But for the most part everyone was okay. So, I can't get the budget summary to load, but this is the VAP log that I was talking about. So, basically we'd come in every week and we'd review anything that's new or open and then this was our way of tracking changes, right? So, instead of having like a change order log that the GC tracks and then the owner and the GC go back and forth and argue with each other, this was reviewed by the entire team every week, and the entire team had to agree whether or not it qualified or not, and then how we were paying for it. And then the one thing to keep in mind is because it's all shared-It's all profit sharing-some of these decisions end up impacting everybody negatively or everybody positively. So, if for instance, [General Contractor] missed 10,000 square feet of a specific type of flooring, we'd bring it up in this meeting, we'd write it in here,

and then the whole team would have to say (you know) "hey, this sucks, explain yourself." But at the end of the day, if we want it, we need to pay for it. We'd have to accept that it's coming out of our target cost which is either contingency or profit, and then we'd have to approve it as a team and move forward. There were quite a few instances where one specific partner made a mistake and it could have been significant and the rest of the team suffered from it. So, it just held accountability for everybody to stay involved and on top of each other.

Interviewer: And is that what those two numbers at the top are? The 1.3 and 2.7?

Interviewee C 1.2: I have no idea what that is.

Interviewer: Oh, okay.

Interviewee C 1.2: Yeah. You'll see a lot of… Because this sheet had existed for two years or two-plus years, and so many different people have touched it, there's a lot of weird stuff on the fringe everywhere on all of these different sheets.

Interviewer: It's like little scratches in the margins.

Interviewee C 1.2: Yeah, like you just like don't know who wrote it or why and what it means, so we just keep kind of pushing along and we leave it there just in case it's important.

Interviewer: You mentioned MOPs a couple of times, what is that?

Interviewee C 1.2: MOPs would be Methods of Procedure. So, that's basically if you had to do some sort of an… Like an impact event on a facility.

Interviewer: A facility impact report?

Interviewee C 1.2: Yeah, you'd sign up an MOP. A lot of times our subs will do it or whoever's actually doing the work. And it would basically just outline date, time, what's the activity, what's the impact, what's the miti… like what are the risks, and what are the mitigation tactics that we're taking.

Interviewer: Did you guys…

Interviewee C 1.2: But…

Interviewer: Oh, go ahead.

Interviewee C 1.2: I was just saying, in a hospital they are v*ery* important and very scrutinized and a huge part of what we do, especially in an active hospital, right.

Interviewer: Did you guys have like regular communication I guess with their like health and safety officer or something who would sign off…

Interviewee C 1.2: Yup.

Interviewer: …on things and yeah…

Interviewee C 1.2: Yeah, so that's even taking it a step further so they… Most hospitals operate on a program called ATG and it's basically like an online… Like an online portal that you can log in to and then you could fill out these ATG permits, and that is where you discuss the impact of the infection control. So, say we're doing a… We're replacing a door in the NICU. We would have to submit an ATG permit, we'd have to outline the actual scope of work, and then we'd have to outline what our infection control parameters are. And that… (you know) we could go very deep into that, but… it's basically kind of a universal system at this point, a class system: class one, two, three, and four. And most hospitals have adapted it. So, if it's a… just kind of going brief overview, right- if it's a class one, you would fill out a series of like question and answer sheets, and they would essentially guide you to which class you fall in. And it depends on scope of work and population. So, you would basically go through and say "okay, we're replacing a door is it dusty, noisy, (you know) what are the chances of particulate getting in the air, what are the chances of particulate getting in the air and *traveling* towards a patient population?" I'm just kind of making these up off the top of my head, but something along those lines. And then the second part of it would be what's the population. So, are you in the parking garage, are you in the NICU, are you in an ICU setting, are you in the emergency department, are you just in an outpatient facility where people are generally healthy, is it like an urgent care? Is it, you know… So, you would answer all of these different questions. You'd identify construction type and population. And then you'd come down to, let's say, a class three. Class three would then give you the parameters you'd have to follow. So, it would say something like you have to have hard barriers in place, you have to have negative air, you have to have fire extinguisher, you have to use a HEPA filter to filter the air inside of the construction site, you might have to have an ante room for your construction barrier. So, you'd have to have a room that you walk in to where you shut the door and then walk into the actual construction space so that you separate the construction from the population from another room. So yeah, like I said, you can get super deep into the infection control side of construction. But they are two separates. We would have MOPs. We would have the ATG permits. And then we would just have like general coordination meetings depending on what the actual scope was too.

Interviewer: And I'm sure that was all made much more exciting doing this during the time of Covid-19, so…

Interviewee C 1.2: Yeah. Covid definitely threw a wrench in everything in healthcare construction.

Interviewer: I noticed on the spreadsheet that you showed us that it had like the term "champion" for like maybe the different team members who were in charge of that particular item.

Interviewee C 1.2: Yeah.

Interviewer: So, were there any relationships between any of these people before this? What was kind of the… 'Cause we mentioned… You said that there was kind of a project manager who

was kind of an IPD expert who started on this thing but then left, were there any other people who kind of like spearheaded this stuff or created that culture or by the time you showed up had everyone done most of their trainings? Or was there continuous training?

Interviewee C 1.2: I'd say most people were… Most people were kind of up to speed by the time I got there. It was a different like… So, we kind of said how I didn't have any experience with IPD going into it. Our company *did*, but not necessarily anyone that was on the project on a daily basis. But like the architect had experience with previous projects and IPD so [they] were already sort of well versed and [they] had…[they] were one of those people we leaned on if we had a question of how is this supposed to work. We leaned on [them] a lot to say "well, the last time I did it, we kind of did *this*." And we would kind of use that as a guide a lot of the times. I don't know the rest of the partners' experience like the MEP guys and the finishers. I don't know that they've done a lot of them, but there also wasn't necessarily a ton of training. I think it's one of those things that like once you establish the parameters for the IPD project, it kind of just blows. It's not… It's not like you need to train people constantly on these spreadsheets and stuff – it's pretty self-explanatory once you have it all set up. It's definitely a… It's a front-end lift. And then you're expected to make up for that front-end work throughout the project by having everyone involved and having all of these things already established.

Interviewer: Yeah. I think that's a good way of putting it. That's a tough sell for people though sometimes.

Interviewee C 1.2: Yeah.

Interviewer: So, again this is kind of very abstract (maybe a little cheesy), but did you notice sort of difference in like the atmosphere or the behavior of people like throughout the jobsite because of this delivery process, or was it one of those things where it like was mostly happening in the office side, and then by the time you got out to the field it was like, the field was the field?

Interviewee C 1.2: I think it was very minimal difference in the field. I would say they operated business as usual. I think the hardest part (going back to what I said in the beginning about control) as the general contractor on the project, you've your superintendents on site, and a lot of the times you tend to control the jobsite and the flow and the schedule. And then in the hospital you tend to control the infection control methods, so having somebody that… It sounds (you know) kind of cynical, but like having someone that is in charge of the group *helps* because you then lead them the way you want them to perform, right? In a scenario like this, IPD sort of takes away your ability to control the group. So, for instance, I don't know if all the people I'm going to mention are correct, but as an example, right? The electrician had a group of guys on site, they weren't wearing their PPE frequently, and we kept getting dinged by the hospital because they'd come walk through and do their checks and they'd notice that (you know) two to three people every day consistently were not wearing their safety glasses and their gloves.

Interviewer: Yeah.

Interviewee C 1.2: As a general contractor, on a *normal* project, we would just throw them off the site.

Interviewer: Yeah.

Interviewee C 1.2: We'd say "hey man, you get one warning. You don't have 'em on next time I see you, you're out of here." Next time I see you don't have them on, we would literally say "alright, you're going home for the day – don't come back." And if their foreman wanted to come and argue with us and fight for that guy, then we may let them come back the next day or after a couple of days, right? But they'll never argue the day of-they get it. They'll always let us kick the guy off. In a scenario like this, you lose that power completely. Because we're not contractually obligated with these partners that they're contracted *under* us, we're all on the same level. So, they're expected to manage *their* people just like we're expected to manage *our* people and if something *does* go wrong (a lot of the times) the heat would still come back onto us as the general contractor, even though we were not contractually obligated to control the rest of the partners, right?

Interviewer: People have that like sense memory of like what general contractors "do," so even though in this instance, you're not able to really do anything about it-you don't have the agency necessarily-people are like "well, that's *your* job. Why aren't you getting on that guy's case?"

Interviewee C 1.2: Yeah.

Interviewer: And you're like "I can only do so much here now."

Interviewee C 1.2: Yeah. Yeah, so that definitely made it difficult from our perspective. I'd be curios to hear what the other guys say, what the other partners say, if they thought it was harder or easier…whatever. But, I think in the general sense, it business as usual. Knowing that everyone was a partner, they tended to care a lot more as long as management maintained that message that "we're all partners." You know, as far as the schedule went and that kind of stuff and produc…productivity, we were right on it. (You know) We turned the project over on time. The crews were productive. The crews were doing a great job. You deal with the same stuff you deal with on any other project. When the busy season hits, all of a sudden guys start to disappear. And you don't know what you're gonna do 'cause now everyone's just giving you a sob story that they're too busy in other places, but again, it was less severe on a job like this where everyone was partnered up, because you didn't want to be that *one* partner who screwed the rest of the team because they decided to pull some guys for another job, right?

Interviewer: And busy season in [state], is that just when it's not really cold?

Interviewee C 1.2: Yeah. The summers tend to be pretty busy specifically with schools. So school season kind of rolls around and a lot the contractors that are doing this type of work are then doing school work in the summers. Hospitals don't ever really slow down. Other than (you know)-like you said-if it's a ground up, you tend to try to get all of your outdoor work done outside of the winter and then in the winter, you hope that you're inside and weatherproofed so you can focus on interiors. Our winters, honestly, are somewhat mild anymore. This year has been a hard winter. We've gotten quite a bit of snow, but for the most part it's just cold. So, as long as you prepare and you've PPE and (you know) you have temporary heat, you have

concrete blankets, whatever it is. A lot of the times, guys are still working throughout the winter - not much changes.

Interviewer: Alright. Let' see… So, you've mentioned like obviously the contingency but also the like savings/risk-reward sort of thing. What was the profit-sharing incentive system like for this contract and how did that work?

Interviewee C 1.2: So, I was going to send you… Here, give me a minute. I want to show it to you, but I don't know if I'm allowed to show you all of the amounts and stuff. So, I was just going to copy and paste it over as an example in an Excel sheet. So, contractually we did have… In our contract we did have a specific profit-sharing section, the language about how it would work, and then the actual way we would calculate the fees at the end of the day. And, in my opinion, it was pretty intricate. I ended up having to sort of rework this entire thing after I got involved because it wasn't really getting managed correctly and it was pretty difficult to get this thing back on track just because of the complexity of it.

I'm just going to blank out the amounts and stuff and then show you this.

Interviewer: And also you mentioned the schedule a couple of times. Who determined that? Like how was that…

Interviewee C 1.2: I think early on in the project, before I got involved, there was a pull planning… a lot of pull planning sessions. So, basically the owner sort of dictates what their expected turnover dates are for certain phases. And then knowing what the dates are, we would have the partner team get together and we might even involve some subcontractors, and we would basically say "here's your end date, let's work back and see what we need to put in place in order to make it there." And it puts a lot of onus on the partners and the subs to actually say (you know) this is my activity… So, a lot of the times it's sort of a "I need and I give" is how they say it so it's "I need *this* in order to do my activity and then out of my activity I give *this*." And that enables something else to happen, right. So basically, each sub would determine their scope of work and what that sort of schedule looks like for them and their durations that they need, and then they would sort of say "this is what I need, this is what I give." So, if I'm a ceiling contractor, right? I need the walls to be primed. That's my… that is predecessor to my activity. Primed walls, then I can start giving you ceilings. And then what I give you, obviously, is a finished ceiling. So, then that may be the next… That may be the predecessor to installing in-ceiling accessories: diffusers, lights, that kind of stuff. So, that was a pretty intricate process that took a lot of time and a lot of effort from a lot of different people, but that's how we came to establish those schedules in an IPD scenario. And they use that… they use that process on different projects too, but even more so in something like this.

Interviewer: Was this your first time pull planning, or had you done it before?

Interviewee C 1.2: I had *not* done it before but our team who did it was pretty well versed in it. (Here, let me show you this.) After… after like by the time I got involved at that point it was basically like everyone already was on board, schedule built. So, it was more just like maintaining it, a P6 schedule. So, if you can see this. This was sort of an example of our fee

calcs. And it's a little confusing, but basically what happens is we determined our calcs based on the partner and based on their percentage of profit which was… That was the contractual part, right? So, as the general contractor, I think we were the one percent. So, because we hold the largest contractual value overall, we only get one percent, but our one percent equals pretty similar to what everyone else is getting, right?

Interviewer: Yeah.

Interviewee C 1.2: Whereas like the design team is gonna be on the higher end because the design team has a smaller contractual value in terms of the overall project construction value. So, the way that this project worked is that we split up the profit into two buckets. Bucket one was target cost profit at risk which is this one here, in this gray. Basically, what that means is our profit is at risk based on hitting our target value on the project. So, we established a contractual value, if we hit that value, anything above that value is considered our profit. If we go *over* our budget because we didn't manage the budget correctly through VAPs, change orders, misses, design issues, whatever, we start to eat into our profit, right? So, this 80% was just based on did we or did we not hit our target value? If we hit our target value, we get all of our profit. 80% of that profit is split up per these percentages, okay? The *other* bucket of profit was based on *performance* profit at risk. And that's what all of the orange is. And the reason there's so many of these oranges is because we had three floors, so we broke this up by floor one, two, and three. If you just focus on one of them, that's all you really need to focus on. So, that's our other 20% out of that hundred, right? So, 80% was just based on hitting our target value. Once we hit our target value, you split up 80% between everybody. The other 20% was based on did we meet our performance expectations. And that was a group discussion. Again, with the owner and all of the partners. We go together at the end of the job and we said "okay, let's determine if we hit these or not" just based on a yes, no. And we had specific terms in place. So, I'll just give you one example. Let's say schedule, that's an easy one to understand, right? The schedule was just based on did we or did we not hit our completion date? Very measurable terms, it's easy to determine yes or no. So, we went back and looked at what was the original date on the P6 schedule, and what was the date that we actually got our substantial completion, which would be our regional and our state substantial completion inspections. If we said "yes," we got this portion of the 20% of the profit. So, it's confusing because there's so many percentage breakdowns, but at the end of the day, you have your total percentage of profit: 80% is based on just the target value, and then 20% is based on performance, and *that* 20% is broken down between all of these different performance indicators…

Interviewer: And then…

Interviewee C 1.2: And then you would take…

Interviewer: …*that's* broken out by *floors*.

Interviewee C 1.2: Yeah, and then we took it one step further. That's why I kind of said "don't even pay attention to all of the orange," 'cause it's really *this* just times three. And they all match each other pretty… pretty similarly. But yeah, so we had disruptions, disruptions on hospital operations, did we hit our schedule, what was the amount of firestopping above ceiling that was

missing because that directly correlates to passing our inspections-it's a very common thing to miss in construction…

Interviewer: I was going to ask you about that with like the fire caulking and stuff. Was that with your interiors contractor? Was that in their scope?

Interviewee C 1.2: It *typically*… I can't remember on this one. But I think typically it depends on… It goes with that specific trade. So, if an electrician is making penetrations in a wall that we built the new wall and it's a fire rate wall, they're responsible to caulk their penetrations. The reason it's difficult, is because they tend to come back… They tend to make all of their penetrations, run all of their piping (and not just electricians, every trade), they run all of their equipment and material through the penetrations, and then they always say "well, we'll come back and get it later because we don't have a guy right now that's gonna… (you know) I'm not gonna put a pipe through the wall and then have the same guy caulk it; we're gonna run everything, and we're gonna have an apprentice come back later and then he'll go through and caulk all of our penetrations at once." Never happens. And if it *does*, they miss half of the shit. So that… That is a really tough one to manage and that's why they put it as an indicator here. Sprinklers… I think specifically that was just if we had any sprinkler incidents which is a huge disruption, right? If you end up hitting a sprinkler head and flooding a floor, something like that. Electrical boxes, that was just if we had any misses where we forgot to put the covers on a junction box above ceiling which again, links specifically to passing our inspections. Sorry, sprinklers would also be not just sprinkler events, but what dings us in inspections there is if you have other things touching your sprinkler lines. So, if we have sprinkler lines above ceiling and there's, say, and armored electrical cable hanging and it's *touching* the sprinkler line, you will *fail* that inspection and you'll have to get that line supported separately. Because they…you cannot…you *cannot* support anything from a sprinkler line. And that includes if it's just touching it or laying on top of it. And then ceiling tiles. I think that was if, during the punch list, if the found ceiling tiles that had to be replaced because of damage during the work, like going back in the ceilings, have to redo work, that kind of stuff. If we had to go back and replace a ton of ceiling tiles, then that would also ding us. So, that's kind of the general breakdown of the fee. It was pretty complicated and then at the end of the job, this was our overall claimed profit per contractor so that we could sort of sum it up and get a final bill in which was also pretty…pretty hard to do at the end of the job there.

Interviewer: Yeah. And… when you guys like (this is kind of just a question for my own curiosity) so like when you guys make your general contractor profit or whatever, at [General Contractor], is that just like a company profit that then goes to however that works? Or is that like every person who worked on this job gets a bonus or something?

Interviewee C 1.2: No, I *wish* it was like that. No, all the money just goes back. So, it…it's a profit for the company.

Interviewer: Are you guys employee owned, or how does that work?

Interviewee C 1.2: That's a good question. We…we are not.

Interviewer: Okay.

Interviewee C 1.2: So, we were bought out by [national general contractor] about two years ago. I don't think [national general contractor] is either. [General Contractor] was not employee owned. You may be able to find [national general contractor]'s info online. I don't think they are employee owned. But they…they do offer like profit sharing and stuff, so… Honestly, I don't know. That may be a type of employee owned. So… Hey, I *do* have to get off here in a minute, so I don't know if you have like one or two last questions. Because I've got a call at 8:00, so I'm already a couple of minutes late.

Interviewer: Yeah, I would say real quick, before we head out, are there any like broad stroke, sort of in summation benefits or challenges in your opinion with this sort of process? Would you do it again? Just kind of like we're closing it up on the daytime talk show.

Interviewee C 1.2: Yeah. I…I think I would do it again if I was on a team that was able to commit from the beginning to stay on the project. I came into the company when this project had already started, so I wasn't a part of like the start up or I wasn't an *option* in the project when it was just starting up, right? If they were to have a new IPD project and they pitched me to be the project manager on it, I would *definitely* be interested in it just because I think having that continuity through the entire job makes a huge difference. The fact that we went through multiple project managers, multiple superintendents. Luckily, we didn't have to like change out any companies altogether on the job. But I think the continuity is the biggest thing, right? Having someone come in a year and a half after the project started and say "alright, give it your best shot to close it out" and it's a very intricate process that you have to be educated and versed in, it just doesn't work. Not that it doesn't work. It *worked*. It's just difficult. So, I think that's probably the biggest takeaway is: trying to figure out how to get the commitment so that you have a continuous team through the entire project so that those little notes in the margins and having the relationships on site where people don't want to listen to each other, (you know) knowing what these *VAPs* are from two years ago that we can't remember any more, that kind of stuff. And, honestly, that's human nature. I don't know how you do that. I don't know how you have fifteen individuals commit to something like this for two years. Obviously, you're going to go through some turnover, so… Yeah. Kind of a good and bad answer, but *I* would do it again. I think it was a worthwhile endeavor. Most IPD teams come out of the projects happy and wanting to redo it, especially from what I've heard from the team that we worked with here that has experience from it before. They typically always want to come back and do it again.

Interviewer: Well, and that's something that like even [Interviewee E] has mentioned to me before where it's like, there can be things that are challenging, but at the end of it, everyone's like "yeah, I would do that again."

Interviewee C 1.2: Yeah. Yeah. So, cool. Hey, if you have any other questions, feel free to let me know. If you want to shoot me over a list of stuff that we didn't get to. Or if you want to schedule more time, I *do* have time, it's just hard because there's so many meetings throughout the day. So, if you… if you say like next week you want to meet up or something, I can give you a few times and dates that work for me.

Interviewer: Yeah, absolutely. Thank you, man!

Interviewee C 1.2: Yeah. Thanks, [Interviewer]. Good luck with everything.

End

Appendix D: Transcript of Interview C 1.3

The date of this interview was February 23, 2023. The venue of the interview was over an online Zoom meeting. The interviewee participated via phone while driving. The interview started at 12:30 PM CST. Interviewee C 1.3 is a Superintendent for the General Contractor who worked on an IPD project located in a Mountain West state of the Western United States. Interviewee C 1.3 has worked in the AEC industry for nine and a half years and had some familiarity with the Design Build method (but not *IPD) prior to working on the project at the focus of Case Study 1. This was this interviewee's first IPD project.*

Interviewer: Alright, so let's just start of with like the like really basic stuff. You are [Interviewee C 1.3], and what is your title specifically at [General Contractor]?

Interviewee C 1.3: I'm a superintendent.

Interviewer: Okay. And how long have you been in the construction industry?

Interviewee C 1.3: Nine… Nine and a half years.

Interviewer: And have you done work with other collaborative delivery methods before, or was [the project] your first like IPD collaborative project?

Interviewee C 1.3: I've done Design Build, but [the project] was my first true IPD project.

Interviewer: On the Design Build deliveries that you've done, were there any like design assist or anything? Was it like "Design Build Plus"? Or was it just straight Design Build?

Interviewee C 1.3: Pretty much just straight Design Build and they were small… smaller projects: million-dollar projects. So, not really the (I guess, in my opinion) correct approach for that scope of work. But yeah, it was just strictly Design Build.

Interviewer: And so, kind of what were you thinking before you worked on [the project]? Did you work the whole schedule, the whole two years or…?

Interviewee C 1.3: No, I came in a little less than halfway through. We had a full turnover pretty much of the team. The superintendent… (it was, oh you said) Two-year project. They'd completed I think three phases out of seven. So, I came in and completed the last four plus phases of work after the superintendent left. And then when I came on, the senior project engineer left and then about two, three months later the project manager left. So, yeah, it was… Yeah, kind of wearing multiple hats there for a little bit. Trying to figure out the project and so, have you already talked to [Interviewee C 1.2], I imagine?

Interviewer: Yeah, I talked to [them] yesterday, actually.

Interviewee C 1.3: Yeah, so. I was kind of (I don't know), *mainly* on the superintendent side, but trying to help out where I could on the project manager side until [Interviewee C 1.2] came in.

Interviewer: Yeah. Did you have any *ideas* about what IPD might mean before you showed up here? Or were you briefed on any of this? Or were they just like "hey, go to [the project]"?

Interviewee C 1.3: I was briefed from a very high level. I knew generally what it was and the fact that it was a… I guess, thinking back, my understanding of it was it's a shared-risk, shared-reward. We have partnered with some cont…other subs who are under the same contract as us along with the design team and that was…that was about the extent of my IPD knowledge. Yeah. We share some risk, we share some reward, and we have true trade partners versus a traditional subcontractor method.

Interviewer: And did you… did this kind of effect your day-to-day life? Like in your experience, what you needed to do in the field versus another job, was there anything that was noticeably different to you?

Interviewee C 1.3: I would say it was initially more meetings than I'd typically seen on past projects. We had a lot of meetings with the owners in addition to the subs. Yeah, it was just more…more meetings to communicate with different entities on the project I suppose. I would say the biggest day-to-day difference.

Interviewer: And I know [Interviewee C 1.2] mentioned that you guys had like a weekly sort of project leadership team or core team meeting every Thursday. Did you participate in those?

Interviewee C 1.3: Yes.

Interviewer: Okay. And I guess this is kind of the same question, but did you feel like that was beneficial to you in like having the work get done in the field and like coordinating stuff preemptively, or was it kind of a net neutral?

Interviewee C 1.3: Depending on the week, I'd say.

Interviewer: That's fair.

Interviewee C 1.3: I'd say based on the fact that it depended on the week, maybe net neutral. Like there were some weeks where it was not a productive use of time, but then there were other weeks where it was very productive. I think from my perspective the Big Room meetings were more centered around cost tracking, less so around the trade partners. A lot of… Yeah, cost tracking conversations there, but as far as superintendent schedule updates, safety updates, there were not (I don't know) really anything too impactful there.

Interviewer: Okay. That was actually something I wanted to follow up with you specifically today and kind of probe into is if this IPD delivery had any kind of material effect on how you approached safety at all or if it was still just mostly the same.

Interviewee C 1.3: The IPD process I would say not really. The *type* of project that we were doing, *yes*. I don't know how far into the weeds you want or need to go, but yeah. It was a… It

was a unique project in the sense of the patient population that we were working around so that was a…there was a heightened sense of safety there. And then, as far as (I guess) the IPD process in regards to safety, having the trade partners as the same kind of con…contractual level as us in a sense added pluses and minuses. I don't know. As a general contractor in a traditional method, you can (I don't know) throw your weight around a little bit more in regards to "it's my way" of how we're doing safety. But with the trade partner aspect, it was getting their insight and making sure that they had their input and there's some good and bad to that.

Interviewer: Yeah. I knew you guys were renovating three floors in an actively used hospital. So, you were mentioning now that you have these trade partners who are sort of on an even contractual level with you, how did that work with regard to things like dust permits or hot permits…hot work permits? Like did they just go directly to the hospital facilities and file them and not file them with you, or did they still file one with you and with like facilities management?

Interviewee C 1.3: More the later.

Interviewer: Okay.

Interviewee C 1.3: They… We had some… I would say we had… So, we had MEP and the MEP sub and then framing and drywall sub as our main trade partners. And the MEP subs were a little bit more self-reliant in submitting their own paperwork to the owner. The framing and drywall sub was not as self-sufficient (I guess), so we helped them out more so than the MEP. But it all got filtered through [General Contractor] regardless, so we would send in the umbrella permit, and then they would attach their (I guess) scope-specifics to our umbrella permit. So, (I don't know) does that answer your question?

Interviewer: Yeah, I think so. I was just kind of trying to see sort of how that worked.

Interviewee C 1.3: Yup.

Interviewer: With the drywall subcontractor and redoing, like remodeling these insides, did you guys utilize any templates? Like I know sometimes in medical work they'll make like a wall template of like junction boxes or headwalls or whatever where you can just take the same template and put it against the wall over and over. And that kind of speeds things up. Were there any… Either *that* or other methods that they used to sort of accelerate the schedule?

Interviewee C 1.3: I'm trying to think. It's been a… been a little bit. No, it wasn't a traditional hospital where you're thinking templating like a patient bed headwall or footwall or anything like that. So, we could not really duplicate conditions room to room or floor to floor or anything like that. But, we… I would say, we had them building our ICRA walls and construction barriers out of framing and drywall and we were kind of able to, in some instances, prefab those panels to a certain extent and gain a little bit of efficiencies there, but as far as the true scope of work, we could not really carry a template through.

Interviewer: And with the like prefab conversation, were you guys able to modularize anything,

aside from kind of what you mentioned? I know sometimes you can make like repeat walls and stuff like that.

Interviewee C 1.3: We… We added, or we *installed* door hardware on the doors at an offsite facility, so we could get that installed in a more controlled environment. And then-the theory is-you can just then bring the doors out onto the site and swing 'em and your hardwaring's already done. That ended up working 50% of the time, I'd say. But with the scope of work, we had some really unique hardware that we could only prefab up to a certain point, but then we had to do actually quite a bit of it still in the field. So, door…doors and door hardware was one prefab instance. I know the mechanical sub they…tried to prefab VAV boxes with kind of like the final connection of copper piping already installed and the first run of duct already installed. And that worked on occasion, but being in an existing facility, those units ended up being too big sometimes, so they'd get up into the ceiling around all the existing conditions. So, I'd say that worked about 50% of the time. Yeah, there were… There were *not* really a whole lot of great opportunities to prefab stuff on this project.

Interviewer: Yeah. Had you done the offsite door hardware system before, or was this a first time doing that?

Interviewee C 1.3: Yeah, I had done that before. It usually works pretty well. Like I said, this project just had some unique…unique sets of hardware that made it a little more challenging and we just flat out couldn't do some of it prefab like you would in the past, so… But, it's a…it's a good method.

Interviewer: Okay. Kind of on the MEP collaboration discussion, I'm sure you guys must have had a BIM model, right?

Interviewee C 1.3: No. We actually did *not*.

Interviewer: *Really*? Okay. Did any of the trade partners have a BIM model, or…?

Interviewee C 1.3: No. Yeah, I don't know how much you…you know about that. It…it's…it's a good *tool* for sure, but in order to get like an accurate BIM model, you need to go in and scan the…the space to capture the data points for all of the existing conditions so that you can put your…your new systems into the BIM model and do the clash detection with the existing conditions already in there, and since there was an occupied hospital, the only real way to do that is to basically demo out like the ceilings and quite a bit of the… You'd basically got to demo it out, then scan the space, build the model, and then…then you can kind of use it that way. But our schedule did not have the luxury of that time. That's a pretty extensive time constraint to do all that.

Interviewer: So, were you guys just on like on 2D plans the whole time?

Interviewee C 1.3: Pretty much, yeah.

Interviewer: Wow. I know [Interviewee C 1.2] mentioned you guys used Teams and it had sort

of like a shared project drive that people would drop things into and make edits on. Were there any other sort of like collaborative technologies or tools? Like, you didn't use BIM, obviously, but you did use Teams. Was there anything else that you guys used sort of with the idea of collaboration in mind?

Interviewee C 1.3: We used Bluebeam Studio. I don't know if you know what that is.

Interviewer: Just the cloud Bluebeam version?

Interviewee C 1.3: Essentially, yeah, but you can create a Studio…quote-unquote "Studio account" that you can then invite other people to that account and then you can drop files in there, drop drawing updates in there, schedule updates, anything you want in there and then they'll get a new notification that a new file's been uploaded, so you can distribute files that way. So, we used that. We used… I went away from it when I came on, just 'cause I was not familiar with it and did not have time to really learn it, given what I was walking in to, but they were using V-Planner which is basically a scheduling software that's designed specifically for pull plans. So, we… We did pull planning with the trades when I was still on the project, but we did it more kind of old school with the just Excel scheduling and sticky notes and transferred that into our scheduling software. So, yeah. Pull planning and Bluebeam Studio in addition to Teams. Those are kind of the big collaborative efforts.

Interviewer: With the Bluebeam Studio (this might be kind of a bizarre question), but who *owned* that, if that makes any sense? Like did the architect *own* that and everyone else had like read and write privileges or did you guys own that Studio session and then everyone else had read and write privileges.

Interviewee C 1.3: We, [General Contractor], owned it.

Interviewer: And then…

Interviewee C 1.3: So, other…other people could upload stuff to it, but we were (I guess) the only ones that could really make edits to the files that were uploaded to it.

Interviewer: Okay.

Interviewee C 1.3: So, yeah. We owned it.

Interviewer: Let's see… Did you guys have any visual… visualization tools that you used at all like a project dashboard or anything that was maybe in a common area that sort of tracked overall project performance?

Interviewee C 1.3: We had a… (I guess) office area that we all kind of shared, so… It was the [General Contractor] team, the electrical superintendent, the framing superintendent, and then the MEP project managers would office out of there occasionally. So, we had… had that set up with a big (I guess) monitor that you could connect to your laptop to display stuff on for the whole office to see. But we didn't have any like (I don't know) tracking tools or anything like that as

far as (I don't know) progress.

Interviewer: [Interviewee C 1.2] showed me like the VAP log and then like something else where it kind of showed you guys tracking the budget over time, but maybe that was about it. It wasn't like you guys had something that was continuously updating and visible to everyone.

Interviewee C 1.3: Yeah, I mean the VAP log was visible to everybody on the team's side, but again that was… I think the big… The IPD method, yeah… It's good for like you mentioned the project management side because you have the VAP log and you have columns for each sub. And then they can go in and add in their own numbers without having to send it to [General Contractor] and [General Contractor] uploads it. They just all input their own information in that VAP log and it's visible to everybody. The… The prog… like construction progress tracking was more in those weekly or bi-weekly pull plan/scheduling sessions that we'd have everybody involved in. And then I would take that information, put it into a schedule update that I would then distribute to everybody. So, that was, yeah… I guess… Yeah, the VAP log probably is more along the lines of what you're talking about as far as a living document.

Interviewer: And so, just 'cause I'm curious, do you remember-off the top of your head-what "VAP" stands for?

Interviewee C 1.3: Value… Value Added… something.

Interviewer: Yeah.

[Laughter]

Interviewee C 1.3: I forgot exactly, but it was "Value Added something"

Interviewer: Yeah, no. That's the answer I've gotten from [Interviewee C 1.1] and [Interviewee C 1.2] who were… They were like "yeah, it's Value Added…something" and I was like "okay, cool cool cool." So, at this point it's just kind of running joke for me to ask do people remember because I don't even know, I'm just trying to figure it out.

Interviewee C 1.3: Yeah. If you want to do the safe answer, "Value Added Process." How about that? I don't know.

Interviewer: So, is the first time as a superintendent you had done pull planning on a project, or had you done that before?

Interviewee C 1.3: This was the more… or I guess the most collaborative and *formal* pull plan that I've done. I'd tried it on other projects with not as much input from subs. So, yeah, I guess. To simplify the answer, you could say "yes," this is the first opportunity I had to do it.

Interviewer: And did you guys have training for pull planning specifically, or did you just kind of do it?

Interviewee C 1.3: That would have been… That would have been *great*. I mean I knew *how* to do it just from… (I don't know) I'd kind of been… I won't say I formally trained, but someone explained like the process and I just of took it and ran with it from there, so I'm sure I didn't do it exactly correct, but we… we got the point across, so… We essentially… I knew what I needed to do and the information I was trying to get out of the session, and I would do a quick (I guess) tutorial with the subs on the sticky notes like what to write on the sticky notes, where to put the sticky notes, how to talk to everybody and move stuff around. And so, each session we would kind of do a little (I guess) "refresh" on that to make sure that everyone was getting the most out of it.

Interviewer: So, aside from pull planning, was there other like IPD specific training involved in the project? I know you said you came in like three sevenths of the way through, but I didn't know if there was any like team training or sort of trust building exercises or anything.

Interviewee C 1.3: I think it was even before [Interviewee C 1.2] came on. I think [Interviewee 1.2] did it maybe by [themselves] after but, yeah… [Interviewee A] and I went through a like a virtual training for a couple sessions where we had a design phase manager who's familiar with IPD go through the whole process (I guess) and give us the… the history of where it came from, why we do it, all the terminology, how to get the most out of it. So, yeah, we *did* do it, a training session, but it was after I was already a few months into the project, so it was more kind of retroactive than anything else.

Interviewer: How long was that training session? Was it like half a day online, or…?

Interviewee C 1.3: I want to say it was two four-hour sessions, but I could be misremembering.

Interviewer: And was it through like an online program like the Lean Construction Institute or something?

Interviewee C 1.3: I'm sure that's where they got a decent amount of the information from, but it was a packet, essentially that… like a presentation that our design phase manager had and if [they] created all of it or used information from other resources, I don't know exactly. But I would imagine [they] kind of gleaned some information from online resources…

Interviewer: And then…

Interviewee C 1.3: …And then just spun it into [their] own.

Interviewer: I know that everyone has kind of mentioned that the person who was spearheading the IPD, at least on the [General Contractor] side, was a project manager who left. So, I guess that kind of informs this next question which is: was there and IPD team leader or coach? And I think the answer is "yes, and they left" is that right?

Interviewee C 1.3: Essentially, yeah. They left. I came on, knew very high level what IPD meant, but didn't probably follow the methodology to the letter (you know), so we had a… Our vice president was on some previous IPD projects, [Interviewee E]. And so [they] were a resource,

but [they] were not day-to-day IPD leader.

Interviewer: Yeah. You kind of talked about it before, but other projects you've worked on, were they *just* Design Build, or have you done like CM at Risk and Design Bid Build before?

Interviewee C 1.3: Yeah, I mean, I think the majority of the projects we do are the traditional method of yeah. Design Bid Build, Negotiated, GMP, CM/GC at Risk, Lump Sum or Stipulated Sum. So, I've touched them all, but I think the Vast majority of the Design Bid Build, GMP kind of more traditional.

Interviewer: Yeah. So, broad strokes wise, what did you find beneficial about this project compared to other projects? Or unique or something you would call a benefit that you would want to take forward or that you appreciated about this project specifically?

Interviewee C 1.3: I think the fact that our entire team turned over and I came in as the… the new guy and was basically told like "figure it out" at the very beginning. Like "here's the job, everyone left, good luck." So, the benefit of IPD was that we had our trade partners that had all the history that they could kind of fill me in on and they helped me kind of navigate the relationships with the owner at the very beginning and it made a smoother transition in that sense.

Interviewer: Is that some kind of…

Interviewee C 1.3: Having strong… having strong trade partners I think is a benefit, to summarize.

Interviewer: Is that a relationship that you would say is sort of unique to this project in the sense that maybe on other projects you wouldn't be able to have leaned on them quite like that?

Interviewee C 1.3: Yeah, I would say just in the sense that (I guess). Again, going back to more of the project management side, like the MEP project managers were very engaged and involved on the…on the VAP logs and invested in the design change conversations. And so, *that* I think is more unique to this style of project and where the benefit was really seen versus traditional where they're under [General Contractor], they're under the general contractor and they might… they might only know their scope versus sitting in the Big Room meetings and hearing all the conversations.

Interviewer: Yeah. I mean I think it's kind of a testament to you guys' ability to deliver this project in the 24 months using only like 2D plans and specs. I mean, knowing how complex medical spaces can be, and especially with renovations where you want to *do* get those measurements right, and you've gotta get those penetrations right, and you've gotta get those clearances right, like that is a *lot* of complex stuff to be able to do with just 2D drawings and the fact that you guys were able to do that and do it (you know) on time and on budget… I mean, I think that's kind of a testament to the success of the collaboration if that makes any sense.

Interviewee C 1.3: No, it does. I would definitely agree.

Interviewer: Now we'll get to the…the other side of the coin which is: do you think there were *challenges* that were unique to this project or to this delivery style? And that… I mean, that's the whole question: do you think there were challenges that you had on this project that were specifically *because of IPD* or specifically because of how we were contracted?

Interviewee C 1.3: The most unique thing that I found to be a challenge was (and you probably know more than I do), but the theory with IPD is there's no traditional RFIs, right? We have a question or an issue or a conflict in the field, and the architect and the MEP engineers are on our trade partner agreement and so we just call them up and say "hey, we're…we ran in to this what would you like to do, blah blah blah" and we have a *conversation* about it versus having an actual, formal, documented RFI that then gets (I guess) incorporated into the drawings to reference back to. So, from my perspective, the first couple months coming into the project I would trying to desi-…or build off of the plans as I saw it, and then someone would stop me and say "No, that's not the plan now, that design changed on VAP 077-A" and I would say "What the *Hell* does that mean? Like, there's nothing on the drawings indicating that we're doing…that we're deviating from the original plan." That was the biggest challenge, I think. With the project engineer turnover on the project, we were plotting drawings and design changes on the drawings, we were marking them, but there wasn't like a formal RFI to reference back to. And so, coming in to something like that halfway through, not knowing the history, it's difficult to find information, especially if you don't even know where to start looking. So, that would be the biggest challenge I would say.

Interviewer: So, is that sort of like lack of continuity, or of things being memorialized properly? Where you're like "Okay, well, you're telling me we're doing something differently, but how do I really *know* that?" and then you go and look at the drawings and it doesn't say anything. Yeah…

Interviewee C 1.3: Yeah, exactly. Yeah, so I think the lack of continuity maybe on the documenting or (as you said) memorializing of items and conversations. But then also, yeah, having to reference back to a *VAP Log* versus a RFI was a different situation.

Interviewer: Hold on, I just lost my train of thought there for a second. With the sort of collaborative element that you just described there, in your experience, when it *did* work, as in like when you *were* able to just *call* the architect or *call* the engineer or have a meeting about it to solve a problem that you found in the field, did that take *less* time than a traditional RFI or the *same* time or *more* time?

Interviewee C 1.3: Yeah, it kind of depends on the situation. There were some instances where it was *way* quicker-you could literally just FaceTime the architect and say "Hey, we wanna do this" and [they]'d give you a thumbs up and off you went. So, you'd have an answer *immediately*. There were other times… (and I think what I'm about say is more related to the *owner* more so than the IPD process, but…) There were times when the design changed and we could get kind of the initial information pulled together pretty quick with all the trade partners and the design team, but there comes a point where there's just too many cooks in the kitchen, you know?

Interviewer: Yeah.

Interviewee C 1.3: And no one frickin' make a decision, so it… In certain situations, it dragged on way longer than I think it would have normally if there was a more (I guess) *defined* chain of command on making final decisions…

Interviewer: It's almost like…

Interviewee C 1.3: …And I think that's more a function of the owner.

Interviewer: Yeah, it's like the lack of structure helped at times and was a detriment at other times?

Interviewee C 1.3: Yeah, and I mean, I mean you could boil your thesis down to that (it's like): there's pros and cons, right? I mean…

Interviewer: Yeah.

Interviewee C 1.3: There's pros and cons with every delivery method. This one is no different. I mean, there's pros to the traditional Design Bid Build, CM/GC… Yeah, there's just situationally changes.

Interviewer: Yeah, I mean there's even literature to suggest that like the *removal* of the classically antagonistic element between different parties is actually *less* efficient than having that. Because like when you're trying to defend yourself a contractor, and the architect's trying to defend themselves as the architect, and everyone's doing that, then everyone's like constantly reviewing the documents and combing through them and theoretically there are fewer defects than when everyone's working collaboratively and there's like less (kind of) contractual insulation between each party, if that makes any sense. And like that's not like rigid or like hard and fast, but it's something people have brought up and talked about.

Interviewee C 1.3: Yeah. I've… I've seen that for sure. I would agree with that statement.

Interviewer: Let's see… I think that is mostly *it* from me, unless you would like to just have a "closing thoughts" sort of moment and wrap up anything else you want me to know.

Interviewee C 1.3: [Indistinguishable] Give me a little bit of (I guess) background about what you're doing. I mean, are you arguing *for* or *against* IPD? Or, I guess, what's the basis of your thesis?

Interviewer: Yeah, I'm not really arguing *either* way. What it is is I'm doing the research to see in 2023 like what people find to be barriers and challenges and (you know) benefits (sort of) with IPD. So like, there's a lot of research that has been done about IPD especially in the last 15 or 20 years, but a lot of the research that focuses specifically on benefits and challenges really kind of falls off about ten years ago. And ten years ago is still pretty recent, but it's also kind of a long time. And what I am doing is trying to see (hey) what's unique about 2023 versus 2013, 2014?

Like are people still experiencing the *same* problems they were ten years ago? If so, like let's talk about it and we can figure it out. Are they experiencing *different* problems? Okay, like if so, what are they? Can we catalog those and then like approach them more efficiently. So, it's sort of updating existing research just by trying to take the temperature of what's going on in the world right now.

Interviewee C 1.3: Got it. Okay. Yeah, I mean, I think… I've been… I'm right on the precipice of being in this industry for a decade. And it seems like it's changed, maybe not a *substantial* amount, but there's definitely… It just feels *tougher* maybe than even ten years ago when I started and when you talk to guys in the field that have been doing this for longer than I've been alive they're just like "Yeah, it's…it's *way* tougher than it used to be back (in like) *back in the day*" (you know) when it was handshake agreements and people would pound their fist on a table and get mad but then figure it out *that way* versus now it's all kind of (I don't know) just a lot more *meetings*, a lot more *documentation*. I think the IPD side… It's a *mentality shift*; it was definitely a mentality shift for me. I came into it with having quite a few lessons learned where I'd been burned in the past, and wanting to cover like…CYA, you know?

Interviewer: Yeah.

Interviewee C 1.3: And the thought with IPD like you said, not having the traditional antagonism, you *shouldn't* have to CYA because "*everybody's a team*" and it's all hunky-dory… And it's like "Nah, I'm still gonna protect myself here." So, I think there's a mentality shift that everyone *felt* like it was a collaborative approach, but there was a…there *seemed* (to me at least) be a underlying tension of "Well, I'm still gonna get my piece" or "I'm still gonna make my position seem better than X, Y, and Z's position." So, not that anyone *really* got thrown under the bus, but there's definitely that underlying kind of older school mentality that I don't think is the *intent* of IPD. And then I think pros and cons from the contractor side aside, there needs to be some understanding and (I guess) training from the owner's perspective as well. Because in quite a few instances the owner was treating us as a traditional general contractor and going to us for every single thing where it's like, "No, we're trade partners with the MEP subs, this is an MEP issue, go to them and keep me in the loop, but I do *not* need to facilitate this," you know what I'm saying? So, (I mean) there's just still some learning curves on the…on the owner's side even too.

Interviewer: And you were mentioning…

Interviewee C 1.3: So…

Interviewer: …Kind of that like I guess you would call it that "culture shift" that hasn't happened and like the sort of reluctance on the part of people to participate in this like teaming collaborative environment, how people were still kind of defensive, was that something that you were talking about specifically from like the general contractor perspective, or did you feel like that was kind of across the board with all parties?

Interviewee C 1.3: I'd say across the board, and don't get me wrong: like it wasn't a contentious project by any means.

Interviewer: No, yeah. Sure.

Interviewee C 1.3: It was a good (I don't know)… Good relationships came out of it, but… I mean, I *myself* felt like I had to be on the defensive a handful of times, defend my position. On the electrical project manager's side and the mechanical/plumbing project manager's side, there were definitely conversations where they were trying to paint themselves in a better light than what my perspective of the situation was, so they were defending *their* position. So like, I'm talking (kind of) one off situations. It was not that way the *vast* majority of the time. But yeah, it's definitely like a…this mentality shift, if you will, that was maybe 80% of the way there, but that there's 20% old school that was still lingering around.

Interviewer: I mean, this is purely speculative, but what do you think personally would have made the last 20% of difference in that regard?

Interviewee C 1.3: I can't say how the project kicked off since I came in like I said (call it basically halfway through). I don't know how they started it. But I think it definitely needs to happen on the front end. If you're trying to shift your paradigm halfway though, that's a losing battle, right?

Interviewer: Yeah…

Interviewee C 1.3: You're gonna be fighting it the entire way, so it definitely… Whatever that approach is… I don't know what that approach could be whether it's a training, everybody getting together and figuring stuff out on the front end over the course of multiple meetings, and then just maintaining that consistency throughout the course of the project. Versus trying to (I guess) not figure it out as you go but (I don't know) implementing new things over the course of the project. Where it's like "alright, we just have to implement everything at once" and then kind of run with that versus changing and tweaking as much as…as much as we did. And I think, unfortunately, it's not probably the best (I guess) data point for you just in the sense that our entire team trans-…transitioned out at one point. That makes it tough. I think to give a good precedent.

Interviewer: Well, it's like almost whatever momentum may have existed at the beginning, you guys were sort of re-bootstrapping it halfway through. So…

Interviewee C 1.3: Exactly. Yeah, exactly.

Interviewer: Where there any…

Interviewee C 1.3: [sneezes] Excuse me.

Interviewer: …Like trade partners on this project that you guys had worked with before or developed a relationship before?

Interviewee C 1.3: The design team for sure, the architects, and the mechanical and electrical

engineer. We had a… Our company works very regularly with both of those firms. The framing/drywall contractor, we work regularly with that firm. I personally had never worked with the electrical contractor before. I haven't really heard of a lot of [General Contractor] projects that were using this partner, so I think that was a newer relationship. And then the mechanical and plumbing partner, they're…they're a bit of a regular (I guess) with [General Contractor], so that was a preexisting relationship I'd say.

Interviewer: So, kind of on that point 'cause this is interesting to me now, what sort of drove selecting this electrical subcontractor to be a part of your Core Team if you guys had never worked with them before?

Interviewee C 1.3: I don't know that answer 'cause I wasn't involved on the front end. If I had to guess, I'd say that they have a pretty consistent presence on that medical campus and so we (again I'm making some assumptions here) we were leveraging their knowledge of that campus to help our team succeed overall versus bringing in someone that we might've been more familiar with but didn't know the campus.

Interviewer: For sure.

Interviewee C 1.3: That'd be my guess.

Interviewer: And then talking about mechanical and plumbing, did your mechanical and plumbing subcontractor or, trade partner rather, were they also the ones who did fire suppression, or was that separate?

Interviewee C 1.3: No, it was separate. They… Fire sprinkler was not a trade partner, they were regularly involved and engaged, but I could be wrong on this, but I'm 90% sure they were not part of the contract agreement.

Interviewer: And with the mechanical/plumbing partner, did they also do like the med gas and stuff, or was that yet another person?

Interviewee C 1.3: We did *not* have med gas on this project.

Interviewer: Oh, okay.

Interviewee C 1.3: It was a pediatric mental health institution, so it was basically like a (I don't know) for lack of a better way to put it, an in-patient psyche unit. Like we had padded rooms, ligature-resistant everything. [Indistinguishable] basically to hold these kids and monitor them. Yeah, but it wasn't like a hospital room like you're thinking with med gas and headwalls and patient beds and all that. It was an in-patient psyche facility.

Interviewer: So, from like a design and installation perspective, talking about the different rooms you guys did. I know that [Interviewee C 1.2] mentioned this where you had to focus on having zero ligature points. Was that something that like the architects designed and then your interior people built out, or what was sort of the coordination on something unique like that?

Interviewee C 1.3: Yeah, I mean…

Interviewer: …very spec'd rooms.

Interviewee C 1.3: That's what I was saying. What's that?

Interviewer: These seem like some very like spec'd and detailed rooms, so I was just kind of wondering how that process worked.

Interviewee C 1.3: Yeah. It was my first time doing anything like that. I came from a healthcare background, but this is just totally different. This… Yeah. The design, the architect, and interiors team, they had the knowledge of building (or designing) these units. I think they even flew out to Seattle to see a in-person unit to get an idea. And they spec'd everything out the way that they understood it, but… And we *built* everything the way that I think we would traditionally build it and built it to those specs. Then you get the…the unit manager. So, like you have the… Our main point of contact was the hospital construction manager, right? And he knows enough to be dangerous, so then like we'll walk with him, and he's like "yup, everything looks good good good" and then we would walk with the nurse manager who's dealing with these patients day in and day out and it's like "Nah, this kid could cut themselves here; they could pick this up and use it as a weapon there; they could hang themselves there." And so, a lot of times, what we thought was the correct design would be challenged by the nurse staff and then we would have to literally get back to the drawing board on some things and rebuild them or just add more details to the drawings in certain situations.

Interviewer: Yeah, that's almost a testament to like including final end-users earlier in the process.

Interviewee C 1.3: Yeah, and we definitely started doing that. We would walk them through the drawings, but they don't know drawings very well; so, they didn't get a *whole* lot of information out of that. And then yeah, we would walk them through as we're getting ready to start working our way to turnover, and that's when they would start catching a lot of stuff. So, we did have an end-user walk and unfortunately like just the way construction is we'd have to have the space over 90% complete for them to really be able to test stuff. And once you're at that point, there's an expectation of a turnover date. And then they would walk something and find a failure point. Have to rebuild it, redesign it, add more detail, what have you. So, that was definitely (kind of) a lot of eleventh-hour changes, if you will, came from those…those walks. We definitely *did* include the end users for that reason.

Interviewer: I think that's probably part of the reason why, at least in my experience, like a lot of medical projects in specific, have started using like VR and stuff for *exactly* what you just described. Where like you'll give these nurse managers a headset and be like "Hey, can you 'walk' through this space?" and in like ten minutes of them doing a virtual walk through the space, they can find all those things for you before you actually (you know) put material in place in build stuff. So, obviously you guys couldn't do like a BIM or virtual mockup on this, but like it's definitely something to keep in mind.

Interviewee C 1.3: Yeah, no it's… I don't know if that conversation was ever had of doing something like *that.* I mean, when you mentioned a BIM model, I was thinking clash detection with systems, but yeah, having a walkthrough with a VR headset… I mean that's something I've never seen before. I've *heard* of that… I think… I don't think they would've caught of *everything*, but it would have…would not have *hurt* to have that option.

Interviewer: For sure.

Interviewee C 1.3: So. But also, I do gotta start kind of wrapping this up. I gotta get ready for this meeting here in about twenty minutes, but…

Interviewer: Nah, we're good. I've gotten I think everything I need. So, thank you for taking the time to talk with me today.

Interviewee C 1.3: Yeah, no problem. Good luck on the thesis!

Interviewer: For sure, man. Have a good day!

Interviewee C 1.3: Yeah, you too! Well, talk… Well, I don't know if we'll talk later, but good luck!

Interviewer: Thank you!

End

Appendix E: Transcript of Interview C 1.4

The date of this interview was March 2, 2023. The venue of the interview was over an online Zoom meeting. The interview started at 2:00 PM CST. Interviewee C 1.4 joined the meeting by phone. Interviewee C 1.4 is a Vice President for the General Contractor who oversaw an IPD project located in a Mountain West state of the Western United States. Interviewee C 1.4 has worked in the AEC industry for twenty-two years and has eight years of familiarity with collaborative project delivery methods. Interviewee C 1.4 had familiarity with collaborative project delivery methods (including Design Build and IPD) prior to the project which is the focus of Case Study 1.

Interviewer: Today is March the second at two o'clock Central Standard Time and we are interviewing [Interviewee C 1.4] and what is your title specifically [Interviewee C 1.4]?

Interviewee C 1.4: Vice president.

Interviewer: Okay. Vice president and-let's see-how long have you worked in the AEC industry?

Interviewee C 1.4: 22 years.

Interviewer: 22 years. And how long have you worked with projects involving collaborative delivery methods, so like IPD or even advanced Design Build?

Interviewee C 1.4: So, 2015 is when I started in that, so what's that? Seven, eight years?

Interviewer: Yeah.

Interviewee C 1.4: Eight years basically.

Interviewer: And then, in your own words, (sort of) what is your understanding (maybe) of IPD or collaborative deliveries in general?

Interviewee C 1.4: So, collaborative deliveries is just when all of us are…("all of us" being the A, E, C, and the owner) are working as one unit. It's gonna end up with the best result at the end of the day. Integrated Project Delivery brings in the more *formalized* structure with a contract and terms and potentially the risk-reward portion of it.

Interviewer: And so, with the project that we are kind of highlighting with this interview, who was the driving force behind adopting the IPD method?

Interviewee C 1.4: On this one…on this project it was driven by the owner who really has experienced it and appreciated the value that it brings to a project.

Interviewer: Had you done IPD projects with them before, or was this one of those situations where they had done other projects as an IPD and then they contracted you for the first time?

Interviewee C 1.4: We had done… With the one particular individual, I had done, started an IPD project when he was at his previous employer, and he brought that to this project, to this employer. And… However, we have worked with [owner] on one previous. It was an "IPD-*Lite*" where the contract was a typical AIA contract with some word modifications to add IPD *behaviors* into it so it wasn't a whole contract, it was kind of slightly modified to baby step into an IPD contract.

Interviewer: And on that one, did you guys still have a core team?

Interviewee C 1.4: We did.

Interviewer: Okay. And was there like a risk-reward mechanism, or was it sort of more of a standard contingency kind of thing?

Interviewee C 1.4: It was…kind of a mix. [*Laughs*]

Interviewer: Yeah.

Interviewee C 1.4: It was a contingency that we managed after we started as more of a risk-reward, but it wasn't fully managed throughout as a risk-reward. It kept falling back into more of a contingency-type setup.

Interviewer: Okay. Yeah, I've heard that mentioned a lot where people will set out to do IPD or like kind of experimental project deliveries and then often it will sort of default back into what they are most comfortable with as the project progresses.

Interviewee C 1.4: Yeah, so that's where (you know) you can do it without a contract, but it's easy for people to fall back into a traditional method if the contract terms aren't fair. Especially if not everybody is bought into the process and understanding it. If that makes sense.

Interviewer: Yeah, for sure. I mean, that's the thing we've talked about a lot where it has to do with the cultural mindset and getting people to buy-in. So, for [project], I know specifically on this project (and we don't have to go too deep into it), I know that there was like some team turnover and that like the "IPD Spearhead" or "Champion" like was there and then left the company, but do you know of anything like in particular that they did as far as like getting that buy-in early on or getting that sort of cohesion between core team members?

Interviewee C 1.4: So, the team… The procurement method by the owner was as an IPD project from the beginning, so we… Even from the interview it was "how do we work together as a team." They did an interactive "Here's-a-scenario-let's-talk-through-how-we-would-work-through-this-challenge-together." So, from the…from the selection it was al-… it was from that integrated standpoint. When we got kicked off, the challenge, a little bit of a challenge we had was there was some people that had…who were very familiar with IPD and some people who were less…this was their first project. The project started right when Covid hit, so…

Interviewer: Yeah.

Interviewee C 1.4: While we had a bunch of team-building planned at the beginning, it became very challenging because we couldn't get together in person, and so there was some team building done virtually, but not to the full extent that we should have or wanted to due to that constraint. So, it… it… By not having that, we did start off and I think the project duration was a little rocky because we never had that opportunity to build those bridges and teach the folks that had not been exposed to an IPD project the full intent of process…of the culture.

Interviewer: Yeah. I mean, after that sort of kick off and then the rocky start due to Covid, were there certain like "maintenance attempts" throughout to like either reinvigorate or keep it going? Do you know?

Interviewee C 1.4: There was a few, but not enough. There was a couple.

Interviewer: Yeah.

Interviewee C 1.4: But then we'd…we'd turn over another person and another person and it just became harder and harder, I think.

Interviewer: Yeah, and that maybe kind of explains some of that tendency to do things…the way they've always done them.

Interviewee C 1.4: Right. Right. So, the challenge… Some of the challenge, too, is even on the owner's side, the… the director level was fully bought-in to the IPD process, but their (the owner's project manager) had never experienced it before. And so, I think, you know, the director's not in the day-to-day, the manager was managing the day-to-day and [they] never had the opportunity to fully learn how it was supposed to work, so I think that caused challenges and then some other staff turnover. And not properly training, mentoring, doing team building at that point. Should have happened but didn't.

Interviewer: Yeah. Some of these questions we have kind of answered, just want to make sure we're not doing anything redundantly. I know I think I've talked to [Interviewee C 1.2] about this… You mentioned you had had a previous relationship with the hospital. Did you have a previous relationship with other trade partners, especially those that were on the Project Leadership Team?

Interviewee C 1.4: This project was new trade partners. Out of, let' see, so there was three subcontractors who were trade partners of this project. One of them I had a previous working experience with on an IPD project, the other two had done it with another general contractor, but not with us, and we didn't have a longstanding relationship with them either. So it was a lot of new connections.

Interviewer: Okay. So, there was at least come cursory familiarity amongst everyone with IPD even if they hadn't worked with you guys before?

Interviewee C 1.4: Correct. However, what my observation is that the IPD experience they had

was more of a… an IPD-Lite type, and not the full-blown we were trying to implement, and so even while people say they have experience, what I've learned is you have to understand *what* that level of experience is because it might not be the full-blown IPD experience of a project and it might just be a lighter version that's kind of a mix of a traditional…

Interviewer: So, for you…

Interviewee C 1.4: If that makes sense.

Interviewer: Yeah, what is kind of the break between IPD-Lite and bona fide IPD?

Interviewee C 1.4: So, from a… Like some of the big differences there were being comfortable (which goes to *culture*), but also just how much are they used to showing…willing to show.. from a financial standpoint, from a schedule standpoint, and actively be a member of that leadership to drive behaviors versus "I'm just following what I've been told to do." If that makes sense. So… So, the breakdowns were really of "well, we want to be Lean." It's not just being collaborative, but it's also how do we be Lean and more efficient on the job. And… and it's not a GMP, even though we kind of treat it like a GMP, but we need you to be very willing to *share* and to *show* your… your total costs: where you're at, where you're projecting, and not kind of keep a separate set of books – here's what I'm gonna show and not show. And if they've been on an IPD project where they have not been requested to share all of that, then they don't know (they might not know) that that's the expectation that I would have is… you share *everything*. You know?

Interviewer: Yeah.

Interviewee C 1.4: There's no secrets,....

Interviewer: Is that something…

Interviewee C 1.4: …good or bad.

Interviewer: …going forward that you would definitely take the time to do the footwork and like explain that to any potential partners in the future?

Interviewee C 1.4: Yes.

Interviewer: Yeah.

Interviewee C 1.4: Yes. And I think the challenge that we constantly have to do is… Schedule dictates, an owner says, "we have to have this space by this date, or… Because we have funding that goes through here, or this that goes through there." So, we naturally will just jump in instead of saying, "no we still have to make time for this upfront alignment on the expectations." Because people quickly get past it because it's not making any physical progress, right? And those people are easy to dismiss it, but it's still important and as much as I know it's important, it's still… I run into "okay, we'll figure it out," you know? So…

Interviewer: It's one of those… There are intangible benefits to it, but that's kind of a tough sell for people who make a living putting material in place all of the time.

Interviewee C 1.4: *That's right*. Yes.

Interviewer: Yeah.

Interviewee C 1.4: Well said.

Interviewer: I mean, I think kind of what you mentioned too with talking about the accounting and stuff like that… I mean, this is something we've talked about before, where it's this lack of transparency and this unwillingness to participate in vulnerability. Whether that's with other people vis a vis like a general contractor and a trade partner, but also even with like themselves and saying like, "hey, I know I promised this, but it's not gonna happen and here's why." Like, people are…

Interviewee C 1.4: That's right.

Interviewer: …pretty self-defensive when it comes to that stuff.

Interviewee C 1.4: Yeah. They're… They… right? Everybody is driven by "I'm gonna make my commitments," but being realistic to what that commitment is and are you really gonna make it and not hurt yourself in the process of trying. You have to not do full due diligence, right? It's hard for everybody to do that.

Interviewer: Kind of dovetailing off of those intangible… I think that's even something that [Interviewee C 1.2] brought up when we talked is [they] were like "yeah, it seems unusual to spend *more* time in the beginning like doing that alignment practice and like doing that sort of upfront work that doesn't seem like it has any material value maybe," but [they] were like, "that's maybe the most valuable thing we could've done is just more of that."

Interviewee C 1.4: Yeah. I agree.

Interviewer: Let's see. So, in the same vein did you have a formal process for dispute resolution? And, if so, what did that… I mean, how did it work?

Interviewee C 1.4: We did not have a *formal* process for that. So, I think we talked through in the past about how it's broken down with the different… Some people call them "cluster groups," we call them "innovation teams" of how you breakdown the teams into smaller groups to tackle like structure or MEPs or exterior skin, right? You… you breakdown the team of who needs to be involved in a scope of work I'll call it. And so, they would work through it in their team, and if that team couldn't come to an agreement, then it would go to the Project Management Team, the PMT, and that's basically the leaders of each of those teams. That group would review it, and if *that* group couldn't come to an agreement, then it would go to the *Executive* Leadership Team, ELT, to make the final decision. So, there wasn't a formal like process, per se, to review

the disruption. What you try and have… at each level, kind of go through a hierarchy of who needs to help make that final decision to get to the final agreement. And it would only go to the top if nobody could come to an agreement of what was the right approach. Does that answer your question?

Interviewer: Yeah, and I mean, what you've sort of described to me is it sounds like there's sort of hierarchical and networked relationships at different levels. Like, you have a team of people who try to solve the problem, and if that doesn't work, then it moves up the hierarchy. And then the same thing repeats itself a couple of times.

Interviewee C 1.4: Right.

Interviewer: It's like…

Interviewee C 1.4: Right.

Interviewer: …one unilateral node-to-node chain of command.

Interviewee C 1.4: Correct.

Interviewer: So, I guess…

Interviewee C 1.4: 'Cause it was always a team in each of those scenarios, right? There is not one person that has the final final say. Most contracts, the owner has the final final say, if it's needed, but you don't… you don't go straight to that, right? You try and work through different levels of teams to get to the resolution first.

Interviewer: Yeah, that's an interesting way that, structurally, you've managed to put collaboration into it like, yeah. I think that's interesting.

Interviewee C 1.4: And I have a visual. I don't know that… if I've sent it to you in the past or not of how that team breakdown is. Of a sample. Each job is a little bit different, but at least it might show you what I'm explaining a little bit.

Interviewer: Yeah, I mean, if you don't mind emailing that to me, that would be great. I know you're not on the video right now.

Interviewee C 1.4: Yeah. It's hard for me to bring it up to show. I was prepared to bring things up to show you, but… I'll email it to you.

Interviewer: And that kind of works seamlessly into the next topic which is technology in general, but more specifically, like visualization tools. Do you know if they used any visualization or like visual communication tools on this project?

Interviewee C 1.4: Not super… The… the only visual, which isn't real visual, it's more just an Excel spreadsheet that showed like the budget tracker and so you could see are on track or are we

not on track. But it's not like a… I struggle with it's not visual: it's not pie graphs, it's not colors. It's just kind of a high-level summary with all of the backup that goes behind it.

Interviewer: Yeah, [Interviewee C 1.2] showed me that, I think, the Excel sheet that was broken out by phases and had like percentages and everything.

Interviewee C 1.4: That's correct.

Interviewer: But not like a formalized dashboard with KPIs?

Interviewee C 1.4: No. We had talked about creating a dashboard. Again, it was a lot of effort, and it fell to the wayside because of the importance to get some stuff rolling. So, it just fell off of the… importance factor.

Interviewer: And then, also, on the topic of technology, I guess… So, I've been told, there was not a BIM model for this, is that correct?

Interviewee C 1.4: No, there was a BIM model…

Interviewer: Oh, okay.

Interviewee C 1.4: …A full-blown…

Interviewer: Well, I was like…

Interviewee C 1.4: …Let me backpedal. It's probably not "full-blown," because there was so much renovation work. So, there was one floor which was before [Interviewee C 1.2]'s time that was modeled.

Interviewer: Okay. Yeah, 'cause I was like man, an interior buildout of a medical office space like… It's gonna be a lot of MEP sort of spaghetti… Like the idea that we would be doing that in 2023 and not using 3D visualization just seemed wild to me.

Interviewee C 1.4: Well, because we did talk early on. We were doing so much… A large portion of the project was renovating, so we'd take a floor and renovate and area by area. And so, the challenge you have on renovations with BIM models is how do you verify that the current existing matches the original BIM model that you have of that existing. And so do you spend too much time verifying what's there versus just going out, field surveying it, and then installing it. That make sense?

Interviewer: Yeah.

Interviewee C 1.4: That's probably a whole other stream of discussion, but… [*Laughter*]

Interviewer: So, how did you guys sort of come to that *accord*? If that makes any sense? 'Cause it seems like you guys made…

Interviewee C 1.4: Well, so…

Interviewer: …the conscious decision to *not* use it in that way, so was there like a team conversation?

Interviewee C 1.4: Yup. So, at the very beginning of the job when we were starting the design phase, that was one of the topics that we talked through and we came to an agreement as one. Put it that way. Knowing here's our risk, here's the challenges, but we're okay with that – we'll work through those.

Interviewer: Okay. And then, this is circling back to just more general project information, but the overall budget, was that set by the owner before they even came to you?

Interviewee C 1.4: They had a budget… So, they had a budget on their side. They did not present that budget to us. So, at the beginning of this job, we came to them in the interview with what we proposed the budget to be, and they had kept to themselves (what their total budget that was approved on the owner's side) they had kept that to themselves because they didn't want to skew the information. However, we spent quite a few times, several months trying to get alignment because the… We were so… Our actual numbers were quite a bit higher than their budget. So, we… we ended up having to, "okay we'll release this first phase and that gives us time for the rest of the phases." At the same time, they weren't… They eventually told us what their cost per square foot they had budgeted for versus where we were and so then we started working towards that number.

Interviewer: Okay.

Interviewee C 1.4: Kind of after we were already on board at that point.

Interviewer: And so, you said there was obviously a difference between those two numbers. How did you guys work to move your cost per square foot closer to theirs?

Interviewee C 1.4: It went through a series of… of different meetings to talk about (well) here's the assumptions we're making. With the design team and with the owner. "Here's the assumptions we're making, are those right?" "Here's the *risks*…" We started talking through our risks. And… "Hey, we're carrying this… this much of an allowance based on the unknowns that we don't have at this point in time where the design is." And we just started walking through that to try and align what were assumptions to what we think final state was and get that scope alignment there.

Interviewer: Yeah.

Interviewee C 1.4: And that… that would get us closer and then we would say, "well, at this point, (you know) I think we have a good scope alignment, now let's talk through is… is there scopes of work we just need to start removing portions of the work to get to that number? Or can you get additional funding?" And that dialogue was the next step. What could become a wish list

item and what is not *needed* right at the beginning – what's the space *need* and what's the "nice to have." So we could separate those out.

Interviewer: And, was there any value engineering you guys did?

Interviewee C 1.4: So, it's not considered value engineering for an IPD because you're onboard before the design starts; however, there was "here's what the hospital typically uses, can we use this other product instead because it saves money?" "What is the functionality?" "Does it give you just an equal amount of service?" So, we did… we did… we did do those steps which would equate to what you would normally hear as a value engineering.

Interviewer: Yeah. So, now at a more like 100,000-foot level, much more abstract, and please pull from all of your experience…. In general and then in specific, like, what would you say are the barriers and challenges (obviously) of just IPD in general like what is preventing people and I guess, on my end, I'll do a little footwork to explain sort of my personal definition of this is like…

[*Background Noise Interrupts Recording*]

Interviewee C 1.4: Are you there?

Interviewer: Yes.

Interviewee C 1.4: Sorry about that.

Interviewer: Is everything good to go?

Interviewee C 1.4: Yup!

Interviewer: Okay. So, my kind of working definitions for these things are, broad strokes, a "barrier" is something sort of *external,* and a "challenge" is sort of something *internal*. So like, a barrier would be (you know) if the law says you literally can't use IPD, then that's an external challenge that you can't really overcome like it's something outside of you, versus a challenge is something that is maybe faced on an individual level or a team level like what's really difficult to do because of IPD at that sort of team level versus something that's structurally outside of oneself. So, barriers *and* challenges… You could start with barriers, start with challenges. Again, this is your opportunity to share with me sort of everything you've accumulated over the almost decade of doing this kind of stuff.

Interviewee C 1.4: So, barriers being like a physical thing that's outside of my control you said, right?

Interviewer: Not physical, literally, but yeah, something that is external to your control. So, like, where the line of one's agency sort of stops, I guess is…

Interviewee C 1.4: Right. So, a contractor… A barrier for the contractor is we don't dictate how

an owner is going to contract the work. So, we can't tell the architect… the owner this needs to be IPD or Design Build or Traditional, it has to… That has to be decided on the owner's side. So, we can *influence*; we can't control. Also… So, a big challenge is under-… getting owners to understand the value of an integrated project delivery because so much of it *is intangible*. And costs kind of dictate in the majority of the industry. So, it's challenging to onboard in an IPD environment based on cost because you usually don't have a design at that point, so you… you couldn't put a good cost to make a hard decision based off of dollars, so… So, that's a challenge because owners want to usually see a budget, and if you're budgeting off of a conceptual plan, every general contractor is going to have a different budget because they're making different assumptions. So, that's a challenge. It's a… it's just a challenge because industry's long, deep mistrust between architects, owners, and contractors. That's been there for so long and overcoming that… that deep history of mistrust. And then coming down to just the per- people… the people. The people aspect of individuals having mistrust of people, others as well, in the same sense. Also, it works great… IPD usually works great when you have three (at least the owner, architect, and contractor) who have a good, trusting relationship. And… So, it's… it's challenging because the owners want to feel like they're giving everybody competitive opportunity to win a job, and in an IPD, you have to have that three… *at least* that three-way trust to be successful. So, if they… if they award to an architect and they don't get along with the general contractor that was hired, you now are going to struggle with an IPD. Those *three* have to build that trust. What else? Those are the… Those are obviously the top ones. You could go down to the individual level. You know. Having that unknown, IPD typically is not like a GMP or a Lump Sum or a Hard Bid going back to that cost certainty, there is a variable. But if you have the risk-reward incentive, it helps… helps spread that. But out of the risk-reward situation, oftentimes, it's hard for owners understand what their reward is because it's not always clear how much money they're going to… A lot of times they look at it as "well, I'm giving you a bonus for doing the base job that I want you to do" which is money *out* of their pocket. So, they struggle with what… with that risk-reward incentive. Although that risk-reward incentive is what drives the contractor and the designer and any trade partner that's part of it to do better. But the owner… It's not as clear where the owner comes out ahead on that. Sometimes if you don't have it set up that the owner gets a portion of that risk and reward…

Interviewer: Do you think some of this may have to do with like owners' ignorance of project deliveries in general? I mean, that doesn't make much sense to me because you would think anyone choosing to do an IPD would be sophisticated enough to know its potential benefits and be able to understand it, but I think there is kind of this ingrained idea of like "oh, well, the lowest bid means the least amount of money" and it's like, well *yeah*, you'll pay the least amount of money *initially*, but then…

Interviewee C 1.4: *That's correct.*

Interviewer: …yeah, after a year or two of change orders, like it could end up being twice as much as if you had gone with even Design-Build, so…

Interviewee C 1.4: So… *Exactly*. So, it… It's a… There is a huge miss there with the education to owners of how to demonstrate the benefits. I'm… actually there's an owner that her and I are trying to figure out how do we educate owners (progressive owners) to understand the… the

benefits. And so, we really… I think that's a huge piece of it is that education to them to *see* the benefits. Because I… I often have asked, "well, you start with that low number, but by the end of the job, are you back to the same number as somebody else who bid it?" Right? However, I don't know that anybody ever looks back to compare that. Or very few, let's say very few ever do.

Interviewer: Yeah.

Interviewee C 1.4: And, so therefore, that's part of probably that case study to show that, right? And demonstrate that. If you went Hard Bid, here's where you started, we feel good when we start… But sometimes, you know, the CFO doesn't see how it ended. You know, they don't… They don't understand the… the… the *process* it took to get there. And they see the end dollar value, and they get upset about it, but do they ever look to see where the other bids were on that Hard Bid to see did they really, truly come out ahead?

Interviewer: Yeah.

Interviewee C 1.4: And I don't think they do, right? So, I think a huge part of it… I mean, the first step is trying to get owners to figure out how we can demonstrate this information to owners and educate them so they understand the logic behind it.

Interviewer: No, I mean, you're right. It's that problem of you show them the collaboration, you show them the upfront alignment and problem solving, but then, in a very material sense, they see "okay, well, I'm just paying you 20% then the next guy and the next guy's gonna put this same thing in place for me for 20% fewer dollars, so why would I not?" and you're like "I promise you that's not gonna happen," but they won't see it until two or three years from now, and then…

Interviewee C 1.4: That's right.

Interviewer: …that's if they even see it at all because, again, that requires that sort of vulnerability we've talked about where it's like you have to have the self-reflection to go "wait a minute, did we… like did we achieve what we said we would…"

Interviewee C 1.4: Right.

Interviewer: "…If not, *why* not?" But by the time people get to the end of a project, they're like ready to (you know) do the punch list, stamp things, get it over with, and move on to the next one. And so, you almost need like a corporate project historian or someone who like does do those constant data comparisons between projects, not just for estimating purposes, but also for (I guess) personal, industrial productivity purposes.

Interviewee C 1.4: Correct. And then that's more time, and you… like you said, the… the vulnerability to go back and go "ew, that was a…*was* a bad call." They don't want to take the time to do it. Later on to find out what it might improve for them they don't want to know.

Interviewer: Yeah, and I think that maybe honestly that's just maybe honestly one of those

general challenges with the AEC industry is being able to educate and convince people of non-material benefits, and that's…

Interviewee C 1.4: Yes.

Interviewer: …that's very tough. Okay.

Interviewee C 1.4: Yeah. Yes.

Interviewer: I know that, at least in a lot of the papers I've read, something they've mentioned when it comes to this sort of idea of immaterial gain, is like a lot of people have mentioned the number one takeaway they had from every IPD project they've done, every experience, has been like the *learning* that they got from it. And obviously, this is a very like abstract concept, but I was wondering if you could maybe talk to that point a little bit.

Interviewee C 1.4: About what you learn and take away from it?

Interviewer: Yeah. Because I think you've said before too where, even despite some of these things (we're talking about some of the negative stuff), even despite these barriers and challenges, you've mentioned like "Oh yeah, I would do an IPD project again" or "Oh yeah, I would definitely want to work with (you know) these specific team members again."

Interviewee C 1.4: Right.

Interviewer: So…

Interviewee C 1.4: Right. Yeah. You know, I think… I mean, as you… If you're going through a battle together, and you're going through… And you're fighting it together on the same side, which is what an IPD experience is teaching you, you know, you're always gonna have that relationship and that friendship with the people you work with instead of going "okay I'm getting up today, I'm gonna go work, and I'm gonna be fighting with everybody," you know?

Interviewer: Yeah.

Interviewee C 1.4: Nobody wants… Nobody wants to wake up and go to work and *fight* and then go home. And in an IPD environment, even if it's *tough,* I'm getting up and I'm enjoying who I'm working with and I know that there's a team that's supporting me. And because you have that environment, you also have the ability to learn. "Oh, well that's why they, when I say this (you know), their reaction is such and such" or just understanding their… where they're coming from because you're in that environment, you ask those curious questions, right? And you have that vulnerable conversation and so you learn. So then you can apply that even to a non-IPD project because you now can ask the right questions, you now can (you know) go… Utilize the friendships you've now hired over here to say, "hey, I'm really struggling over here, what am I missing?" You know?

Interviewer: Yeah.

Interviewee C 1.4: So, that camaraderie is just *huge*, right? Of… of learning and being aware of how your actions affect others. And then how their actions affect us too, right? So, you know, you can… You then take that to the next job, and even if… So, any time that I can go into an IPD project, it's… You're gonna have the same struggles you do on any other project, but the benefit is is I know I'm going in there with people that I have a good relationship with and we're all in it together: we fail together, we succeed together.

Interviewer: Yeah.

Interviewee C 1.4: Versus on a Traditional, you're going in and *somebody's losing*. You just have to hope whether you're on the losing… *Not* on the losing side. And so, for me, specifically, right? I don't wanna get up to work and dread the conversations and the battles I'm going to have to have every day.

Interviewer: Yeah.

Interviewee C 1.4: I'd rather go to a team environment.

Interviewer: Well, and it's kind of… It's sort of like you replace the antagonism with solidarity, and instead of like a you-against-me-*and*-the-job, it's like you-and-me-*together*-against-the-job. Like…

Interviewee C 1.4: That's right.

Interviewer: There are going to be days that suck, there are going to be things that are hard, but like you, me, the other guy, like let's all get together and like just tackle it versus "oh, I have to fight you, I have to fight this other person, and I have to fight this supplier, *and* I have still have energy to deal with the problems of the job that are *literally* my job."

Interviewee C 1.4: Right. Exactly. Exactly. It's tough no matter what, right? But it's better when you're working to solve it with other people and not feeling at all on your own. And… and regardless of whether we did *true* team building or not, like that mentality, I feel like we still really drove that as much as possible *throughout* the project. And you can do that with small stuff too, right? It's not… it doesn't have to be a big… But you have to have *every*body, or at least a few people that are *pushing* everybody to keep that mindset, right?

Interviewer: Yeah.

Interviewee C 1.4: And not fall into the traditional "us against you," (you know) "me against you."

Interviewer: Okay. I think we have kind of hit everything. *I'm* good if you're good. Is there anything else you'd like to ask me or append to this?

Interviewee C 1.4: No, I think it's awesome that you guys are doing this as part of your thesis,

so… I commend you and I'm glad that I get to be a part of it.

Interviewer: Yeah, thank you. I mean, you've been a great help for me *multiple* times now. So, I really appreciate you taking the time to do this. I appreciate you getting all the people together to do this. And then, once this is finally finished, I will send you all a copy if you'd like to peruse it, but… See what we find.

Interviewee C 1.4: Yeah!

Interviewer: Yeah.

Interviewee C 1.4: That'd be great. Especially as I'm on this (you know) mission to try and educate and keep promoting on my side and so, your research can only help with that. So…

Interviewer: Yeah, I'm very interested to see where your attempts to engage owners and educate them like how that shakes out. 'Cause that's where I've gotten in a lot of both my research and other personal endeavors is understanding often it seems like the biggest hurdles we have are just, maybe ignorance? Like, oh! There's rarely malice. It's like, people just don't *know* things. So, they have to *know* these things, and then we can like convince them of why it's meaningful or why it's important.

Interviewee C 1.4: Right.

Interviewer: Alright. I'm good to go. Again, thank you for taking time to talk with me this afternoon. I really appreciate it.

Interviewee C 1.4: Yeah, no. Thanks for your flexibility.

Interviewer: Alright, I'll talk to you later.

Interviewee C 1.4: Alright. Have a good day!

End

Appendix F: Transcript of Interview D 1.1

The date of this interview was March 7, 2023. The venue of the interview was over an online Zoom meeting. The interview started at 4:19 PM CST. Interviewee D 1.1 is a Principle at the mechanical engineering firm who worked on an IPD project located in a Mountain West state of the Western United States. Interviewee D 1.1 has worked in the AEC industry for nearly thirteen years and had almost a decade of experience with collaborative project delivery methods (but not *IPD) prior to working on the project at the focus of Case Study 1. This was this interviewee's first* true *IPD project.*

Interviewer: Alright, so it's 4:19 on March the seventh, two thousand and twenty-three. We're here today with [Interviewee D 1.1], is that right?

Interviewee D 1.1: That's perfect, actually. Good job.

Interviewer: Perfect. Okay. So, what is your position and title specifically?

Interviewee D 1.1: I am a principal mechanical engineer at [Engineering Firm]. I guess my title is mechanical engineering and then I'm a principal in the company.

Interviewer: And how long have you worked in the AEC industry?

Interviewee D 1.1: Twelve years, and I've been with [Engineering Firm] for twelve years. I guess it'll be almost thirteen in June…

Interviewer: So, you…

Interviewee D 1.1: Thirteen in June.

Interviewer: …you left college and then went straight into working with them?

Interviewee D 1.1: Yes.

Interviewer: And, just so we're clear, we're talking specifically about the [Case Study 1] project today.

Interviewee D 1.1: Okay.

Interviewer: Okay.

Interviewee D 1.1: Yup. That's the PMHI [Pediatric Mental Health Institute] job that I worked on with [Interviewee C 1.2]. Yup.

Interviewer: Yeah, okay.

Interviewee D 1.1: [Indistinguishable]

Interviewer: Cool cool. And so, the big thing about that is, obviously, it's an IPD project. How long have you done work with projects that are collaborative like that? Or ha-… was this your first one?

Interviewee D 1.1: I've done plenty of projects that are collaborative. That was one of the first ones that really fell under a true IPD contract. We often don't see a lot of *true* IPD. And this one I think even had some variances from the "letter of the law" IPD, but it was pretty close.

Interviewer: So, what are your other sort of collaborative things you've done? Is it like Design Build Plus?

Interviewee D 1.1: We've Design B... (You Know) Design Build. We do some Design Build *Plus*, if you… to a *degree*. Not with the profit sharing and things like that that IPD comes with, but… Lots of (you know) we've got certain facilities that have the same team on every project. So, it's not really Design Build, but (you know) we're all working together with the same mechanical contractor, electrical contractor, owner, architect, GC. Is… is very consistent, so they don't fall under Design Build, they don't fall under IPD, but it's a very much a collaborative proj-… project 'cause we're all working for the same owner.

Interviewer: Yeah. And how have you done (sort of) collaborative delivery methods? So, you've done that the entire time you've worked?

Interviewee D 1.1: Pretty close, yeah. I mean, there's a hospital in town that I've worked with, gosh, for the last probably close to ten years, maybe a little less than that. And they've fairly consistently have had the same team or very similar team members – a few pieces have moved in and out. And as of the last two years, things have changed a little bit up there, but in general, the same team. So, that is a collaborative process, but not necessarily with a title.

Interviewer: Okay. And you, meaning your company, the mechanical company, was part of the Core Team from the very beginning of this project.

Interviewee D 1.1: Correct.

Interviewer: And so…

Interviewee D 1.1: And it was…

Interviewer: Okay…

Interviewee D 1.1: I would say they had different groups of meet-…of *teams*, right? There was… Oh, I forget the names. (You know) They classified them differently. So, at the time, when we started that job several years ago, I was in a different position within [Engineering Firm]: I was the Project Architect, not necessarily the Principal in charge over the job. And so, we had somebody else who was that. And so *they* were involved with the contract side of things and I was more involved with the day-to-day design and cost reconciliation.

Interviewer: Are you aware of, early on like, how they went about integrating project personnel. Like, were there team building exercises? Was there like IPD training?

Interviewee D 1.1: We did a little bit of training. We did some team building stuff. You know, unfortunately, this one kind of got started and was through the heart of that… that Covid deal that we all went through. So, it… it changed the tone of the project dramstic…dra- *drastically*. Excuse me. Dramatically. Drastically. In the sense that it was *supposed* to be colocation; it was *supposed* to be a lot more personal and integrated and ended up being fully remote almost the entire project. So, we… We didn't do some of the things were initially set out to just because of the situation we were all in.

Interviewer: I know, I think [Interviewee C 1.2] and [Interviewee C 1.3] told me that you guys had… By you guys, I mean like the Project Leadership Team all officed in the same place. Did you office on site there?

Interviewee D 1.1: So, they *did* that for a while. And there was a workspace setup where people were co-locating, but I… we may have gone out a time or *two*, and then it all got shut down and they kicked everyone out, right? And nobody was allowed to be in-person. And then it kind of went *back* to being in person, but I think everybody was so set in their ways by then, we never went back to really having a whole lot of co-location. I know the architect showed up a little bit more than we did, with their involvement on… on…(you know) the CA side of things when we got to that and past design. Then when things kind of freed up a little bit to let people go back, their requirement was to be there more than we were.

Interviewer: Were you the mechanical representative in like the Thursday meetings that they had?

Interviewee D 1.1: Yup. I was on all those meetings as far as when we were going over cost logs and VAP… VAPS is what they called them. (You know) I was a part of those and the representative for mechanical and often electrical. Many times, mechanical leads the charge on our projects and then electrical has often got a smaller scope and a smaller fee. So, when we're working through our fees and how we're staffing meetings, (trying to avoid just having people be on meetings to be on meetings) – and IPD has a lot of meetings.

Interviewer: What was your (kind of talking about fees) what was your contract amount of the overall contract?

Interviewee D 1.1: I'd have to… I'd have to go back and look. I don't have those numbers right in front of me. Typically, our fee on a larger project like that, is based on a percentage of the overall construction cost. And then as part of the IPD, we also had a… a portion of risk, right? That was broken out. That actually became a little challenging and a "lessons learned" out of the project is the way contractor looks at the terms "fee" and "risk" and "profit" and the way a design team (such as us) looks at fee and risk… *Everything* we have is "fee." We don't have a profit number like a GC would have or a contractor that we tack on top of our fee, we just have our time that we sell. So, it got a little tricky going back and forth on what they were calling

"fee" and "profit." Something… I would bring to light earlier in a project next time.

Interviewer: So, there was like some semantic confusion?

Interviewee D 1.1: Yeah. And just how things were reconciled at the end of the day. (You know) They kept saying "how much *fee* do you have left?" and I'm like, "well, my *fee* is the only thing I *have* – I have all my fee left." They were… Their term "fee" or "profit" was really the portion at risk.

Interviewer: Okay.

Interviewee D 1.1: So, it's just semantics (for *sure*) were a little bit off on that one. And we had a lot of people move in and out of that project. I'm sure [Interviewee C 1.2] mentioned to you. So, it… it became a little challenging managing everything towards the end there.

Interviewer: And were you on it the whole two years?

Interviewee D 1.1: Yup. Yeah, I was involved through the start of design (you know) until the very last meeting.

Interviewer: Compared to other projects that you've had, do you think that having those Thursday meetings was *beneficial*? Like did you find the *more* or *less* valuable than they otherwise could have been?

Interviewee D 1.1: It'd depend on the meeting, right? I mean… We were required to be at it, but we often didn't have a whole lot to contribute to it. So it, like I said, there were a *lot* of meetings on that job where we just got on and (you know) were required to be on the meeting, but didn't have a whole lot to contribute to it. And I think that's a big concern with IPD, especially when you're required to co-locate. (You know) We are as the design side, and *especially* on the MEP side even relative to architectural, it is *extremely* rare that we would be dedicated to a single project. Whereas an architect or (for example) a GC, the people on that job are often dedicated solely to that job and we are *not.* We work on a handful of jobs typically. And so being collocated for an entire day makes workflow a little challenging for us, especially if we're not contributing all the time. So, I… I… there… they had their moments of value, but they also had their moments where it's like, "gosh, do we really need to be on here? Can you let us go early?"

Interviewer: Yeah, it kind of sounds like *most* meetings at that point.

Interviewee D 1.1: Yes.

Interviewer: Yeah. Had you guys (meaning your mechanical company) worked with [General Contractor] before?

Interviewee D 1.1: Yeah. No, we…(I mean) we've done a *ton* of work with [General Contractor] and… on a *wide* range of projects. In fact, (You know) [General Contractor] had historically been part of that other hospital group that I was mentioning working with [Interviewee C 1.3]

and [Interviewee C 1.4]. I don't know if you've met [Interviewee C 1.4]?

Interviewer: Yeah.

Interviewee D 1.1: That was in [Interviewee C 1.4]'s younger days, mine as well. When we were working hand-in-hand on those (you know) "collaborative projects," but not necessarily under a specific contract or Design Build. Sometimes it was Design Build, often we're working for the architect depending on the size of the project. In… It didn't have the same meeting cadence, but it was also very much everybody wanted to achieve the same goal.

Interviewer: And as a subcontractor, (I mean) I guess you guys were a Trade Partner under this contract, you weren't bonded, were you?

Interviewee D 1.1: I do not believe so. No.

Interviewer: And this is just kind of a very granular question, but did you guys have any issues with securing insurance for this project because it *was* and IPD project?

Interviewee D 1.1: I wasn't involved in that. I know in the past, we *have* (depending on what the insurance requirements are) had to adjust that, but we carry pretty high levels of insurance standard because a lot of our contracts require a significant amount of insurance, so we… we cover our standard insurance to cover our large and our small projects so we're not… up and… (you know) upping it project-dependent.

Interviewer: And were anything… Was there anything from your perspective or any stories you'd like to share about like specifically the mechanical side of this project that you remember? I mean, obviously it's a big package – it's a big *piece* of it. So…

Interviewee D 1.1: Yeah. I mean, this… this was a *very* unique project because of the client and because of the setting of the project. I mean, it was… It was behavioral health, it was *children's* behavioral health, with a *lot* of unique requirements for it as far as safety precautions and how we were specifying things, how things were laid out, the importance of safety on it. So, I mean, that for *sure*… I'll never forget some of the stories that came out of that project. There were just different things that happened and… and a lot of reactionary processes to it. In the sense that if something happened in the facility while we were in design or construction, they may change the design at that point in time to accommodate that, and that's pretty rare, right? We don't *often* switch our design out in the middle of it because something that's happening there, but it was a *safety* concern. Okay, we did this on the… (you know) level *three*, but we ran into issues, so we're gonna change that for five and six. So that… that was *definitely very* unique. The other piece to this one that was *interesting* is the budget for it (you know). The initial budget was… came in. The owner said "that's way too high," beat everybody back down. Budget got put there, but quickly went right back to where it was, and so that… that was a bit of a challenge on this job for everybody involved.

Interviewer: How did you guys finally arrive at a budget that was workable for everyone? Like, what was the process of getting there?

Interviewee D 1.1: Well, that's the part that made it *interesting*. I think everyone *arrived* at the budget the owner *wanted*, but I don't think anybody had a whole lot of confidence that it was gonna *work*. The… (you know) they took *everything* out. They took… they threw everything and the kitchen sink at it. Got back to the number the owner wanted to *see,* but then very quickly it became apparent things were gonna have to come back into the job to make it safe and make it work. And so that… that was a *challenge* with the job and a concern (you know) what is the perception of the job? Because it came in *way* over budget, but that *budget* was… was beat down *very* hard to a point where people were concerned about making that work.

Interviewer: And did you guys (as the mechanical contractors) use a BIM model to coordinate all of your construction on this?

Interviewee D 1.1: Yes and no. There were a lot of existing conditions we were working within and those were *not* through (you know) *not* in our model as a true BIM model or 3D coordinated. So, when we went back in, we were *not* blowing the whole space out and redrawing, there were many spaces where we were leaving existing conditions in place and adding on to them. So, we didn't do a true (you know) BIM coordination process. We drew it, the contractor would go out and modify it as need to make it fit. Or if something wasn't working properly, they'd come back to us and we'd together to try and find a solution.

Interviewer: So, there wasn't like a centralized, shared BIM model or anything like that?

Interviewee D 1.1: Well, there *was*. I can't remember… I don't think this one was like… When you say centralized, I… We do all our work in Revit. I go to BIM360 where it's a centralized, *shared* Revit model on the cloud and everybody's tapping into that. I believe we all had our *own* models, and then we were sharing that with the architect. [Indistinguishable] I don't… I think this one started before BIM360 got real popular. I could… I'd have to go back and look. I started out drawing, but I did very little drawing actually *in* this project. That was carried out by some other people. Let's see… No, it *was* BIM360. I think we *upgraded* throughout the project. So, we did it in BIM 360, it was a shared model, but it wasn't necessarily a true coordination process where the contractor took our drawing and then converted it into a… their own shop drawings, they were just doing takeoffs from our drawings.

Interviewer: So, like everybody on *your* team obviously would use that, but it's not like it was everybody across all of the teams using that?

Interviewee D 1.1: Well, my te- (you know)… My team, being [Engineering Firm] was mechanical, electrical, plumbing, and technology as all in the same model. And then the architect was in that model. So, the… the… the *core* design team was all sharing that one model.

Interviewer: Okay. That is good to know. And did you guys also do (meaning [Engineering Firm]), did you guys do the fire suppression system?

Interviewee D 1.1: We do a performance-based specification for fire sprinkler, so we… I don't believe on this one I think all we did was la… We'll callout hazard levels for different spaces.

You know, if it's ordinary hazard or light hazard, whatever it may be. And then, our specification (you know) requires a fire sprinkler contractor to come in and do the layout of the heads, the hydraulic calculations, things like to meet… to meet NFPA requirements. We… there… we don't… [Engineering Firm] does *not have* a FPE that is doing those designs.

Interviewer: Okay.

Interviewee D 1.1: And that's pretty typical.

Interviewer: Did you guys have (and this is just purely a curiosity question on my part) did you guys have *strange* material problems during the time of Covid? Like, material acquisition. I mean, if you're doing mechanical and electrical *and* plumbing, I would imagine *yes*, but…

Interviewee D 1.1: There… there was some of that going on. You know, it… Lead times and things like that. (You know) There was door frame issues or door hardware issues. It… We were *mostly done* by the time things got really weird, but it… it was… it was definitely a concern. *Costs*. And… and… the *cost* of things went up and that was part of the budget issue is… things started to cost more and that's continued to be a problem.

Interviewer: Yeah. So, since you've done collaborative delivery methods over a time, this is actually really *perfect* because the whole thrust of my master's thesis is like what are the barriers, what are the challenges, opportunities, that kind of thing. Kind of probing the world in 2023 and seeing what people say now. Only because so much of the literature at this point is nearly a decade old or older.

Interviewee D 1.1: [Indistinguishable]

Interviewer: So, trying to update it and see what people are talking about. But all of that is a preamble to in your opinion, both with this… *this* job specifically and then more generally, what do you think are just common barriers that people have with this sort of IPD or even Design Build Plus? Like what have been (sort of) recurring themes that you've been exposed to?

Interviewee D 1.1: I think one *major* one from us on the MEP side is the co-location. And understanding the value of that, of us being there the *whole* day. We… we struggle with that one. It's… it… it's tough. Especially in today's age now when we've all become so proficient with these Zoom calls. Are you getting a whole lot of value out of us being there other than it costing the owner a whole heck of a lot of money for us to camp someone out on there project for an entire day. So that… That's one of the barriers I see. But I… I *personally* really *like* the collaborative approach to projects because you've got a lot more depth, you've got more team players, and everyone's vested in the end result. But it… it… ca- (I mean) it… it *can* be more expensive and so that makes it *tough* for an owner to *justify* those costs because it… it requires more of our involvement, more of the contractor's involvement. Everybody's more involved in the job. So, it… it… it *has* its pluses and minuses. I think the biggest barrier is when is a job *big enough* to warrant having a collaborative (you know) *true* IPD approach to it or Design Build *Plus*, if you will. Our job was… I think it ended up being twenty million-ish and to me that felt like right on the edge of being big enough. (You know) It really-in *my eyes*-requires a larger

project than that to *justify* using that much time and that much involvement on a job and to have it be successful. On a *mega-job*, (you know) when you're talking a *new-build hospital* or a *large lab building*, I could see the value coming out of it 'cause that's a…that's a *big* job taking a *lot* of people's time. But on something like this, it was smaller, didn't see as much value in it. And then to get it on something even smaller than that, it… (you know) you start to question are you using people's times wisely?

Interviewer: Yeah, you maybe… Once you go under that lower threshold, you're maybe involving *too many people* with *too many ideas* for maybe not enough *conversion* on that time that you spent doing that.

Interviewee D 1.1: Yeah. You know, what is the cost-benefit of involving *that* many people for *that* much amount of time? Are you saving any money at the end result, or are you just spending more time on the job? 'Cause everyone's fees are gonna go up. You're gonna pay for that.

Interviewer: Do you think… I mean, there's gonna be like a happy median of like price point like a hundred million dollars or something where it really starts to become apparent, or…

Interviewee D 1.1: I mean, I… I… I… There's *gotta* be something out… there's a price out there *for sure*, and maybe it's not a *hundred million dollars*. But, you know… I guess, total project cost, but it… it… Maybe it's *fifty million dollars* or *sixty million dollars*. Where there's a point there where there's enough involvement in the job and a complicated enough job that it requires a lot of that help, but if you're doing a patient tower and you're repeating the same thing up and throughout the building, (you know) again that's a pretty simple job, if you've got a strong contractor team that can figure that out. And I think that's the other key component to it also is you *have* to have strong team members. (You know) You're only as strong as your…strong as your weakest link. If you have a weak link, (you know) it makes it painful for everybody. 'Cause that… that wink… *weak* link could cost the whole team to pay money, right? When you're all sharing risk.

Interviewer: Yeah. Speaking of, was the participation in like transparent accounting something that you were familiar with from having done other collaborative projects?

Interviewee D 1.1: No, that… I mean, that's *super* uncommon for us…

Interviewer: Okay.

Interviewee D 1.1: …for us to share our billings with except for with just with our client and how much money we have left in the job and (you know) on that… On this PMHI job in particular, every week we were sharing "how much money did you spend?" That's… *un*common. Typically, that's… All it is is an invoice sent directly to our client. That's where it gets shared. Nobody's sharing fees. That's usually very *private* information.

Interviewer: So, would you say that was a level vulnerability that was unfamiliar for sure?

Interviewee D 1.1: Yup! No doubt, no doubt. When we're sitting there sharing our fees and

hanging that all out there in front of everybody… You know, it's kind of a look behind the curtain that we don't usually see. Or how much people were spending.

Interviewer: Yeah. Have all of your other collaborative projects been hospitals?

Interviewee D 1.1: Not necessarily. I mean, we've done some other Design Build projects for other types of higher education, things like that. But *true* IPD… I'd have to say… In our office, in general, it is healthcare projects that we've seen it. In those that have been IPD-*ish*, if you will…

Interviewer: Yeah.

Interviewee D 1.1: …very rarely are we coming across one that is a true IPD contract.

Interviewer: That's seems to be pretty common…

Interviewee D 1.1: Yeah. I mean, the *costs* and the *work* involved with a true IPD contract (and the *risk*)… Because it… when you take a step back, it's all risk on the design and construction team, all benefit for the owner. And I think a lot of owners recognize that and they want to take park in the risk to a degree as well.

Interviewer: Do you think this is something that fits more with medical construction only because of the amount of *capital* they have?

Interviewee D 1.1: I… I think some of it is just… Construction does some large proje- Not construction, excuse me. Hospital healthcare does large projects, and… and they are *complicated*, and they require a high level of detail. Whereas (you know) if it's a residential building or an office building, something along those lines, not as complicated, not as important for everyone to be on the same page (in *my opinion*). There's just not as many *systems* going on there. But, again, we do a *lot* of healthcare projects that are *very large* and they are *not* IPD…

Interviewer: Yeah.

Interviewee D 1.1: …and they're *still* successful projects. And they're not *Design Build*. They're standard Design Bid Build. It *is* helpful when they have a CMGC or some sort of involvement of the contractors early can be a big benefit.

Interviewer: Yeah. And, in your opinion, would there be any way to remedy or smooth over some of the things that you see as being hangups with IPD? Or… what would you do if you could be king for a day, like make some of these things a little better, I guess?

Interviewee D 1.1: I… I think some of that has started to happen naturally… And…and… and you hit it, and I said the same thing: nobody's doing true IPD; they're taking IPD and modifying it to make it work *best* for their situation. And I think that's *always* the case. Each project is gonna need some sort of unique nuance that is gonna make it *flow* better or *work* better for the job. And so that may be (you know) how much risk each consultant is carrying, or the *schedule*,

or the *cadence of meetings*, or the *involvement of different consultants*. And we see that *change* in how they do that. They may (you know)… We've seen where they want *all the collaboration*, but they want *none of the profit sharing*. (You know) They wipe that away, but they're gonna take some pieces, so it's "IPD-Lite," if you will…

Interviewer: Yeah.

Interviewee D 1.1: No, I think that's… that's what people are *doing* is taking the pieces they feel are…are best. And I would do the same thing, right? I don't know if all the co-location is that beneficial every single week - maybe you break that up. How much information you're sharing with… How much you're spending week to week? What value is that providing? Why does everybody need to know that? But, working hand-in-hand to work through problems, that's the valuable piece in my eyes.

Interviewer: Yeah. Alright, I think we are pretty much almost done unless you have some closing thoughts or anything that you wanna just to punctuate the mesh… the *session* with.

Interviewee D 1.1: No. I mean, I think we'll continue to see it. I've got an… another owner-client who wants to push towards using IPD in the future. And many of them are moving *away* from it right now. So, I don't know if it'll ever be something that is the commonplace, but I think it has it's place. And collaborative design is important because if… if you're not all working together, you ultimately can start working against each other. And it's a *tough go* when you start being contentious with the rest of the design-construction team.

Interviewer: Yeah.

Interviewee D 1.1: Makes for…makes for long projects.

Interviewer: Speaking of, really quickly, 'cause this has just reminded me of something that someone else has mentioned. Did you feel like that sort of traditional antagonism between trade partners and contractor and designer ever *really* subsided or was it still in some way present throughout the whole project?

Interviewee D 1.1: On this project in particular, I didn't think there was a *ton* of that happening. Everybody was pretty open. The owner was pretty open. (You know) We were *very familiar* with the contractors being the mechanical, the electrical, and the general contractor. There… (I mean) there definitely was contention at time on like "why is it costing this much," or "why isn't this person participating anymore?" But that dro-… *job* drug out for a *very long time*. People, I think [Indistinguishable] by the end of it. So that… that came up, but it was definitely lesser than if it was a true plan spec job where you were constantly saying "no, this was what was intended, you guys owe it to the job," and they're saying, "heck no, that's added costs." And we fight over it.

Interviewer: Yeah. I think that was the consensus everyone else had mentioned too. Where it's like, "yeah, there were *moments*," but it was certainly much less than a regular job would be.

Interviewee D 1.1: Yeah, no. I mean, much less than a regular job. And when you have a… a *rough* job with a contentious team (I mean) it is *long* and *tiring* and (you know) *not a great*… *not a lot of fun to be a part of*. And they *happen*.

Interviewer: Yeah. Alright, thank you for spending time with me. I really appreciate it.

Interviewee D 1.1: Yeah, no worries. Sorry it took me so long to connect.

Interviewer: Nah, you're all good. I'm good if you're good. Have a good evening, man!

Interviewee D 1.1: Yeah, you too!

End

Appendix G: Transcript of Interview TP 1.1

This transcript does not represent an interview, but rather, the responses to certain questions from the interview instrument which were answered by the "interviewee" and sent via email to the researcher. The email was received on February 26, 2023. The "interviewee" was a Project Manager for the interiors contractor who worked on the IPD project located in a Mountain West state of the Western United States which is the focus of Case Study 1. The respondent has ten years of experience in the AEC industry, six of which have featured involvement in IPD projects.

Interviewer: What is your position/title (e.g., Construction Project Manager, Owner's Rep., Lead Designer)

[Interviewee TP 1.1]: Project Manager.

Interviewer: How long have you worked within the AEC industry?

[Interviewee TP 1.1]: Ten Years.

Interviewer: How long have you done work with projects involving collaborative delivery methods?

[Interviewee TP 1.1]: Six Years.

Interviewer: What is your understanding of and familiarity with collaborative delivery methods?

[Interviewee TP 1.1]: Fairly familiar. I've worked on three IPD projects.

Interviewer: Was this the first time you or your team had participated in a project with collaborative delivery method?

[Interviewee TP 1.1]: No.

Interviewer: What was the contracting style used? (AIA 195-295, Modified AIA, DBIA, Modified DBIA, IPDA or IFOA)

[Interviewee TP 1.1]: We used AIA C191-2009 Multi Party Agreement.

Interviewer: What was the compensation structure? (GMP, Lump sum, Fixed fee, EMP)

[Interviewee TP 1.1]: Essentially a GMP with shared risk and incentive.

Interviewer: What was the duration of the overall project? How was this determined?

[Interviewee TP 1.1]: Two and half years this was developed with the owner to come up with the best possible result to meet the needs of the owner and allow the most production.

Interviewer: Who was the driving force behind adopting an integrated project method? (Owner, Designer, Contractor, Other)

[Interviewee TP 1.1]: Owner.

Interviewer: What, if any, do you believe are major barriers and challenges to the implementation of collaborative delivery methods?

[Interviewee TP 1.1]: Owners allowing and trusting process.

Interviewer: Was there a shared risk reward mechanism? (Profit pooling, sharing savings/overruns)?

[Interviewee TP 1.1]: Yes.

Interviewer: Were there challenges unique to agreeing upon the compensation structure? What were they?

[Interviewee TP 1.1]: The owner wanted goal-based incentives tied included.

Interviewer: How did you go about integrating project personnel? (e.g., Integrated subcontractors, referring to subcontractors as "trade partners," collocating, use of a singular shared BIM model)

[Interviewee TP 1.1]: Trade partners were added through an interview and selection process.

Interviewer: Did you have established procedures for conflict resolution? What were they? Were they contractual?

[Interviewee TP 1.1]: Yes, it was just a simple vote process in the PMT or PLT.

Interviewer: Did the contract/agreement require a liability waiver on the part of the "core team" participants?

[Interviewee TP 1.1]: I'm not sure about this one.

Interviewer: Was there IPD specific training involved? If so, what did this consist of?

[Interviewee TP 1.1]: Not for this project.

Interviewer: Was there an IPD Team Leader or "coach"? How was ongoing support provided?

[Interviewee TP 1.1]: Yes. [General Contractor]'s first PM was also the "coach."

Interviewer: Was there a preexisting relationship between any of the contracting parties?

[Interviewee TP 1.1]: Some, if not all, of the trade partners have all worked on other projects together before.

Interviewer: Was there a type of continuous learning plan implemented on the project? If so, how was it structured and who spearheaded its implementation?

[Interviewee TP 1.1]: Not for this project.

Interviewer: Were there any legal barriers to integrated project delivery? (e.g., limitations presented by insurance, bonding, or municipal requirements)?

[Interviewee TP 1.1]: No.

Interviewer: What was the formal process for dispute resolution?

[Interviewee TP 1.1]: Disputes were to be resolved by the PLT.

Interviewer: Was bonding required?

[Interviewee TP 1.1]: No.

Interviewer: Was Subcontractor Default Insurance (SDI, "Subguard") Utilized on this project? If so, who bore the cost of the insurance?

[Interviewee TP 1.1]: Yes, we just had our standard insurance.

Interviewer: Was this project able to fit within a more traditional product offered by the insuring party?

[Interviewee TP 1.1]: Yes.

Interviewer: Was there a singular shared BIM model used on the project for coordination?

[Interviewee TP 1.1]: Not sure.

Interviewer: Was the use of BIM technology unfamiliar to members of your team?

[Interviewee TP 1.1]: In the [state name] market, it is rare to model walls and studs. We didn't model anything, so it was solely used by the MEPs. We were not reluctant to model it, but the team decided not to model our scope because we didn't think the benefit was worth the cost.

Interviewer: Was there a regularly updated project dashboard available to all project participants?

[Interviewee TP 1.1]: Yes, we utilized Teams for this.

End

Appendix H: Transcript of Interview C 2.1 and C 2.2

The date of this interview was March 17, 2023. The venue of the interview was over an online Zoom meeting. The interview started at 1:00 PM CST. Interviewee C 2.1 is a Project Director for the General Contractor. Interviewee C 2.1 has eighteen years of experience in the AEC industry. Prior to working on the project at the focus of Case Study 2, Interviewee C 2.1 had no formal *experience working with collaborative project delivery methods, but had incorporated some collaborative elements int CMAR jobs.*

Interviewee C 2.2 is an Assistant Project Manager with the General Contractor. Interviewee C 2.2 has eleven years of experience in the AEC industry. Prior to the project at the focus of Case Study 2, Interviewee C 2.2 had no formal *experience with collaborative project delivery methods, but like Interviewee C 2.1* had *worked collaboratively on previous CMAR projects.*

Interviewer: Alright. So, it's March seventeenth. One o'clock in the afternoon. I've got [Interviewee C 2.1] and [Interviewee C 2.2]. First things first: would you guys tell me your positions and titles and also how long you've been in the industry.

Interviewee C 2.1: Okay. I'm [Interviewee C 2.1]. I'm the project *director* on the project. My role is overall responsibility for execution of the *project*. I've been with the industry *and* [General Contractor] for eighteen years. All of that experience being with [General Contractor], obviously. *Interviewee C 2.2*?

Interviewee C 2.2: Yeah, Interviewee C 2.2. Assistant project manager. Functional team lead for the building enclosure portion of the scope. Have worked for [General Contractor] for eight years now and been in the industry for eleven. Yeah.

Interviewer: Okay. And then, for each of you, how long have you done projects that are collaborative? So, like, is this Progressive Design Build? The [Project Name] project.

Interviewee C 2.1: This is… *Yes*. This is the first *contractually* Design Build project I've ever done…

Interviewer: Oh!

Interviewee C 2.1: …Obviously collaboration's important on all jobs. So, yeah. This is the first time that I've been a part of a job that was Design Build or IPD or anything other than CM at Risk.

Interviewer: Okay.

Interviewee C 2.1: Yeah.

Interviewee C 2.2: Yeah. Yeah, same with me.

Interviewer: Very cool. Very cool… So, in general, what is (kind of) your understanding of these

(sort of) collaborative projects and how does that differ from things that you've done in the past? Like, what's your just (again) personal understanding?

Interviewee C 2.1: [Nods to Interviewee C 2.2] Go.

Interviewee C 2.2: I would say that I don't necessarily feel a big difference in terms of the way the project operates in terms of like culturally or the effort that it takes to resolve issues or… or come up with resolutions. Like [Interviewee C 2.1] kind of mentioned there already: the collaborative aspect is always super important. Like, we cannot build the building without having a great working relationship with our architects, or we *can* but it doesn't go very well. Or our ownes… our *owners* or our trade partners. So, the only thing that really feels different on this one was we have contracts in place that support that relationship that we always try to build anyway. So, we had specific (you know)… We were ince-… Incentives… Incentivized might not be the right word, but we were encouraged to bring on trade partners early on, and we were able to get those trade partners under contract very early because of the like integrated project (you know) approach that we have here. We brought them all on as design-as… *most* of them on as design-assist partners so they were able to like (you know) essentially act as consultants during the design phase, and then ultimately we… we translated all of those contracts for the most part into Part B construction contracts. So, there… (you know) we essentially smoothed out the buyout (you know) going through that process. We definitely got some good integration between like what the trade partners ultimately were going to ask for and what the design team was drawing on the pages that (you know) increase efficiency there, but you can do that without a formal contract in place. Like the trade partners are interested in selling those services and getting involved early in the project whether or not they get a design-assist contract or not it… it feels like. So, yeah. In terms of actual execution don't feel a lot different, it's mainly a contractual difference. In my eyes.

Interviewee C 2.1: Yeah, I'd echo some of that. I think (you know) from a conceptual standpoint of the thought is that the contractual setup allows for more opportunities to build integration into the project, right? For all the reasons that [Interviewee C 2.2] said about bringing on partners earlier, bringing partners together earlier, bringing members of the final team to the job together earlier to begin building collaborative relationships, building the team work that needs to occur. I would also echo what… Well, I would also add to what [Interviewee C 2.2] said to say that this is *not* the most collaborative job I've worked on. The most collaborative job I've worked on was a CM at Risk job, but it was because the partners. We brought them on early in SD, but it was still the architect… *who* the architect works for is the only real *change* in this structure, and I don't think that by itself that element is the controlling factor for how integrated and collaborative a project is, right? It really depends on the people, the personalities, and the ability of the group to build the team which has kind of been the experience overall.

Interviewer: Yeah. And you mentioned who the architect works for in this contract, so who is that specifically?

Interviewee C 2.1: This is contractor-led Design Build, so [General Contractor] holds the only contract direct with the client and then we hold the contract for the main designer of record, and then they hold contracts with their subconsultants, and we hold all the subcontracts for the… for

the actual work as well.

Interviewer: Okay. Kind of dovetailing into the next question, what style of contract did you guys use? Was it a modified DBIA or a DBIA?

Interviewee C 2.1: It was. Yeah.

Interviewer: Okay.

Interviewee C 2.1: Yup.

Interviewer: And then… So, with the compensation structure, in IPD there's a lot of like shared risk-reward elements. That's like usually the most unique part of IPD. Do you guys have any of that, or is it just really just Design Build in the sense that everybody's together, but they still have all of these individual subcontracts?

Interviewee C 2.1: We have elements of that through incentives in the contract. We have an incentive program to share contingency savings. That… that portion of the contract is with [General Contractor] and the client, and then we decided that we would take that element [coughs]… Excuse me. …and pass that down to [the Designer] for the use and savings of design contingency. And incentivize them to make good decisions for the project (you know) in the equitable sense or the economical sense and say, if there is a remaining portion of what we… we have allocated as design contingency for the job, we'll share those savings with you.

Interviewer: Okay. So, pretty close, but not like exactly how…

Interviewee C 2.1: Right.

Interviewer: …IPD usually is.

Interviewee C 2.1: That's right.

Interviewer: And I saw on the YouTube videos that you guys like got your final Phase 4 plans or whatever not too long ago…

Interviewee C 2.1: We did!

Interviewee C 2.2: Yeah. Got 'em a couple of weeks ago.

Interviewee C 2.1: We got. Design is done done… done done. Which is good.

Interviewer: So, actually, I'll go in (just for a second) and talk about the project specifically so I can get all of those little factoids.

Interviewee C 2.1: Sure.

Interviewer: The building hospital, yes?

Interviewee C 2.1: *Yup.*

Interviewee C 2.2: *Yup.*

Interviewee C 2.1: It's a patient tower. Yup. So, it's a… it's a new patient tower, seventeen stories. It will have inpatient beds as well as imaging, radiology, surgery, support space, and then kitchen and dining.

Interviewer: Okay. And how many square feet is it total?

Interviewee C 2.1: Ssss….

Interviewee C 2.2: Six hundred eighty thou-.

Interviewee C 2.1: …ix hundred and eighty. Yeah. Six eighty.

Interviewee C 2.2: [Nodding]

Interviewer: Okay. Six hundred and eighty thousand?

Interviewee C 2.1: [Nods] Mhmm.

Interviewer: Yeah. And then what's your total construction period expected from like start to finish? Or when did you guys start (I guess) the Design Build integration all the way to when we expect to be completed?

Interviewee C 2.1: Woof. That would be… So, we were awarded the job and began (kind of) planning and design in December of 2019. There is a gap in here for Covid where the project was put on hold, so let me think about that o… o… over all from December of 2019 to our last substantial completion date which will be December of 2025. So, that's a six-year period. I think you have to take about eight months off for Covid…

Interviewer: Okay

Interviewee C 2.1: …where the project was… was paused. So, I think overall that would be… Whatever that is. Five years and four months.

Interviewer: And what's the overall project budget, or I you guys have a GMP?

Interviewee C 2.1: Yeah. We have a GMP (Guaranteed Maximum Price). It's… it's six hundred and eighty million dollars…

Interviewer: Okay.

Interviewee C 2.1: …-ish. Give or take a few million.

Interviewee C 2.2: Who's counting?

Interviewee C 2.1: Between friends

Interviewer: Contract type we've addressed. And then the location's in… Yeah… [Central US City A].

Interviewee C 2.1: Yup.

Interviewer: So, now we'll get into some project information. The overall budget of the project, how was that determined?

Interviewee C 2.1: What do you mean?

Interviewer: So, did your owner say "hey, I just have this much money, you guys have to make it six hundred and eighty *million* or fewer dollars"?

Interviewee C 2.1: *Oh!*

Interviewee C 2.1: No. No. It was… So, the project was put out with bridging documents that were created as part of a master planning effort from the… from the client. So, they had a concept for what the building should look like, and then [General Contractor] worked early when we… we… we provided with the initial proposal for the Design Build our Schematic Design for the building basically *plus* an estimate of that, right? And so, they kind of took the teams that they were competing against and said, "what is your… what is *your* vision for this building and how much does it cost?" And they sort of awarded based on those two things. There was not like a "cap" for the building, there was not a… a set budget at the time. And then… And then really just target budgeting from there as we refined the design and... Obviously, at that time it was kind of a proposal… conceptu- more conceptual design. And then as we went through the iterations of Schematic and Design Development and final Construction Documents, just making sure that we're trending and managing the ups and the downs and the wants and the needs and keeping that thing within budget.

Interviewer: And so, did they have a *schedule* maximum at all?

Interviewee C 2.1: No. No. They really took… they took a pretty liberal approach here, right? Where they… they had the teams get together and pair up. And then they… they stipend each team they gave… [coughs] …I don't remember the exact dollar amount, but they said, "we're gonna (you know) we're gonna pay you guys to develop this estimate, develop this thing, but we wanna watch. We wanna be in the room with the team to see they dynamics of how these pairings are gonna… are gonna come together and how the team's gonna work." And so, they… Like… It was really interesting as the teams were working together like we were of course trying to like find some information from them like what's the other team doing? How long is it gonna

take them to build this thing and what does it look like? And the… So, there's all these varying parameters, right? And at the end of the day, I think that the client was not necessarily deciding on the building and the schedule that they wanted, they were really focused on the team that they wanted. They were really focused on the team that they wanted and… and so they really put a lot of emphasis and weight into the dynamics of how that team operated. And I think making their ultimate decision. Assuming that no one stayed really far from the bridging documents that were originally given us given to us for the kind of vision for the tower, the minimum program that was needed. And… and so it sort of lead us all to the same building *size* obviously and then based on… When you get to jobs of that *scale*, right? Like the schedule's gonna be pretty close [laughs] overall, right? How long it takes to build so many square footage of healthcare space in [Central US City A], right? And so, I think, I don't know this, but I suppose that most of the teams were relatively close in terms of budget and building size and scope.

Interviewer: And so, when you're talking about these teams that they had work together, was it just like representatives from [General Contractor]? Or was it like [General Contractor] and some trade partners all working together to do this like (I guess) estimate in a room or something?

Interviewee C 2.1: Good question. So, each team approached this a little bit differently. I do know that piece, right? So, like some of our competitors, they decided that they were bringing on some of the trade partners during this proposal phase and saying "we're *going* to use this trade partner to do the mechanical work and the electrical work and so they are part of our proposal team." [General Contractor] does a lot of the estimating for mechanical and electrical in house, so we didn't go that route. We decided to leave it more competitive later in the job. And so… for… for our intents and purposes, it was… it was just [Designer], [General Contractor], and then the mechanical electrical designer, [Mechanical Electrical Designer (Represented by D 2.1)]. It… In the room. So, that was kind of the proposal team. Along with the structural designer, [Structural Engineer]. That's it. And [Civil Engineer] design, who was our civil designer. But it was a design and build team, generally, who were coming up with these things.

Interviewer: Yeah, this is really interesting. I haven't heard of something quite like this in the interview process. So, again, this is really one of those like… That's about as IPD as you can get without a label.

Interviewee C 2.1: Oh, for sure. Yeah.

Interviewer: Just back tracking for a quick second.

Interviewee C 2.1: Yeah!

Interviewer: Forgive my ignorance. In [Central US State], are your hospitals public or privately funded? How does that work?

Interviewee C 2.1: Privately funded.

Interviewer: Okay, so you…

Interviewee C 2.1: Well, it could… It varies, right? Most of the hospitals will have some combination of funding. This project is entirely privately funded from [Owner].

Interviewer: Okay.

Interviewee C 2.1: They're a private organization. So, made things a little bit easier on us. [Clears throat]

Interviewer: And so, was [Owner] the driving person in generating all of this collaboration? Like they're really (I guess) spearheading (sort of) getting all this integration happening?

Interviewee C 2.1: Yeah. They sent the RFP out, right? The Request for Proposal. Or request for qualifications or whatever it was called at the time, and they… they did a lot of… of… They drove this into the process, right? They had… they had a ne-… less than stellar experience on their last major project, right? And they… they contracted that with a program manager and then like a hundred contracts directly to [Owner] and they let the program manager (kind of) influence it, but not own it and so they ended up with this kind of disaster…

Interviewer: [Laughs] "Kind of disaster."

Interviewee C 2.1: [Laughs] Right. And so, they… they decided to do Design Build on this job to increase that collaboration and… and really they sort of chose the right method for all the wrong reasons, right? They really just wanted to have one throat to choke and say like "[General Contractor] is gonna own all of the risk and all of the contractors – including the design – and we want one piece, one go-to element that will control all of that risk and be responsible for it." And we love that, right? We thought… We thought that was amazing. And yes, this is all the stuff that we want to do. We know that the risk is ours at the end of the day, so we love to be in control of it or at least influence it from the beginning. And so, that… So… So, they were very intentional about driving this Design Build. And they… they did their homework for sure in understanding that Design Build drives collaboration and that good teams build good buildings and all that good stuff, so… So, the short answer is "yes, they drove this," and… and it was… it was just an interesting way that it came about, right? Having been… Kind of knowing the experience they had before. This is their first major Design Build project (as well) as a client, so they were kind of going out on a limb. And they… they did good stuff here, pushed it in the right direction, and set it up the right way so that we could take it and… and run with it.

Interviewer: Okay. And then we've talked about this a second ago but was there (kind of) a core group that you guys have. I mean, so, just to reiterate: it's like you, and the design team, and the MEP, and then the civil, [Civil Engineer]?

Interviewee C 2.1: Mhmm.

Interviewer: And so that's *kind of the*…

Interviewee C 2.1: *And the*…

Interviewer: …*core group*?

Interviewee C 2.1: *And the Str-* Yeah. And the structural team would kind of the core group, right?

Interviewer: And you guys… You said that you don't have an actual like shared-risk/reward but you have like shared contingency things that are passed through…

Interviewee C 2.1: That's right. Yup. Shared *incentives*, yeah. Contingency savings incentives.

Interviewer: Let's see. So, did you guys go about integrating the team personnel at all? And usually what I mean is like by some kind of kickoff meeting or things like that between you and these other core group members.

Interviewee C 2.1: Yeah. Lot… lot of that stuff was done… Honestly, a lot of it was done before either of us were on the job. We have an… a person who is designated Design Integrator, that's [Design Integrator's Name]. [They]… [their] job was to do exactly that, right? Integrate the team. Get… (you know) like facilitate the conversation, set up the team in the right way, get the right conversations happening, drive the team to results. So, lots of that was… was… was going on during the initial phase. W- when I came on board, we did a lot of that stuff, and then as we transitioned to construction we did some of those as well, right? Like the team is gonna change a little bit as we transition into the construction period. Like during design, our role was to support the designer and make sure that they can deliver the highest-quality deliverable as possible and then as we… as we transition ourselves into construction, it changes a little bit as now the designer's role is to support us to deliver the highest-quality deliverable as possible. And… and so that… that piece and that communication becomes really important, and that… that shift is difficult on a team, right? To like really get the whole… In a great big team (you know) we have a hundred and sixty kind of like team members I would call it, right? Like from all of our trade partners, designers, Design Build team (right) I would call it. And getting the whole ship to change direction it was a big trick for us, but we're there now.

Interviewer: Yeah. And (kind of) dovetailing off of that, did you guys have any established procedures for like conflict resolution? Or how does that process (sort of) go between parties?

Interviewee C 2.1: I don't know that we did, [Interviewer]. I don't… I don't know that there was ever established like rules of engagement necessarily for the team. The team had goals through the design period and obviously through the construction period, (you know) common goals. But I don't think that we ever set rules of engagement for the team which is probably a piece that (lesson learned) we really *could* benefit from that. And maybe we still could.

Interviewee C 2.2: We also subdivided a bit of that design effort though into the functional teams. So, there was sort of (you know) four or five [General Contractor] individuals that were managing components of the design and helping support those. So, there was a lot of differences in processes between those individual teams. It (sort of) found whatever worked best for that smaller group they were working [inaudible].

Interviewer: It's almost like you guys mitigated the need for it by being more proactive.

Interviewee C 2.1: Maybe. Or… or like I said, we probably could have benefited from a more intentional focus on that piece. For sure.

Interviewer: You mentioned your Design Integration Leader. Would you say that's (kind of) your "Design Build coach" for this project? Or like the spearhead?

Interviewee C 2.1: Well, I would, except (you know) it was [their] first Design Build too. And so, [they were] kind of learning and teaching at the same time. So… That's the intention for that role, right? Certainly. Design Integrator is the bridge between contractor and architect and when we get together in the same room and have the same goals, [their] job is to push that forward and to coordinate all that. So, I think [they] learned a lot through that whole proc- I think we all learned a lot through this process being our fist time and certainly took away some lessons of how we might do things a little bit differently, but I think that role is that coach… I don't know if I would have described [them] as that on this job, but maybe it's just 'cause it was [their] first time. [Laughs]

Interviewer: Yeah. Did you guys have any like Design-Build-specific training as part of this?

Interviewee C 2.1: Not really. (You know) I don't think so. No.

Interviewer: And then we kind of talked about like trust-building exercises and you said that that would have happened maybe before you got there. Did [General Contractor] have any like preexisting relationships with any of your trade partners on this job like maybe [Civil Engineer] or whomever?

Interviewee C 2.1: Yeah… Well, [Civil Engineer] is a subsidiary of [General Contractor], so they…

Interviewer: Oh!

Interviewee C 2.1: …they… they actually…

Interviewer: For sure!

Interviewee C 2.1: Yeah. They… yeah… they're like our civil arm. They do both the contracting and the design. Design Build kind of arm of [General Contractor], so certainly that. We… we have lots of standing relationships with the trade partners here in [Central US City A]. [Central US City A] is [General Contractor]'s home. It's our home base. So, like we've been here for a hundred and however many years. And so, it's… We know all the trade partners here in town and have standing relationships. With the designers, we have… we have run across all of these design partners (you now) before. We are currently working with [Designer] on a number of projects across [Central US City A] and the country. [Mechanical Electrical Designer] I've worked with on previous jobs and we as a company have worked with probably not here in

[Central US City A], but across the country. And then [Structural Engineer] is a national outfit as well that we've run across and… and are working with on multiple… multiple projects. So, yeah. I don't… I don't think there was anybody new to the fold that we haven't… that we didn't have any familiarity with, or at least preexisting relationship.

Interviewer: Okay. Let's see… We kind of touched on this with talking about like learning about Design Build, was there any continuous learning that you guys had on the project? And it doesn't have to be Design-Build-specific, but I mean, do you even have like maybe weekly or monthly meetings with everyone, or continuing education of some sort?

Interviewee C 2.1: We do have team meetings, right? And as part of those meetings we have been *wanting* to add this training element to it. I'd be lying if I said we *have* yet. But those… those meetings in themselves are an output… a here's-what-everybody-is-working-on-and-what-we're-prioritizing-as-a-team-and-what-things-need-attention kind of a meeting. I think there's… there's a… there's certainly a lot of internal training, right? But in terms of like Design Build team training? I don't th-… I can't think of anything that we do that would be considered (sort of) continuing education in that realm, right? That's another *good idea though*. If we ran like a monthly Design Build training… Man, that would really help some stuff. That's a really good idea, [Interviewer]. When are you available to hire? [Laughs]

Interviewee C 2.2: [Laughs]

Interviewer: [Laughs]

Interviewee C 2.1: We need a Design… Design Integrator here.

Interviewer: Yeah, this is actually just… I'm just interviewing for my job, that's all.

Interviewee C 2.1: Right. Yes. Yes.

Interviewer: On the legal conversation, did you guys… are you aware of any legal barriers to doing like a Design Build? I think this is probably a no, but…

Interviewee C 2.1: No. No.

Interviewer: Okay.

Interviewee C 2.1: Not that I'm aware of.

Interviewer: 'Cause it's private money, so you don't have to worry about that.

Interviewee C 2.1: Nope.

Interviewer: Was bonding required?

Interviewee C 2.1: Bonding is required at the s-… at the second tier level. [General contractor] is

not bonded. We… we… the *owner* did not require a bond for [General Contractor], but we have bonded all of our *sub*contractors performing the work.

Interviewer: Okay. That answers the *next* question about bonding. So, did you guys have subcontractor default insurance for… in addition to having your subcontractors bonded?

Interviewee C 2.1: Either or. So… if-

Interviewer: Oh, okay.

Interviewee C 2.1: S-, so [General Contractor] sort of prequalifies contractors who enroll in the CDI program. If they don't qualify for CDI, then we bond them. And that's just based on a financial analysis and… and performance.

Interviewer: CBI meaning?

Interviewee C 2.1: C-*D*-I. Contractor Default Insurance.

Interviewer: Gotcha gotcha. Let's see… And then was this project able to fit within like a traditional product offered by your insurance company? Like you didn't have any insurance issues?

Interviewee C 2.1: No, we didn't. This is a CCIP job, so it's a Contractor Controlled Insurance Program. It is… it is not that… It does not then fit under like [General Contractor]'s umbrella insurance. We took out a separate policy for this project. We also dealt with the professional liability piece from the designer that we don't typically deal with of making sure that they were adequately covered for all of those things. But it is… but yeah. So, it is a… it is a C- is a Contractor Controlled Insurance Program. As opposed to an OCIP, right? Where the owner would carry all of the insurance. We're… we're taking that risk on for all of our contractors and we think it really helps, right? It helps us have more skin in the game.

Interviewer: Yeah.

Interviewee C 2.1: To make sure that people are performing their work safely and intelligently so they don't damage a bunch of stuff.

Interviewer: So, with the design risk thing that you just mentioned, is that like an E&O policy?

Interviewee C 2.1: Yup.

Interviewer: Okay.

Interviewee C 2.1: Exactly. Yup.

Interviewer: Interesting. Man, that's really exciting. I think you guys are maybe some of the first people that have had stuff to say about insurance and bonding.

Interviewee C 2.1: [Laughs] Most people don't know? They're like, "I dunno!"

Interviewer: Yeah. Most people are like, "ahhh… well, I don't think so" or "no, probably not." And it's like "oh, okay… well… whatever." Technology wise…

Interviewee C 2.1: [Laughs] Now I need a list of people he's interviewed. Now I need a list. I gotta figure out who should know this shit and doesn't.

Interviewer: Technology wise…

Interviewee C 2.1: Yeah!

Interviewer: …what are the (sort of) primary technologies you guys are using for collaboration on this project?

Interviewee C 2.1: Mural is number one. Mural. It's a… it's a like an electronic white board, right? It's a shared white board space that is like everyone's go-to thing for almost anything collaborative that you need to do that just… facilitates. It's just like essentially stickies, right? But like we do pull planning on it, we do all kinds of crazy stuff. It's the basis for our… for our… team meeting, right? Each team has a board where they update, collaborate, talk about their priorities and what they need from the other teams and all this good stuff and it's always live, it's always there, it's always collaborative, right? People can share ideas, and we can bucket stuff together, we can vote on things. It's like real-… It's really just… It's intended to be this big collaborative software. So, that… that I think is the biggest piece. We use Procore for the job. That we've found a real barrier to being collaborative because the design team holds their own copy of Procore and so we kind of like… Procore *is* collaboration software, but [Designer]'s policy is that they won't work within our Procore. And so, they take a copy of our stuff, and download it, put it in theirs, and then send it around for approval, and then download it, and send it back to ours. Which is the *opposite* of collaboration. So, we… we've seen a challenge with that piece of col-… like we set up the job for Procore to be real collaborative and share all the information and make sure that we're doing all the right stuff. We're still working through that hump to try and figure out the best solution there, but it's been a… it's been a… a challenge for the team for sure.

Interviewer: And with Mural, is that a…

Interviewee C 2.1: Yeah!

Interviewer: …third-party software, or is that *like* proprietary?

Interviewee C 2.1: *It is.* No, it's a third party software. Yeah, you go to… you can just go to Mural dot com and check it out. It's pretty cool. It's kind of like there's also another version called *Miro*, which is very close. M-I-R-O. Similar program or… website, I guess. Where you just create these spaces and then you can add content to them and share it. Yeah, work in it.

Interviewer: *And do you guys use…*

Interviewee C 2.1: [to Interviewee C 2.2] *That's probably the biggest one.*

Interviewee C 2.2: Revisto's probably the last one.

Interviewee C 2.1: Oh yeah!

Interviewee C 2.2: I think that would be the other piece there.

Interviewee C 2.1: Yeah…

Interviewee C 2.2: Revisto's like the replacement (or *our* replacement) that we've been using for BIM 360 like the model, 3D model (you know) collaboration stuff. So, that's what we use for clash detection and issue resolution within the 3D model, 3D coordination. All that sort of stuff. So, it's a *relatively* new software. I this is like [General Contractor]'s second or first project really that's using it. [Other Local Project] is the other one, so… But it… it works really, really well, and everyone's in it all the time. It like automatically syncs with all the design models and trade partner models so that it's always a live view of where everyone's at in the 3D coordination stuff.

Interviewer: So, that answers kind of the next question which is "Is there a singular, shared BIM model?" And it looks like "yes." Who owns that model?

Interviewee C 2.1: [laughs]

Interviewee C 2.2: Complicated…

Interviewee C 2.1: Complicated question with a complicated answer. Because of the way that we bought out the project (in a few different ways and with different packages and different scopes), the answer to that's a little bit complicated. The answer for the *majority* of the tower is that our… our BIM execution plan is that the… the design team took the model to a Design Development stage and then we bought out the work, then we handed the model to the trade partners to finish the Contract Documents. They would then be reviewed and stamped by the archi-… the engineer of record, so that they still owned the design and the documents at the end of the day, but the *ownership* of the model is held with the mechanical, electrical, plumbing, fire protection trade partners. Outside of that, everything else is owned by [Designer]. They… they own all the… the rest of it. [to Interviewee C 2.2] On the enclosure piece, anything there from like [Enclosures Subcontractor (Represented by Interviewee D 2.1)] or anybody that's owned…

Interviewee C 2.2: From a technical standpoint, [Designer] continues to own the model, but we…

Interviewee C 2.1: …Provide content.

Interviewee C 2.2: …have… have demanded from certain trade partners model content for their systems that we can overlay over [Designer] model for (you know) the purposes of coordination. So, curtain wall's probably the biggest example of that. Structural steel's another example of that where it's like we don't technically *own* that level of design content to [Owner], but (you know) we… we… our trade partners owe it to us because we need it (you know) for coordination purposes.

Interviewer: Word. So…

Interviewee C 2.1: That's the short answer.

Interviewer: Yeah. I guess (kind of) a follow up to that, does everyone have same privileges to the BIM model, or is there (kind of) like a restriction in the sense that you guys have ultimate privileges, and you take other pieces and put it in there?

Interviewee C 2.2: The… the model is the accumulation of many, many models. So, Revisto is just a viewer that is combining… I don't know how many models in there, maybe there's eighty model files that go into that thing. So, the permissions are set up based on the specific model file and who is responsible to make changes. So, there's a electrical power model specifically that certain people have the ability to get in and make modifications to, but every time you hit sync it updates the Revisto which everyone has access to see the accumulation of all the models basically.

Interviewer: So, *it's a…*

Interviewee C 2.2: *So, no one* is… No one is designing in Revisto. Revisto is purely the viewer and the coordination tool, the collaboration tool, of the model. If that makes sense.

Interviewer: Yeah. Is there anyone that you're working with like for whom BIM is new on this project like they've never done BIM before, or are most people pretty familiar with using that?

Interviewee C 2.2: You mean like trade partner wise?

Interviewer: Yeah.

Interviewee C 2.2: Yeah. It's alw-… It's always new… I mean, you always have these *smaller* contractors that have relatively limited scopes that haven't used it, *won't* use it. They're old school (you know) and... But normally you can get around it. So, we are speci-… we try to be specific about people that we *expect* to do something with it and have the resources. And that's like part of the interview process too is "what are your capabilities?" "are you able to do the things that we need you to be able to do to like get all the concrete sleeves and inserts and stuff coordinated?" 'Cause that would be a big deal if those people did not have the ability to produce the 3D models that we need too, but… There's… (I don't know) there's probably a handful of contractors that don't use it, haven't used it, probably won't use it (you know) over the next five years.

Interviewer: And as a more general question about [General Contractor], do you guys use it on *every single* project or every project over a certain amount?

Interviewee C 2.1: I would say, *generally* now we're using it on every project. Unless there is some compelling reason *not* to do it. So… We… we have… We've convinced ourselves that it's valuable, so we… we will generally BIM every project. Yeah.

Interviewer: Let's see. So, especially with like coordination meetings, (I mean) you guys have like what? Electrical, mechanical, plumbing, fire suppression, med gas, do you have a hydronic piping system?

Interviewee C 2.1: [Nods]

Interviewee C 2.2: Yeah. We have pneumatic tubes, we have laundry chute systems, we have…

Interviewee C 2.1: Low voltage.

Interviewee C 2.2: Low voltage, yeah. Nurse call, that sort of stuff.

Interviewee C 2.1: We've got…

Interviewee C 2.2: Fuel oil…

Interviewee C 2.1: Cryogen vents. We' got… all kinds of crazy stuff. What else… That's probably it.

Interviewee C 2.2: Big stuff at least. Patient lifts…

Interviewee C 2.1: Right.

Interviewee C 2.2: …for your coordination piece.

Interviewee C 2.1: We have a lot of… [Interviewer], we've got a lot of overhead supported equipment. So, like X-ray machines. And we've got MRIs that have shielding around them. And so, we've got some… some things that penetrate through our above-ceiling space that leads us to some pretty complicated overhead MEP…

Interviewer: Yeah.

Interviewee C 2.1: … coordination efforts.

Interviewer: Let's see. Have you guys used Teams at all? Microsoft Teams.

Interviewee C 2.1: Mhmm. Yeah, it was pretty… Obviously going through Covid (right) it became the thing that everybody used all the time for everything. So, we… we continue to use it regularly. I think… I think we're probably having some meetings that three years ago would *be*

in person and now because everyone's so used to Teams, they're just happening on Teams.

Interviewer: Yeah.

Interviewee C 2.1: In fact, it seems like unless you tell everybody to be there in person, people just assume they're in Teams now. So, yeah. We… we're still using… using a lot of Microsoft Teams for *meetings*. We use SharePoint for file sharing which integrates with Teams so you can… you can kind of get that from anywhere. We have a shared file structure with the design team that we've set up for the collaboration of files.

Interviewer: Yeah. A lot of people have mentioned using like the Teams platform as just (sort of) their collective repository and that's what they're doing (you know) all of their IPD jobs through or what-… or whatever.

Interviewee C 2.1: Yeah. Yup.

Interviewer: Do you guys have any *visualization tools*? I know you mentioned the Mural that you used for like collaboration, but do you have like a project dashboard that you update or any like KPIs that you track?

Interviewee C 2.1: No. We don't… No. We don't have what you're describing which is another really great idea of having like just kind of the… the overall dashboard of how we're tracking the… the metrics that the team finds important. Also a really good idea and we should [to Interviewee C 2.2], [Interviewee C 2.2], do that.

[Interviewer, Interviewee C 2.1, and Interviewee C 2.2 all laugh]

Interviewee C 2.1: Good idea.

Interviewer: And then, this last bit is gonna be kind of just abstract in nature, but this is an opportunity for you guys to (kind of) rap on this.

Interviewee C 2.1: Yeah.

Interviewer: In general, what would you say (do you think) are barriers or challenges to some of these collaborative delivery methods? So, whether it's IPD or modified Design Build or what you guys are doing, Progressive Design Build. And just for a little clarity, (kind of) my understanding of the way that I've defined this is like *Barriers* are things (sort of) outside of your immediate agency, like you can't change the law, right? Like if [Central US State] says "you literally can't do this," that's outside of your control. Versus *Challenges* I view as more *internal* sort of things, so like *team*work or working together or even familiarity with respective technologies. So, barriers, challenges, collaborative delivery methods. You guys both have a collective (you know) like thirty years of construction experience to (you know) go on this.

Interviewee C 2.1: Hmmm… [Sighs after a pause and looks at Interviewee C 2.2]

Interviewee C 2.2: It seems the biggest… I don't know. One of the biggest challenges I've felt like we've dealt with through the design and build phase and continues today is just personalities, right? It's like some people just have the attitude where they individually believe in the collaborative approach and they are approaching problems with a collaborative nature and some people just *don't* have that mindset. Some people are just naturally adversarial. Something in their career has trained them to be (you know) to *act* a certain way when we are trying to solve problems as a (you know) group. And like *that* energy can be very toxic in the Design Build relationship where you're constantly preaching about the importance of collaboration and a… (you know) there's a rotten apple in that group that isn't behaving that way, it really can change the mood of the room. Or if *a* person who should be doing it isn't doing it all of the time like, it can really, really sour the feel. You… if you have that, you have to have people that (you know) are able to manage around that and can continue to push the effort and (you know) reinforce the importance even in light of those situations. So, I'd say we definitely have *had* that experience and we've had people that were you look at them and it's like this person is not the right person for this project in terms of their ability to coordinate and collaborate and (you know) and have the right attitude about the importance of this approach. The other thing that was challenging I would say is (you know) with this *super long front end* of the job that we went through as design-assist, it was a little bit tough to get all of the trades and all… all of the design team even to like understand how much we had to get done to be ready to go build out in the field like the project always felt so far away during the design-assist phase, that we didn't get the attention always that we needed to make decisions at the right points in time. And now we're starting to see like as we get closer to actually building in the field, trade partners are starting to get more engaged in the project and they're finding things that they wish they would have… (you know) that we could change. And the answer is, yo-… we could've changed it two years ago when we were going through design-assist phase and we were looking for that sort of input. But we are *past* that point of input. We are ready to go and execute (you know) the documents as we have them sort of thing. So, there is… You… you see those missed opportunities. And not everyone has those missed opportunities because some people were super engaged with that process and got the documents (you know) in the *best* way possible before (you know) CDs got issued and are now ready to go like kick ass in the field because they know exactly what they're supposed to do and the documents perfectly align with their systems. But, there's definitely two sides to that. Some people did that, some people didn't do that. And the people that didn't take advantage are gonna pay those consequences, or they're gonna miss out on the opportunities is probably a better way to say it.

Interviewee C 2.1: Yeah! So, one of those… one of those challenges or barriers is like lack of Design Build experience, right? Like the challenge to getting Design Build experience is *lack* of Design Build experience. And the risk of having a bad experience and then turning you off to the Design Build method, right? And s-, so it's like the m-… the more (like you said) the more people that you have who have experience working in Design Build, and understanding the things that they *should* be looking at during the schematic design, and the ability of the things that they… they *can* influence and *should* influence like… those guys will be better at the next one, right? They'll as the right questions at the right time which is an interesting piece for sure.

Interviewee C 2.2: You have… I put [TP 2.2] on your list, [Interviewer], from [Enclosures Subcontractor Name] like that's an example of a person who really took advantage of the design-

assist approach and really tried to influence the design and make it *as* good as possible for (you know) the limitations of the system that [they were] gonna provide, so… That's a good person to talk to about how to take advantage of that from like a trade partner perspective and a (you know) being a *consultant* in that role. 'Cause like we (you know) as… During the design-assist phase, we acted as sort of a consultant like we would provide advi-… Like [Interviewee C 2.1] mentioned, we are there to provide support to the designer who's ultimately responsible at that point to make the deliverable. But, there is a limitation to our ability to provide that consulting expertise based on (you know) how detailed the system is like… If we're talking about curtain wall, there's a limit to my knowledge on curtain wall before I need to go get the curtain wall installer (you know) involved in that process. So, those are the people that (like I said) really took advantage of that… that time and made the most of that effort over the course of that (whatever it was) year and a half that we spent talking about design every day.

Interviewer: Yeah.

Interviewee C 2.1: Yeah and I… I definitely agree with what [Interviewee C 2.2] said first too about old habits (right?) being one of the barriers (right?) like people… people not changing behaviors which is a big piece of this, right? People falling back into their old habits. And… and preventing them from *trusting* enough to make collaboration work which is what it takes, right? It *has* to be that like "everybody holster your weapons and like trust that we're all acting with good intentions and that… that we're all making decisions that are right for the entire team, not just my organization." And that… that when things get… when things *get* tough, people retreat to those corners and go back… fall back on those old habits and then the whole thing breaks… breaks down. So, it's… that piece is just a big challenge. So, again, there like experience through Design Build. If you can get a good *experience* through a collaborative project, you will understand that and then it doesn't matter what the contract says, right? Really it just matters that you… you've made it, you underst-… you… you like put some trust in a group of people, you all came out on the other end, and it worked out *flawlessly* because you all trusted each other and that's what… that's *really* what Design Build was mean to set up. I think one of the challenges too… And maybe this is a similar thing, right? But… It… Design Build inst-, as it contrasts to IPD *truly* (right?), kind of takes this like O and AC like it puts the architect and contractor *together* and shields whatever happens here from the client. As it… Like almost intentionally, right? The client says, "I don't wanna see… I don't wanna even see the arguing between you two or like figure out what RFIs are late or submittals are up for review" or like whatever it is… which I think is just… I… I don't think that's great, right? I think that that… that problem moves this thing that happens (for a reason) and kind of takes ju-… just like… prete-… It's kind of that false harmony that creates a little bit like "everything's fine, nothing to see here."

Interviewer: Yeah.

Interviewee C 2.1: When really, the same things are happening, right? And the… It's not… It… the… The *pressure*… The way to relieve that pressure is for "mom and dad" (the owner) to say "hey, listen, it's *your* job to support these people to be successful and it's *your* job to support these people to be successful, now sort it out!" You know. And that helps, honestly, because it… it… Wh- When we're sitting… when we're sitting across the table from one another and going "it's your job to support me," "no, it's your job to support me" it has a different connotation,

right? It has… It comes off in a different way. So, so I say all that just to say I-… The… The IPD has real value *there*, where Design Build creates a little bit of a *challenge* there to make sure that you're not creating or… or… or inducing that sense of false harmony. Just for… The client wants to hear nothing means that everything is going good and that's just not true, right? You want… You *should* as a client (who's building a six hundred and eighty million dollar facility) you should want to hear that thi-… how things are going and if you never hear that there's like a disagreement, you're being *lied* to, right? [Laughs] You're not paying enough attention.

Interviewer: Well, and what you've just described very much is kind of the dividing line between Progressive Design Build and IPD. It's like the owner's desire to *be* actively involved versus the owner's desire to essentially just like plug and play and like…

Interviewee C 2.1: Yup!

Interviewer: …set it and forget it

Interviewee C 2.1: Yeah.

Interviewer: …and just be like "hey, I'm paying you guys money – you figure it out."

Interviewee C 2.1: Yup.

Interviewer: And I think-*to your point*-that's kind of that like last ingredient of like "hey, if we really want this thing to *be* integrated, to *be* collaborative, ev-e-ry-one (and that means everyone)…

Interviewee C 2.1: Yeah.

Interviewer: …has to be participating all of the time."

Interviewee C 2.1: That's right. Yup. I think that is… I think that is the key and I think (you know) that is one of the barriers to integrated project delivery, what- whatever the contracting method is is owner involvement, right? Owner… owner *understanding* of their role in the process and the team, right? That piece is a barrier.

Interviewer: So, if you guys could just play armchair industrial psychologists, what do you think would be a way to (kind of) get that cultural shift? And this is going back even to like you were mentioning a minute ago where you're saying it seems like one of the challenges is the traditional adversarial relationships like this (sort of) antagonistic element between parties like how would we work to (sort of) get that out of the system over time? Or (I guess) it's kind of like having a culture shift.

Interviewee C 2.1: I… Man, that's an interesting question. I… One of the ways that we do that [laughs] if we're fortunate enough to do that, is by being selective as contractors on the clients that we work for. If we're fortunate enough to be able to do that, right? We get to… We get to say… We interview the client and understand who we're gonna work for and then if contractors

wanna work with the clients, then it will (kind of) drive them to maybe ask why. [Laughs] Or maybe ask them… Or… or they're gonna end up with not-so-great experiences because they have not-so-great contractors and they may say "hey, is there anything *better* out there?" They may come looking for the answer.

Interviewer: Yeah.

Interviewee C 2.1: Which is kind of harsh reality, right? Like… So… So, maybe that's *one* way is driving… driving upward the expectation for clients and helping set that educate them and how… how important that is, right? So, maybe there's two things there. One is a little softer like educate them and one is like "let 'em fail and then figure it out." It… Either one of those things is kind of elevating the… their… their knowledge and… and… *of* their role in the project.

Interviewee C 2.2: Yeah, I think [Interviewee C 2.1] mentioned like the fact that (you know) during the design phase, our job as the contractor was to support the design team, and now it is the design team's responsibility to support us. And [Interviewee C 2.1] has said this a couple of recent meetings (which I think is definitely true) I think something we could have done is we should have *said that* during the design phase that we are here right now to sup-… like we should have said that *all of the time* just constantly. "We're here to support you, we're here to help." Like we should've been constantly saying that with the expectation that that the relationship would eventually flip. 'Cause I think when we say it now, they're like "well did you actually do that thing, did you support us dur-?" Like they… It's sort of a sort of a short memory.

Interviewer: Yeah.

Interviewee C 2.2: If we would have been more… messaged that more during the design phase, it would've… we could have very clearly had a moment where we said "alright, this thing is now flipped. And now, here's how it is. And (you know) you remember that we did this thing for you and now it's your turn to (you know) do your part and… and return that effort for us." So, probably a minor thing, but I *do* think that is something that is… That specifically like the Design Build that I thought would feel different would be the relationship between us and our architect and it doesn't really feel different. The architect still *behaves* normally, as if they work for the cli-… the owner and not work for us.

Interviewer: Yeah.

Interviewee C 2.2: Because it.. I mean, which is probably tr-… valid in a way that that owner is a big piece of whether they get hired on the next project as much as their relationship with us. So, they… and they behave that way, so… There's… That… That piece isn't quite running as smoothly as I thought it would (you know) if you would've asked me three years ago.

Interviewee C 2.1: But it *could* have… I… Y- your point there is interesting (and I know that you gotta go too, [Interviewer]), but like IPD *is* the magic sauce for that, right? Where you put all three people on a more equal playing field to hold each other accountable *for* the things we're talking about. Instead of putting the veil over it and then it… it's creating that kind of *odd* dynamic, right? Where as much as we *know* they need to support us, us *saying* they need to

support us is making them support us less [laughs]…

Interviewee C 2.2: *Yeah.*

Interviewer: Yeah.

Interviewee C 2.1: …(you know) or making them want to support us less. So, anyway. Just a… just a thing. [Inaudible]

Interviewer: So, on the topic of like meetings, do you guys have anybody that's collocated?

Interviewee C 2.1: We have *sort of*. And this is a little challenging as well. We have… we have spaces here for one, two, three, four… five? Five full-time design (six!) design partners. Five from [Designer] and one from our [Mechanical Electrical Designer (Represented by D 2.1)] to be here during contract administration, right? The CA phase of the job. It's kind of hit or miss how much they're *here*. They're… It's more of a cultural thing there like [Designer] doesn't… they don't even have offices like they don't require people to come to work, so they mostly work from home and so trying to get them in here is tough.

Interviewer: Yeah.

Interviewee C 2.1: We… We had a colocation space for the entire team (owner, contractor, designer). During Covid, they repurposed it and then it disappeared. Like the client provided that for us (again, *driving* that forward) and saying "we all wanna be in one space so that we can have the same conversations." Which we are seeing it… the effects of not having *that* space *through* the design period now in construction, right? Because it would have… It would have helped build *all* these cultural things we're talking about: the right discussions happen, the right conversations are overheard, the right… right things are going on, the right culture is built. So, I think that is a major… major piece of just what would be really beneficial.

Interviewer: And do you guys have like weekly meetings where you do have (sort of) this core team all get together?

Interviewee C 2.1: We do. We have… We… Well, we have… We have weekly meetings with the… with the core team of the owner, architect, and… and contractor. And then we have monthly meetings with the whole Design Build team. And then we have a weekly meeting with the functional team leads of… of both the architect and the builder, right? So, it's kind of that AC meeting where like the mechanical lead for [General Contractor] and for [Mechanical Electrical Designer], and the architectural lead for [General Contractor] and [Architect]. And so, we have a group of ten or twelve people in that room talk about (you know) pushing the major issues forward and… and how's the team doing and what can we improve on and those kinds of things are part of that… that… that meeting.

Interviewee C 2.2: And then each of those teams are having smaller like *functional* team meetings where they're more like in the nitty gritty of the details of like the things that functional team is working on actively.

Interviewer: Okay. And then (really quickly before we go) I just want to circle back to some minutiae.

Interviewee C 2.1: Yeah.

Interviewer: You guys are just building a brand-new tower, right? So, like we demo'd an old space and then we're building a new tower. Are you *connecting* to any existing facilities?

Interviewee C 2.1: Yup. Two of 'em. There's two adjacent buildings. We connect from basement level to level five on one of them. And on the west side… east side. And then on the north side of the building we have four bridges (level two and three and six and seven) that connect to another adjacent tower.

Interviewer: Okay. And do you have to… What's the coordination with like your facility impact reports or things like that?

Interviewee C 2.1: Ooo! It's a big deal. So, we… we use… we use videos a lot there, right?

Interviewer: Yeah.

Interviewee C 2.1: We send out weekly updates of what we're planning to do, what the noise out-… outlook looks like (noise and vibration, right?). We're also doing monitoring of those things. And then we're… we're meeting *strategically* with the facilities and activation group that helps us figure out how and when to move people around so that we're coordinating schedules with different entities, not even just people, departments, right? [Local University] is a part of this other building and like they're a whole other organization under the [Owner] umbrella, so… *Lots* of intricate coordination going on there for sure.

Interviewer: Yeah. Okay. Cool. But yeah, I was just kind of wondering about that because I don't think you guys are at the phase yet where you would have to worry about like hot work and dust work maybe, but I guess eventually when you start connecting…

Interviewee C 2.1: Yup.

Interviewer: …yeah. That just seems like it could be its own mess. Alright. This has been great. I really appreciate you guys taking an hour…

Interviewee C 2.1: Yeah!

Interviewer: …to chat with me

Interviewee C 2.1: Yeah, it was good. For sure.

Interviewer: Any closing thoughts or final remarks or anything?

Interviewee C 2.1: No, nothing from us, man. Sorry it was so hard to get ahold of us. I… I appreciate your patience there. Hopefully… hopefully everybody's lined up and enjoy the rest of your interviews.

Interviewer: For sure! Thank you, guys.

Interviewee C 2.1: You got it! Okay [Interviewer], see you, man!

Interviewer: Have a good weekend!

Interviewee C 2.1: You too!

Interviewee C 2.2: See ya!

End

Appendix I: Transcript of Interview C 2.3

The date of this interview was March 24, 2023. The venue of the interview was an online Teams meeting. The interview started at 1:15 PM CST. Interviewee C 2.3 is the Assistant Superintendent for General Contractor's self-perform concrete team and is working on the Progressive Design Build project located in a Central US state that is at the focus of Case Study 2. Interviewee C 2.3 has worked in the AEC industry for nearly five years. Prior to the Case Study 2 project, Interviewee C 2.3 had only worked on jobs utilizing either Design Bid Build or Construction Management at Risk.

Interviewer: It is March the 24th, one fifteen. We are here with [Interviewee C 2.3]. And [Interviewee C 2.3], what is your position and title?

Interviewee C 2.3: So, I'm an Assistant Superintendent with [General Contractor].

Interviewer: And with what do you do *specifically* *versus* a regular superintendent?

Interviewee C 2.3: *Yeah.* Yeah, so I basically assist the superintendent in quality control and field execution. So, what that looks like for our self-perform concrete *structure* is I'm out there verifying rebar drawings and verifying installations in the field are *accurate* and also just making sure that we're being productive when we're putting work in place. And also helping track weekly production for our self-perform crews and analyzing that data to see how we're doing overall on the job.

Interviewer: Do you guys have individual QC managers?

Interviewee C 2.3: So, we… On our project specifically, we do not have a dedicated QC manager; however, at [General Contractor] we do have quality control directors or managers who might be (kind of) walking through different projects. They might be on different projects. But they kind of are more regional-specific to where they're a quality control rep for the region, not just any specific project.

Interviewer: So, back to questions really quick, how long have you been in the construction industry?

Interviewee C 2.3: So, I've been in the construction industry for about five years now, *all* with [General Contractor].

Interviewer: So, right after you graduated from college?

Interviewee C 2.3: Yup.

Interviewer: How long have you done work on collaborative delivery methods or projects using collaborative delivery methods.

Interviewee C 2.3: So, this is actually my *first* project here at [Project Name] that we've done

this. I've been here for about a *year* now. So, certainly not an *expert* on it by any means, but I do have one year of experiences and I'm learning something new every single day.

Interviewer: For sure. All of your jobs previously (so those four years), were they just Design Bid Build?

Interviewee C 2.3: Yeah, they were Design Bid Build, CMAR jobs. We just get a set of drawings (plans and specs) and go out and build it. So, a little bit of a different perspective. Not as collaborative in that sense, but this job has been cool to see the *difference* in the value that it can add by having a collaborative *Design* Build team.

Interviewer: *For sure.* And prior to working on this, what was (kind of) your understanding of collaborative delivery methods?

Interviewee C 2.3: So, before I started here, my understanding was that we would have contracts with the designers and help do constructability reviews very early on in the design phase and DD phase. That would help really eliminate some of the unneeded RFIs that would happen during a regular plan-spec job when you get drawings in construction. Before I started here, I was more or less thinking it was more collaborative and the fact that you were more in tune, in communication with our design team of what wanted to build and help guide their design based on what we thought is constructable, so it helped eliminate some of the headaches. Which I've found to be very true coming which is awesome.

Interviewer: That *was* my follow up question is "did you find that to be the case?"

Interviewee C 2.3: Oh yeah! It definitely has been really cool to be a on a Design Build project even with some of our rebar detailing specifically and working with our ironworkers who are helping design this building. And based off what the Engineer of Record wants, they can (kind of) help do those constructability reviews. And when we get a submittal, we've already gone through and say "yeah, that's constructable." And there's no more "oh, shoot!" moments at the end when you're trying to pour a deck and you can't build something the way it's designed. So, it's helped alleviate a lot of that headache, which is really cool to see.

Interviewer: Yeah, I saw on one of the YouTube videos that you guys had subcontracted like rebar design review out to someone and they had like really detailed *BIM models* of all the pieces of rebar.

Interviewee C 2.3: Yeah. So, it's been awesome to work with them. Yeah, it's [BIM Services Company]. They're out of [West Coast State].

Interviewer: Yeah.

Interviewee C 2.3: And they've modeled every single piece of rebar. And really, what's been cool about seeing that is that we can go through in our weekly coordination meetings when we're designing this and design for submittals to go through and see where are maybe those congested areas and what maybe are we going to run into and possibly eliminate that well ahead of time.

So, that's been really cool to see. It's been a huge *value-add* to the project.

Interviewer: For sure. And I think that's a good point saying "value-add" there, because a lot of times people don't quite understand (I don't think) maybe *what* BIM brings to the table. Or like what it *can* do. And you were even sitting here from a field perspective and being like "yeah, no. This is definitely something we want to do." Especially with the concrete package as big as it is. I mean, what all is in your concrete scope on this job. I know that you guys dug a *really* big hole and then put up walls and columns and all of that.

Interviewee C 2.3: Yeah, so [General Contractors]'s scope of the concrete work, it varies. Everything from foundations, and then forming the foundation walls as you said, and then the columns and decks all the way up the tower, as well as our shear walls and cores for the elevators and stairs. So, we do all the vertical concrete work, we form up all the horizontal work, and then we have a subcontractor for us, [Subcontractor Name], who actually pours all the flatwork for us. So, all the slabs on grade, all the elevated decks they just come in and pour it and finish it. But we pour all the vertical work, all the columns and doors.

Interviewer: Do you guys have a subcontractor for the bar? Or are you guys doing that too?

Interviewee C 2.3: We have a subcontractor for the rebar and services. So, we have a good working relationship with them here in [Central US City] and they're the ones who did all the rebar for us for the vertical work as well as the decks. And then, the slab on grade work was bought out separately though our flatwork subcontractor.

Interviewer: And so, I want to circle back for a moment. You mentioned that your experience with RFIs is much better than it has been on previous jobs. Will you (kind of) explain that to me? And (kind of) maybe compare and contrast?

Interviewee C 2.3: Yeah. I'd say *before* I came to this collaborative Design Build approach, the way RFIs were *mostly* generated was you'd be building something, and you'd run into an issue in the field, there'd be a stop standstill, there's this issue, we can't proceed until we figure it out. So, a lot of that was also due to the fact that we had a small project team, it wasn't a large project team like what we have here, so whatever we didn't catch ahead of time, was being caught right at the time that we went to build it. So, the RFI process definitely caused more *roadblocks* and more *delays* than what we have in this project right now. 'Cause on a larger project you have more sets of eyes looking at it. You have designers looking at stuff well ahead of time, and with the BIM modeling we're able to accurately depict where we're going to have those problem areas. On the smaller jobs, I never had BIM modeling to go through and see where clashes are gonna be or what issues you run in to. But that model's proved very valuable to where we're only on level two right now, but we're already talking about details of Level Five and Six of what's gonna… potentially be an issue and solving those well ahead of time.

Interviewer: Yeah.

Interviewee C 2.3: So, it goes a lot smoother just 'cause you're able to catch it sooner. You can react to it in the early stages and then it doesn't cause any delays to schedule.

Interviewer: But what is your… What is it kind of *like* (I guess) is… What I mean is… For your RFI process *now* (I mean), are you just (kind of) emailing a designer directly or…

Interviewee C 2.3: So, I… I thin-… I guess the process itself really hasn't changed. It's really the timing of when we actually get it, so… We're still using the same polic-… processes and procedures I have in my current job… on current jobs… or previous jobs as we are here. So, the process is the same, we're just catching it earlier which is making it better for the entire team. So, maybe I should've… Yeah. Need to reword that, but…

Interviewer: Yeah, I just know on some collaborative jobs, I've heard people say the RFI process is as relaxed as like literally Facetiming an architect and being like "Can we do this?" and they're like, "Yeah, sure. Go."

Interviewee C 2.3: Yeah. I will say there is… there is value too in that when we can call the architect, call the engineer (you know), send a couple emails, Facetime them be like "hey (you know) here's this RFI, here's the question we have," but we're already coordinating a solution before we send the RFI in. And really at [General Contractor] that's how we write all our… all our RFIs is confirming RFIs knowing that we've already done the coordination ahead of time.

Interviewer: Yeah.

Interviewee C 2.3: So…

Interviewer: Have you noticed an increased amount of ease in the field with like communicating with your craft and labor teams when you have these like BIM models? Like does that make it to them?

Interviewee C 2.3: I would say the BIM models themselves doesn't exactly make it down to the craft. I think it *should*. It's really cool. I feel like a lot of what gets shown in the model is basically they export stuff from the model that will then go to guys in the field. Like shop drawings are all made off of the model …so they're seeing the output of what's… you know all the coordination happening in the model, but they're not necessarily seeing the model itself. However, we do have iPads out there in the field pulled up with the model in case there is a *really weird* detail or something we just don't know how are we gonna build this? Do we need something better to *visualize*? We can then pull up that model on our iPad, from management's iPad, or on our computer here in Revizto and really use that to see what are the issues and see how we are actually going to build this. So, in that sense, they *do* use the model for like little one-offs and two-of-… Like little one-off things that might not be shown in the drawings very well.

Interviewer: And do you think that 3D visualization helps with the amount of time they spend creating formwork? Or do you guys model formwork too?

Interviewee C 2.3: So, we do not model formwork. At least [General Contractor] doesn't. We have our formwork supplier do all the engineering for that formwork and I don't really think… I

think they model everything in 2D. I don't think they model everything in 3D. They have some typical elevations, but it's not as *robust* as what you might think of. At least for foundation walls or for decking they might give you a couple section cuts here or there or show the general gist of how they want to form it, but there's not really a formwork *model* that we then ported for use then on our project, so… When they're building formwork, they… they're very used to the system. And it's very rinse and repeat, and they can kind of see from a very generic plan view what needs to happen. And then any job-built forms that need to make those transitions that are needed they can easily put in the field. So…

Interviewer: Yeah. I suppose you guys are probably building a lot of very similar sections over and over.

Interviewee C 2.3: Correct. Yeah. So, we have two main parts of our building. We have the podium which is floors… basically from street all the way up to Level Five, larger floor plate. It is a little bit different, but we're using the same systems and we're tabelizing a lot of our formwork where we can cycle it up to the next floors. And then the… really where we're going to start getting a lot of big production is at Level Six where our floorplate shrinks, and then we have that same repetitive floor plate all the way up to Level Seventeen. So, that's where we're gonna really capitalize on reusing the same stuff and just figuring out (you know) just putting those pieces in place just as fast as we can. So…

Interviewer: And so, with that (sort of) modularized or repeated process once you hit Levels Six through Seventeen, are you guys doing any kind of takt planning or pull planning like some of the other teams are?

Interviewee C 2.3: Yeah, so with our… all our decks we're doing flow planning. It basically kind of follows like a takt flow plan almost, kind of a similar concept where you break decks out into areas and you move people (you know) from area to another. (You know) You have your setup crew, followed by your decking crew, followed by your MEP crew doing Bang-Its in the deck, followed by rebar, and then pour. So, we do show that sequence out like in a takt plan and we reinforce that takt plan with visual aids that show a flow based on the plan view of the deck what areas we're calling "A," "B," "C," "D" on each deck, and then showing that flow visually.

Interviewer: You said doing *something* in the deck. What… what was that word?

Interviewee C 2.3: So, they have… You talking about the Bang-Its? Like the MEP?

Interviewer: Yeah. What are… Yeah. Bang-Its? B-A-N-G-I-T-S?

Interviewee C 2.3: Yeah. It's… it's the informal term for it. They're basically inserts in the deck *for like* threaded rods.

Interviewer: *Oh, like sleeves?*

Interviewee C 2.3: Yeah.

Interviewer: Oh, okay.

Interviewee C 2.3: There's like… Yeah, there's sleeves. They put *sleeves* in the deck and then they also have inserts for their threaded rod for all their piping hangers in there, so you don't have to drill up in the concrete deck after. So, these… pre-threaded inserts basically go in the bottom of the deck, and then they have little caps in the bottom to where when they go to start finishes and… insert their hanger rods, then all their wholes are already there in the deck. They don't need to drill anything new in the deck, just screw the rod right in and go.

Interviewer: Okay, so forgive my ignorance, is this something *relatively new*? Because I've… I've never heard of this before.

Interviewee C 2.3: I'd say… I mean, at least since I've been in the industry. I mean, they've had these things. I mean, we've used them a lot. I've done a lot of hospital projects. They might be used more in hospitals more than anything where you have a ton of mechanical, electrical, plumbing systems where you have thousands of points where you're gonna have to put hangers in and install hangers in. And if you don't get those inserts in, then you have to drill up through the deck and get all that threaded rod installed which *does* take a lot of time when you go to do interior fit out. So, I'd say probably on healthcare jobs there's a ton of this stuff in there in the ceiling. They like to put them inside the decks that way it saves them time later.

Interviewer: Yeah, I mean, for me, not only is it more efficient from a time perspective, but you're also like reducing exposure to different like dust nonsense and then it's a little bit safer because you don't have someone like reaching up vertically all day drilling holes. So…

Interviewee C 2.3: Mhmm.

Interviewer: Yeah. This is a very *appealing* technology to me.

Interviewee C 2.3: It is, yeah. Especially with silica exposure that we have to deal with and everything too and reducing that dust and drilling into the concrete. Whatever we can do to minimize that will… Yeah, help us. You hit the nail on the head.

Interviewer: Going back to flow planning for a second. Do you guys… Is that… Do you guys use *pull* planning as part of that?

Interviewee C 2.3: So, the pull planning kind of works in collaboration with that. We don't really establish a pull plan *for* that. We could if we wanted to. But really, the takt flow planning is what really *governs* our structure schedule. There might be times where we take a small section of that flow plan. (You know) The flow plan will show basically for the next couple months will be a two month lookahead for what decks we're doing. But if we want to see like a weekly sprint of "hey, what are we gonna do in this next week and how are we gonna be able to pour this Level Two deck by Friday?" (You know) At the beginning of the week we might break it out and say "okay, here's our milestone here" and let's further break out the takt plan and say "hey, what areas are you gonna be in" and then further break out that takt plan into more specific buckets to show that weekly work plan. So, we *do* do it informally. And kind of… it's basically more of a

shorter-term schedule. So, the takt's like more of our broad overview plan, our road map: here's where we're going, here's what we want to achieve, here's the *flow*. But then the… it can be reinforced with the pull planning of those short one-week sprints of like what work you're doing that week.

Interviewer: Okay. Now, in these collaborative deliveries I've had other superintendents mention that *maybe* one of the challenges is there still might be (sort of) that traditional sense of *antagonism* between general contractor and trade partner. Obviously, your experience is going to be informed by the fact that you're deal with your *self*-perform team mostly, but like…

Interviewee C 2.3: Mhmm.

Interviewer: …have you noticed any of that in your experience on this job in a year? Like is there still that *undercurrent* of *confrontation* or antagonism between trade partners?

Interviewee C 2.3: I would say on our self-perform job not so much. I mean, we look at (you know) for instance our [Indistinguishable] services, our steel supplier, and the rebar ironworkers that are putting the stuff in for them, we see them as a trade partner. And they're very good to work with. We have a great working relationship with them. And they've been phenomenal on this project to work with. (You know) Given there are those times where you have to have confrontations, those difficult conversation about (you know) pushing the schedule and (you know) we're trying to keep both our crews productive… But ultimately at the end (you know), we're responsible for this concrete scope and we know that in order to get full buy in, in order for [General Contractor] to be successful, we need our trade partners to be successful as well. So, we almost place more of an emphasis in how do we collaborate to make sure our subs are successful that way we're successful.

Interviewer: That makes a *lot* of sense. What would you say from a field perspective (and we kind of probably hit on this earlier) is the biggest difference in your day to day, week to week on this job versus a Design Bid Build job?

Interviewee C 2.3: I would say if I'm just comparing delivery methods… I would say my roles have also changed too from the projects as well so I haven't really (you know)… On the previous projects when we've done Design Bid Build, I played a different role as a Project Engineer where I was processing submittals, RFIs, doing all of the paperwork documentation. I had a little bit of field experience, was able to help the superintendent, but I really didn't *know* what it took as far as to be a superintendent on a small job like that 'cause I didn't really get the opportunity to figure out what those challenges were. But as far as like my day to day here now as an Assistant Superintendent and being the fact that is a Design Bid Build (you kn-)… or now I'm on a collaborative design thing. Now, we have (you know) we're more confident in the drawings we're getting out in the field so a lot of my time can then be *focused*, shifted. Instead of putting out fires and solving a lot of problems to really just QCing our work and making sure we're putting in *exactly* what's in place. (You know) Lots of times on previous projects I've had superintendents come to me with issues like "hey, we're at a stop point, we can't do anything until this problem gets resolved" and we were typ- a lot of their role was playing role of like guiding towards a solution of "hey, what are we gonna do to fix this problem right here, right

now"…

Interviewer: Yeah.

Interviewee C 2.3: … versus (you know) a lot of what we're doing now (you know) we still have some of those things that come up, but a lot if it is like "what are we gonna do to put this work in place" and "how are we gonna flow this project to it all the way up to Level Seventeen." So, it's more logistics and less coordination if that… if any of that makes sense. Like less… less coordinating problems, more putting the work in place and making sure it gets done.

Interviewer: Yeah. It almost feels like what you're describing is being more *proactive* and a little less *reactive*.

Interviewee C 2.3: Correct.

Interviewer: Versus (kind of) the traditional superintendent (you know) idea or role which is like every superintendent needs stuff yesterday…

Interviewee C 2.3: Mhmm.

Interviewer: …and there's problems *right now*.

Interviewee C 2.3: Yeah. And superintendents no matter what project you're on, they're always proactive about like "hey, what's gonna (you know) what's gonna hurt us a week down the road?" We're always thinking ahead to that. But in this case like because we're able to think ahead and stuff we know like we've already eliminated a lot of those roadblocks and what we need versus on another job we think ahead and then we realize "oh, we have more roadblocks now." 'Cause we haven't thought about x, y, or z.

Interviewer: Yeah. And then that way you've gotten all the big stuff out of the way, so even if stuff does arise, hopefully it's like small enough to where you're like "oh, it's just a *pebble*" instead of a massive boulder.

Interviewee C 2.3: Exactly.

Interviewer: Do you guys have meetings to (sort of) emphasize anything that has to do with collaboration. So, do you have like weekly trade partner meetings?

Interviewee C 2.3: We do. We… we really focus on really collaboration every single day on this project. I mean, if you're talking collaboration between like design partners and our contract… contracting team and everything. (You know) We have… we used to have weekly meetings basically where (we'd call it Big Room meeting) where we'd bring in architects, engineers, contractors, subs, just get everyone in a room to hash stuff out and talk about what important for the job. Really, specifically for our concrete job, for our self-perform operations, we meet *daily*. We have daily meetings, daily standups with all our trade partners, our iron workers, the guys (you know) getting ready to pour the concrete. We have everyone in a room at the start of the

morning basically saying "hey, what's going to get done today, what are we needing, what does everyone need from each other in order to be successful?" So, it does start with those daily conversations, those daily 5:30 meetings. But then every day we also have coordination amongst all the trades (you know), not just the self-perform concrete team. We have… across any scope of work we have on the jobsite we have daily pod meetings in the afternoon where we talk about schedules for the next day, crane schedules, logistics, all the work that's happening just to get general awareness items where that way everyone knows what's happening that next day.

Interviewer: And who's in the afternoon meetings?

Interviewee C 2.3: So, the afternoon meeting is the overall Project Superintendent like the General Superintendent. And then we have superintendents from all those different scopes of work whether it be self-perform concrete or building enclosure, mechanical electrical plumbing, and we also have foremen from all our trade partners who are involved in those afternoon meetings too.

Interviewer: And do you find *value* in these meetings?

Interviewee C 2.3: Yeah. Hundred percent. I'd say the more we communicate… (you know) These meeting provide a stop where we can all communicate together and know what's going on so that way we're not caught up in the field surprised by anything. So, just having that outlet to communicate. The *more* we communicate, the better off we're going to be. So, originally we only had the pod meetings every day to where it'd be in the afternoon we'd talk about work that's happening the next day so then the morning time frame stuff would get crazy and we wouldn't be grounded on… or we'd forget what we talked about in that meeting in the afternoon in that meeting the previous day.

Interviewer: Yeah.

Interviewee C 2.3: So, now after instituting that daily meeting at the very start of the day with everybody, that's really helped drive that conversation, reinforce that. (you know) Daily work plan.

Interviewer: Yeah. It kind of sounds like a daily huddle. I mean, that's what…

Interviewee C 2.3: It is.

Interviewer: It's also… I've noticed interviewing people on this project that no one is *allergic* to the terms like communication or collaboration.

Interviewee C 2.3: Mhmm.

Interviewer: So, I think that really emphasizes whatever is in the air or the water over there. Like clearly there is at least alignment on *that*. On that like value of *collaborating* and integrating things. And (sort of) to that point, did you guys have any like kickoffs or education or training or senimar-… seminars for Design Build? Did you get any indoctrination when you arrived on the

project?

Interviewee C 2.3: I wouldn't say… Nothing *formally*. I got (you know)… I was alerted that (hey) this was a Design B-… or this is a Design Build project and here's how it's set up. We kind of talked through at the start of the job when I got here about how was our contract set up, who were the key players, what does it look like, what are the *goals* of the project. I know [Interviewee C 2.1] did a very good job right off the bat (you know) kind of explaining our contract, how it's set up, and what's gonna make us successful. And really reinforcing (you know) that stuff in the air you were talking about, that communication piece. And how *vital* it is when you have team of fifty, sixty people trying to build a building. And when you have… When you're not clearly communicating or you're not overcommunicating and stuff gets dropped or whatever, (you know) it just… (you know) larger project teams yield larger opportunities for miscommunication or misinterpretation. So, it's like the *more* we are focused on that, the better off we're gonna be.

Interviewer: Yeah. So, I will backfill you kind of quickly. The thrust of my research is just (kind of) trying to identify barriers and challenges to the adoption of collaborative delivery methods because even though these things have been around for twenty, thirty, maybe forty years at this point…

Interviewee C 2.3: Mhmm.

Interviewer: …they still only account for a small percentage over overall construction project delivers.

Interviewee C 2.3: Mhmm.

Interviewer: So, in my thesis, essentially a barrier is obviously something that you really *can't* change. Like if the law says, "you can only use Design Bid Build," like there's not really a lot that you can do in your lifetime to change that short of *actually* changing legislation.

Interviewee C 2.3: Mhmm.

Interviewer: So, a barrier is something that's (kind of) external to your agency. Versus a challenge is something (you know) like interpersonal *team* challenges or like *individual* challenges *because* of the whole project delivery method. So, all of that is a preamble to, *in your opinion*, what do you think are some of the barriers or challenges that are preventing people from adopting these more collaborative delivery methods like Progressive Design Build and IPD?

Interviewee C 2.3: I'd say… It's interesting. Even (you know) kind of coming into this thing a year ago and seeing the benefits of (you know) an IPD slash Design Build collaborative team approach (you know) there are some challenges with it that (you know) happen not necessarily (you know)… It's kind of project-specific too (you know). As you design a building, you kind of work your way from the ground up. (You know) we're trying to build a building while they're still trying to coordinate stuff on the interiors for these lower decks and everything. We have to *really*… We're really pushing ourselves to try and get everything right on these lower floors, that

way we can continue up the tower. So, a lot of stuff we're trying to plan for it's not even designed yet or it hasn't even been *bought out* yet. So, you have… At least on this project, there's like two different phases. I'm not sure if [Interviewee C 2.1] or anyone else talked to you about like our Phase 3 slash Phase 4 and what that meant. (You know) Phase 3 was the initial structure plus the fit out of a few of the floors and then Phase 4 was the fit out of the rest of the floors. But Phase 4 came after Phase 3, and Phase 4 fit out rooms were in like our lower Levels One, Two, and Three on our decks. I think… So, we had a lot of coordination catching up to do and we had to try and basically design a building while we were trying to build it. So, it didn't lead to a lot of comeback work after we get (you know) design drawings approved to be able to comeback, change it, it just… It caused so much change and chaos, maybe that could be… (you know) that's definitely a challenge with Design Build is just trying to plan for those changes that you know are going to be coming and you're trying to get it built at the same time, so you have…

Interviewer: So, you're kind of saying that like the *fast tracking* was almost *too* fast in a sense?

Interviewee C 2.3: Yeah.

Interviewer: Where they were like "yeah, yeah, yeah, go build it!" and you're like "yes, *but*… give me a second. You know, maybe we wait a month." Like…

Interviewee C 2.3: Exactly. Yeah. And… and that's the whole point of Design Build, right? You're trying to get the owner the best project in a faster time because you are collaborating, doing all this stuff that does (you know) at least on this project, it's definitely shown a lot of challenges for us in the fact that coordination and fit out of some of these lower floors that were part of a *later* work package. So, trying to get everything in there that you need and coordinating all that… And you know that took a lot of (you know) took a lot of that for… And I think we're doing a great job. It's going good. So, I'd say overall challenges could be the fact that (hey) you're trying to design a building and you're trying to build it *while* you're still designing it, so there's a lot of unknowns and stuff that could pop up and everything. But I think it's just a matter of having that right team there to help solve those challenges ahead of time before it gets to the field. So, I'd say that's a *challenge*. I'd say… I'm trying to think of a *barrier* per se about (you know) maybe that works one and the same (you know) maybe (you know) for instance (you know) owners (you know) owners are all different, right? They all prefer their different contract delivery types. Some owners like to stick with an architect because "hey, I want to have a… I want to have a contract with my architect and I want to have a… contract with my contractor." (You know) They might not trust the contractor to be able to coordinate all that based off experience. So, a lot of it… 'cause it is new and you rely on one contractor who's going to be the builder to really *run* the thing (you know) it could be (you know) just the environment. The owners want to be able to control the design and control the build and see it as like two *separate* things almost. I feel like as an industry I've seen (over the past few years) that Design Build's become the more *common* delivery method. And having those collaborative, IPD-type situations has helped (you know) basically it's become a lot more prevalent and there's a lot of value to it.

Interviewer: Yeah. I mean, this project (from what I've seen) is pretty much everything about IPD except for like a shared risk/reward mechanism.

Interviewee C 2.3: Mhmm.

Interviewer: Because you guys are all involved. You guys have had a lot of trade partners and various subcontractors involved for a very long time, very early. So, I mean, it's about as close I think as you could get to being an IPD without a couple of features.

Interviewee C 2.3: Mhmm.

Interviewer: It's interesting (yeah) that you mentioned the struggle with that kind of fast tracking element. Because I think it gets *sold* to people so much that they don't consider what are the very practical implication of doing that and I mean… So, I guess this is kind of my follow up, what do you think would help *remedy* some of that fast-tracking difficulty when it comes to it being a little too fast or there's that uncertainty?

Interviewee C 2.3: I would say really the (you know) kind of getting in contact with clients *sooner* who want to have the Design Build delivery method or want to use that method (you know) getting them onboarded early and getting awa-… like winning the contract early, start design earlier, like well ahead of when the want to start construction. I think what's unique about (I think) this [Owner] project I think this is one of [Owner]'s first Design Build contracts or one of their first (you know) times doing this type of delivery method. Which I know I think they were hesitant to do in the past and [Interviewee C 2.1] can correct me if I'm wrong, but I *think* that was kind of the case here is that [Owner] was not as used to Design Build delivery method, so maybe that caused us some delays to allow us to convince them, to say "hey, this is the right scope for you, here you go (you know)… here's when we want to start building it." So, ma-…maybe it's just that barrier of entry of just really like… (You know) You just have to *start out* design sooner and start coordinating sooner. And let the owners know that ahead of time if they know when they want to start structural and when they want to finish it (you know) basically how to… planning for that and factoring desi- being far enough along in the design where you know you can start and not run into issues.

Interviewer: Yeah. And some of that maybe comes down to just owner experience *and education.*

Interviewee C 2.3: *It is.*

Interviewer: Yeah.

Interviewee C 2.3: Yeah.

Interviewer: So, we've kind of touched on how there is a different atmosphere at the [Project Name] project. Like… a lot of people refer to this as like a "project *culture*." What do you think *makes that happen*? And if a project didn't have that, maybe how would you *make* it happen?

Interviewee C 2.3: Yeah. I'd say… You're just asking about the project culture in general like what sets it apart from any other project or just like what's *unique* about it?

Interviewer: Yeah. I mean, what's there? And if it weren't there, how would you make it there?

Interviewee C 2.3: I would say what's here at the [Project Name] project that really drives our project culture is the… really… the openness and communication between everyone. Like whenever problems arise and stuff, we know we have those partners that are there whether it be design partners that we hire out or trade partners we need help with or even constructability reviews, like everyone has their little piece of the pie and everyone's very (you know) *willing* on this team to throw their hand up in the air and say "hey, something's wrong, I don't know what's going on here, how do we *fix* this?" And it's really fostering that culture of collaboration not…(you know)… (you know) you're not… not shying away from it because (you know) you're scared of what the architect might make you do or something. It's like "hey, no, we're all in this together and let's see how we can (you know) work together to overcome this challenge that we're having." So, I'd say just that… really that communication piece that is the big… probably one of the biggest things, a part of the culture that makes this project (you know) what it is. And if a project *didn't* have that? To where they weren't communicating or (you know) they weren't… It wasn't as easy to communicate with the architects or engineers… Lots of times you could be waiting weeks for an answer. (You know) I've been on smaller projects where it's not the biggest project in town, the architect has lots of different projects going on, we don't have a contract with them, they just work for the owner separately. To where if they are given one week to respond to an RFI, they'll take that full week. And then you'd just be sitting around there waiting no matter how many times you call or whatever. Versus if you have a contract with them and they work for you and you have that collaboration and they see you as a true client and a true partner and not just somebody else that the own-… that they're trying to… That's trying to (you know)… (You know) I've had some architects think we try to screw the owner and it's like "no, it's not… not the right case." (You know) They think the contractor's the *bad guy*, but… (You know) Really repairing that relationship and seeing it as a true partner. Of like someone (you know) a business partner, a client, someone you're working with. I think that's the big differentiator that we have here.

Interviewer: It's kind of like (and I've talked about this with other people) there's a greater willingness to *be vulnerable* and also *be transparent*.

Interviewee C 2.3: Mhmm.

Interviewer: But that's tough to do in traditionally antagonistic dynamic, right?

Interviewee C 2.3: Exactly. Yeah.

Interviewer: Alright. I think we have hit nearly everything. [Interviewee C 2.3], do you have any final thoughts or closing remarks you would like to add?

Interviewee C 2.3: Nah, I think I'm good. Appreciate you interviewing me and everything. I know I'm not probably giving you all the right answ- or I'm trying to give you the best answers I can, but...

Interviewer: Nah. This is great. But yeah, I really appreciate it. Thanks for taking the time. Have a good weekend, man!

Interviewee C 2.3: Yeah! No problem. Hey, nice guitars back there!

Interviewer: Thank you.

Interviewee C 2.3: Well, see ya!

Interviewer: See ya!

End

Appendix J: Transcript of Interview D 2.1

The date of this interview was March 22, 2023. The venue of the interview was over an online Zoom meeting. Interviewee. The interview started at 12:04 PM CST. Interviewee D 2.1is a Senior Associate mechanical electrical design firm and is working on the Progressive Design Build project located in a Central US state that is at the focus of Case Study 2. Interviewee D 2.1 has worked in the AEC industry for six years. The Case Study 2 project is Interviewee D 2.1's first time working within a collaborative project delivery method.

Interviewer: So, it is March the 22nd at 12:04 PM and we are here with [Interviewee D 2.1]. And what is your position and title?

Interviewee D 2.1: I am a mechanical engineer. Technically Senior Associate with [Mechanical Electrical Designer] consulting engineers.

Interviewer: Okay. And how long have you worked in the AEC industry?

Interviewee D 2.1: So, I just hit my six-year anniversary. So, I started with [Mechanical Electrical Designer] right out of school, so January 2017. So, I've been there about six years. This is actually my first Design Build design-assist project. But our company usu-… does *mostly* healthcare and lab spaces, so we have several offices. Our office is (really our biggest client) *is* [Owner], so this is under the [Owner] umbrella, the project that I'm working on with [General Contractor].

Interviewer: And so, yeah, the next question was "how long have you worked with projects involving collaborative delivery methods?" And you said this is your first Design Build…

Interviewee D 2.1: Yup.

Interviewer: So, maybe before you started on this, what was (kind of) your understanding of or familiarity with collaborative delivery methods. (Sort of) What did you know, what did you expect, and then what are you experiencing now?

Interviewee D 2.1: So, what did expect? What did I know? So, I've for the most part done Design Bid Build, more traditional routes. We do, as a company, do a lot of *different* procurements. But most of our big Design Build or IPD projects are out on the East Coast. And what did I *expect*? I honestly didn't know a *lot* going into it. I thought it was going to be a *better* delivery method for this client in particularly just because I was on the previous phase and just seeing how many different entities there were under [Owner] and we're all kind of reporting to [Owner] I thought this was a better, *more efficient* process. And what I know now… Looking… I mean, I think it's going really well. And that's like also, from what I hear, the client's persp-… perception too. Is that they are… think it's going really *well*. I think it's more collaborative this way. It's also like… instead of going Design Bid Build, getting all of the coordination issues worked out before you actually *issue* CDs has been a huge, *huge* advantage to this project. And there's always gonna be other things that come up, but getting ahead of those not only helps schedule, but also cost, relationships. It's just… it's more seamless in my opinion.

Interviewer: Yeah. Have there been any challenges to you *uniquely* since this is like your first time doing a Design Build? Anything that you've found that's stuck out?

Interviewee D 2.1: Just *knowing* my (I think) knowing my place in (kind of) the *chain* of… command. So, I am under the architect. So, we all… Like I indirectly work for [General Contractor], but I'm technically *under* the architect, so [Designer]. And [Designer] has several different subconsultants. So, just like little things like making sure that if… if it's necessary that [Designer] is included in a meeting because technically I should be coordinated… coordinating or coordinated with them prior to moving forward with something. Like not just… It's just always keeping in mind like the different players, who reports to who, and the chain of command. Especially when changes happen. Which is kind of what w-… what I'm learning as I go, but… But I'm actually on site three… three out of five days a week. So… Along with the other design team members. So, that also is something that I *like* about this process. It seems more of like a team effort.

Interviewer: And are you in a jobsite trailer with the [General Contractor] team? Or is that just a designer trailer right there? [Referring to the interviewee's background]

Interviewee D 2.1: No, it's [General Contractor]. There's like *maybe* five people from the design team. But the rest… I would say there's like forty people on site, forty [General Contractor] people. So, yeah. It's… We're all sitting next to each other, so that helps too.

Interviewer: So, something other mechanical designers have mentioned to me (especially with regard to collocating regularly) is they were unsure if it was a good use of their time or not. But it seems like you said that you feel like it is a good use of your time.

Interviewee D 2.1: It *is* because my… Technically I'm a mechanical engineer, but I also am leading the like const-… we call it CA, but construction administration side of it. So, a different role for me. I've done it on other smaller jobs. But… In that aspect, *yes*. Now, if I was still designing, then it would be… it would be *hard* to get work done like productive work. If I was still actually designing, but we're technically done, so… I can see that perspective though, hundred percent.

Interviewer: And, as the mechanical engineer, what's under your scope or your purview for this job?

Interviewee D 2.1: So, it's HVAC. So, it's all the air handling unit systems, chiller plant, heating plant, all of the associated distributed piping and pumps, fuel oil. Let's see, what else? All the exhaust systems. And there's a lot of them. But… Yeah. Anything related to HVAC.

Interviewer: Okay, so you're also doing the hydronic piping system?

Interviewee D 2.1: Yes! Yup.

Interviewer: And then, do you guys have (and by "you guys"…) Sorry, that's unclear. Does the

onsite team have regular weekly meetings where you guys do coordination?

Interviewee D 2.1: Yes. So, there's [Interviewee C 2.4] who I think is also on your list. [They] lead the VDC side of things. So, [they]… [they] meet with trade partners for hours at a time every day to go through what we call "finite coordination." We have meetings throughout the week where we are actively coordinating specific things whether it's regards the schedule or procurement, but yes, there is… I jump in if there is like a *bigger* question with r-… with regards to coordination that may impact *design intent*. Otherwise, the trade partners are really taking that on. But like today, we had an owner flythrough meeting so, [Interviewee C 2.4] leads those too and I sit in in case the owner has questions. So…

Interviewer: And same question from earlier, do you *feel value* in these things?

Interviewee D 2.1: I *do*. It keeps the owner (kind of)… Instead of having them involved in the day to day, it kind of lets *them* focus on the things that they should be focusing on. We involve them if we feel like we are changing something that they have spec'd or going back on something that we agreed to during the design phases. But *otherwise*, like I do think that there is value. Like we did the owner flythrough for a certain level. So, we're doing level by level, going through the… We're using Revizto which is like a 3D model. And basically flying through and showing them here's your access to this terminal box, things that they care about. And just… If they don't… If there are issues and we have questions for them, that is the place where like "okay, would you rather have access from *this* side, or do you need us to *move* this?" And then, [Interviewee C 2.4] takes it, basically creates issues for trade partners, they go ahead and update it. So, it's really… Like we are using their time the most efficiently. I see value in *that*. I also see value in giving them the opportunity to make changes *past* design and *past* issuance. But… it's… I think that the way our team is set up especially with… We have different func-… We call them "functional teams." But there's like an MEP functional team, there's a structural enclosure fuction… *functional* team there's dif- Interiors. But those different teams really… And then there's like leaders. So, there's leaders that cross-coordinate in between. But the way we have the teams set up, I think there's definitely a lot of value in how we've delivered-and how we continue to deliver-to the owner.

Interviewer: Yeah. A lot of people on this job in specific have mentioned the strength of the team. Like I've heard…

Interviewee D 2.1: Yeah.

Interviewer: …that over and over. Really quickly…

Interviewee D 2.1: Yeah.

Interviewer: …just for triangulation, the BIM model. So, you guys (meaning [Mechanical Electrical Designer])…

Interviewee D 2.1: Yeah.

Interviewer: …you do your part and then you upload it to Revisto, so…

Interviewee D 2.1: Yeah, so that's actually a good question. So, this building is split into *two* different phases and it's basically two buckets of funding is how I see it. But they did Phase 3 basically the core and shell of the building and the fit out of the patient floors and then like the public areas on like the lower floors. It left… There were four floors that are all heavy imaging, that is called Phase 4. And so, two separate packages, bid separately. But we… For Phase 3, we brought the documents and the model to DD level, and then at that point they bid out the MEP scope and… So, the trade partners took over the model and the drawings at… basically when CDs started. So, that's when like it was helpful to do that because we get a lot of coordination out of the way like they could basically progress and advance fabrication better. And… But Phase… So, we basically relinquished the model after DDs for Phase 3. For Phase 4, we brought the documents to (and model) to the CD level, *but* the trade partners who ended up bidding and getting the job for Phase 4, *did* participate in meetings. Like they just did not have control of the model during the CDs. And there were multiple reasons for that. I think imaging is a little more complicated and there were still… there was still a lot of development with the imaging scope, so that is maybe one of the reasons, but… Yeah, it… We relinquished modeling for the *bigger* package early so they could get into the model and start doing their fabrication models.

Interviewer: Okay. And in your role as Construction Administrator, on the day to day, are you like reconciling clash issues in the field, or have you guys managed to catch most of those before they've gone out there?

Interviewee D 2.1: Yeah, there's like *no*… That is the *goal* of this whole process is to *eliminate* a-… any rework or like anything that is basically signed off on there's… [General Contractor] has like a *seven step* sign off process for finite coordination, and that process eliminates th-… like… the *possibility* of having a field clash unless something was *completely* off or something changes. So, if something changes sizes is when I can *see* that happening, but I don't even see it getting to the field point. On a day-to-day basis, I am… There are a *lot* of meetings, but I also get out to the field. So, I'm reviewing submittals, RFIs. I'm like the point person for… if I get an RFI that touches low voltage or electrical or plumbing, I am like the one point of contact *for this team*. And then like it's my responsibility to communicate to *my* internal team (so others at [Mechanical Electrical Designer]) and get the answers that I need. So, feels like… Some days it's like putting out fires all day, and then… But some days are me reviewing submittals and getting through a lot of the paperwork. So…

Interviewer: Yeah. With your experience with the RFI process on other jobs, would you say this is better, worse?

Interviewee D 2.1: A *lot* better. Because instead of sending out RFIs just out of the blue. Like for other projects we'll get an RFI and we're like "what are they even talking about?" Like what area is this? This team has decided the goal is that any RFI that I get I should be able to say "confirmed" and that' it because we've already talked about it before, they got what they need from me before and therefore wrote the RFI based on *our* conversation. So, that is a *huge* advantage for everyone, I think. 'Cause then it… it… it eliminates the back and forth. And I might be able to say "this… this isn't an RFI, you can just find this answer here." And

sometimes it happens, sometimes it turns into an RFI, but for the most part, I at least know what's coming. Which is great.

Interviewer: Now you said that was the *goal*, how has that played out?

Interviewee D 2.1: So, for certain things there… th- there are things that need to be answered more quickly because they need it for schedule that I'll know about it, but I will have to respond with an attachment or provide more information or clarification. Or I will… I'll hear about this question, I will basically communicate internally on my team, and then I get a different answer because I didn't have all the background from what was discussed in the different design phases for a certain trade. So, yeah. Sometimes it doesn't say "confirmed" when I send it back, but that is the goal and I… I appreciate that they've made that an important piece of this project.

Interviewer: And are you guys using (other than like 3D BIM)…

Interviewee D 2.1: Yeah.

Interviewer: …are you using visualization tools? Like a dashboard or something to track project KPIs?

Interviewee D 2.1: Yeah, we are. So, we use Procore for like *all* documentation. We also use *Mural*. Which I don't know if you know what Mural is, but it's… it's meant for like basically a white board, a digital whiteboard, and you can basically do whatever you want with that white board. So, there is so many different Murals, but each one has a specific purpose. So, I don't know if you're familiar with scrum…

Interviewer: [Nods]

Interviewee D 2.1: But there's like a scrum board for the MEP team. So, I'll go on the scrum board and I know where to look in a certain box to know what *is hot* or needs to be reviewed *quickly* that they've submitted to me. So, that's how I prioritize really. So, it's… it's a good communication tool. And that… I mean, we also use Teams and SharePoint, but other than that it's mostly Mural, Procore… yeah.

Interviewer: And prior to the job starting, or even now, were there like team building and training exercises between you and the various trade partners and [General Contractor] and all that?

Interviewee D 2.1: Yes. So, before we were all in trailers, we were really… I was at [General Contractor]'s office where we had meetings with the trade partners on a daily basis. But there were also team building. [General Contractor] would either bring someone in to a meeting to do like a team building exercise or we would… they would host events. So, there were several. We just did a big event and everyone was invited, so there were a lot of people. But yeah, they do see a huge… they *value* culture. And team culture. And that is important to them. So, they *do* put an emphasis on that and… and host events and make an effort… *so that helps.*

Interviewer: And *you feel* like that is *materially* evident to you is that it's not just something they've put on a corporate logo or whatever?

Interviewee D 2.1: Right! Right. Yeah. A hundred percent. They actually execute and take action to do it. So… Which you can… There are certain times where someone will say "I think we need like a team building exercise" just because high stress, a lot going on, people are frustrated, but yeah. And then we have, for MEP, a monthly like happy hour. So, our monthly happy hour is tomorrow, it's like the last Thursday over every month. Which is also a g-… It's always fun. And there's more than just MEP people that show up which is… which is good. 'Cause you get to talk to other people on the team and get to know them when you really wouldn't talk to them otherwise.

Interviewer: And (sort of) with that project culture, do you guys have a… like a "team leader" or like somebody on the jobsite who's really making sure to keep that at the fore like…

Interviewee D 2.1: Yeah! Well… So, we have (I mean) [Interviewee C 2.1], is project director. So, [they]… In that [they] talk about culture a lot. So, [they] do push culture. And then you have certain people like continuing to make things… *events* happen. So, different levels, but that is like one of their goals is to keep the team culture alive and good team culture.

Interviewer: Well, and I've seen a lot of that on the little YouTube videos that they've put out.

Interviewee D 2.1: Yeah! Yeah.

Interviewer: Every other video there's like some kind of get-together or celebration or something.

Interviewee D 2.1: Yeah, they also do a good job with like certain like… Women in Construction, they do like a breakfast. And so, you have *everyone*. So, you have the trades, you have the owner, you have the design team all in one room which is… is good. And they… they do that consistently. Probably once a month there is an event, so…

Interviewer: And it's good to see that owner involvement too. That's not always common.

Interviewee D 2.1: It is! Yeah. Especially with these project 'cause… Yeah. There's a… a lot of people. And it's… It's also like pretty div- like from the owner there's all different levels of people, so… even really up high, I'll see them on site which is good to see.

Interviewer: For this job did your company have to have bonding or any kind of unique insurance that you otherwise wouldn't have?

Interviewee D 2.1: No. I do not think so.

Interviewer: Okay.

Interviewee D 2.1: Not that I am aware of.

Interviewer: Do you remember what any of the like team building (kind of) activities or exercises you guys have done were?

Interviewee D 2.1: Yeah, so we've done [Local MLB Team] games…

Interviewer: I'm sorry, what was th-…

Interviewee D 2.1: [Local MLB Team]. So, the [Local MLB Team] baseball games…

Interviewer: Oh, okay!

Interviewee D 2.1: …they've hosted there. Golf outings. They… then they will also like (I think his name is [name] something. I can't remember his last name) but he will come in but it's more like a personality kind of thing where he like will ask interesting questions and… Some of… it almost feels like a counseling session, but it's… it's meant to help everyone understand how people work, what people get frustrated with or are frustrated with, and things that are going well. But… I'm trying to think of what else.

Interviewer: You mentioned [Name], what is his name and like title?

Interviewee D 2.1: Yeah. It's [Name]. Let me look it up. It's someone with [General Contractor]. [Name]… Would have been a while ago. [Searches through email] I can get… I can send it to you.

Interviewer: Okay.

Interviewee D 2.1: But yeah, he… He's come in a few times just different teams and different… different exercises. So…

Interviewer: I'm just kind of interested in *whatever* that might be like some like…

Interviewee D 2.1: Yeah!

Interviewer: …company psychologist or something who's…

Interviewee D 2.1: Yeah! It… That's what it kind of felt like, but he's definitely like… (I'm trying to f-… see what this event was called) [Continues searching through email] Yeah! I'll get it to you.

Interviewer: Very cool. So, I think finally we'll just get to the big part of it which is in your opinion (and in your experience), what do you think are probably the challenges that people have with these more collaborative styles of project delivery versus ones that they might be more familiar with? And this is perfect because you've kind of experienced this…

Interviewee D 2.1: Yeah.

Interviewer: …recently.

Interviewee D 2.1: So, sorry what was the first part of the question? What is the… like benefit? Like what are the…

Interviewer: Yeah, I think we know the benefits, so…

Interviewee D 2.1: The challenges?

Interviewer: Yeah, what do you think are (sort of) the challenges that are preventing people from adopting (you know) this is Progressive Design Build…

Interviewee D 2.1: Gotcha.

Interviewer: …but also IPD. Stuff like that, these very collaborative, very involved, (kind of) dynamic project delivery methods versus something like a Design Bid Build.

Interviewee D 2.1: [Sighs] That's a good question. The challenges I would say is… finding the right *team*. Like not… You don't always have the long-lasting relationships with architects and engineers and between the three, so the… like [General Contractor] and [Designer] had a really strong relationship and we had a relationship with [Designer]. So, to team up like that and all be on one page and all have like *one vision* and be able to like agree on everything 'cause it's… the fir-… You don't realize how much is (kind of) decided in the first few months of like a pursuit. But it's also like… It can be a *risk* to go on this long… Like it was a pretty… it felt like a long pursuit for this job. But…

Interviewer: I think someone was telling me it was like a year and a half or something

Interviewee D 2.1: Yeah. So, it was (I mean) I think the biggest hurdle, could be, just the relationships between all three. And there are different ways you can still do a progressive delivery method, but that's one thing that (I think) is a *huge*… Our team has a huge advantage because there are such strong relationships on the leadership side of the Design Build team. And they're very like transparent with each other. They're all likeminded. They all have one *goal*. And so, to be able to agree on those things and still keep the owner *happy* is important because I know Design Bid Build is a little different. Because everyone is trying to… We (in Design Bid Build) sometimes we report directly to the owner or to the architect, so it's always… Everyone kind of looking out for themselves in a Design Bid Build, but… Let's see. What else could be a challenge? Another challenge is just like the *details* of like… We hand over our model and our drawings to trade partners and we have to *agree* to basically *trust* that the drawings are what we all agreed to. Because at the end of the day, it's always going to be a rush towards the end, and we have to stamp them. So, that *trust* between the trade partners and the engineers is huge. And the architect. So, that piece. And then the owner. The owner has to *want* it. So, if the owner doesn't *want* something like this, then… 'Cause it's different for… I know for this client it's just a different way to do things. They had not done this at this *scale* before, and so it's just that can be risky.

Interviewer: And had [Mechanical Electrical Designer] worked with any of your trade partners that you have on this job before, like any of your duct guys?

Interviewee D 2.1: Yes. We have. We actually did the project before this that was a different delivery method and I think that project may have influenced why we did *this* delivery method, but we did work with a lot of these trade partners. So, that is also helpful because there was a little bit of like "okay, we've been through this before… this is what we learned. So, how are we going to do it for this job differently?" And that time before CDs, when we… they were brought on early, allowed us to get *through* a lot of that. So, we have worked with a lot of them before. Almost all of them.

Interviewer: And a lot of people that I've interviewed also mentioned (sort of) that like *cultural difference*. (I mean) We talked about this a little bit earlier. But it's almost like there's something in the air if that makes any sense. Where like it *just* feels different.

Interviewee D 2.1: *Yeah.* Yeah, it does. But I think… Yeah, this way… It just seems to be going a lot smoother.

Interviewer: And you mentioned how it was kind of challenging developing that *trust* with people and that was maybe one of the bigger barriers, what do you think would be a way to remedy that? Just in your opinion.

Interviewee D 2.1: So, what they tried to do (and wasn't successful), during CDs was for like… basically every… there were like three different milestones, and they were called Alpha, Bravo, and Charlie…

Interviewer: That's kind of cool.

Interviewee D 2.1: And… Yeah. Well, yeah. It would have allowed us to review certain things along the way, but there wasn't a lot of time, so it ended up being like… just kind of all at once at the end. And obviously we were… we were working with them on a day-to-day basis, so it wasn't like we… we thought that they were going completely off course on their own. So, that… If we could have kept those deadlines and had more *time*, I think *more time* (which is hard to do in today's world), more time and like more checkpoints along the way, would've helped.

Interviewer: Or even maybe just accountability for the things that you guys *did* agree on?

Interviewee D 2.1: Mhmm. Yeah.

Interviewer: 'Cause it seems like you said "we set up three things," and then everyone was like "uuhhhh… A and B don't matter – everything is C now."

Interviewee D 2.1: Yeah!

Interviewer: Yeah.

Interviewee D 2.1: Right. Yeah. Agree.

Interviewer: Okay, I think we have hit *everything*. Is there *anything* you want to add final remarks wise?

Interviewee D 2.1: *Awesome!* I don't think so. But thanks for including me on this.

Interviewer: Yeah, of course. Thanks for taking time to do this interview with me.

Interviewee D 2.1: Of course. And it was nice to meet you.

Interviewer: Yeah. Have a good week!

Interviewee D 2.1: Alright. You too. Bye.

End

Appendix K: Transcript of Interview O 2.1

The date of this interview was March 24, 2023. The venue of the interview was an online Teams meeting. The interview started at 10:12 AM CST. Interviewee O 2.1 is a Senior Project Manager and is working as the owner's rep for the Progressive Design Build project located in a Central US state that is at the focus of Case Study 2. Interviewee O 2.1 has worked in the AEC industry for eleven years. Prior to the Case Study 2 project, Interviewee O 2.1 had nearly five years of experience working with collaborative project delivery methods, primarily Design Build.

Interviewer: Alright. So, it's March 24th at 10:12 in the morning. We're here with [Interviewee O 2.1]. [Interviewee O 2.1], what is your position and title specifically?

Interviewee O 2.1: So, I am the Senior Project Manager for the [Project Name]project at [project location]. My r-… my role on the project is owner's rep.

Interviewer: And how long have you been in the construction industry.

Interviewee O 2.1: Eleven years.

Interviewer: So, right out of college?

Interviewee O 2.1: Right out of college.

Interviewer: And you've been with [Owner] the entire time.

Interviewee O 2.1: [Nods] Correct.

Interviewer: And how long have you done work with collaborative delivery methods? meaning like Design Build, IPD.

Interviewee O 2.1: Roughly five years.

Interviewer: Okay. So, like you're reasonably familiar with these things?

Interviewee O 2.1: Correct.

Interviewer: So, what is your understanding of a collaborative delivery process?

Interviewee O 2.1: To *my* mind, a collaborative delivery process is one where you have owner, designers, and builder engaged from the start. Everybody's coming in together building scope, schedule, budget as… as a team.

Interviewer: And what was… Or rather, how long have you been involved with the [Project Name] project, and how has your involvement… What has that looked like the entire time?

Interviewee O 2.1: So, I've been involved since twenty-one, so about two years. I came off of a

previous Design Build project and came into this as design was coming to a close on the… this [Larger Project] project. So, my role as a Construction Project Manager… We oversee the… the process from design, construction, activation, closeout.

Interviewer: And what is your day-to-day involvement with the project like? Are you there every single *day*? Are you in weekly meetings?

Interviewee O 2.1: Yeah. Here day to day and regular (you know) standing meetings. Meetings as needed for coordination. Yeah.

Interviewer: And what is your role (sort of) when you get into those things, get into those meetings?

Interviewee O 2.1: So, my role is to provide direction to the team, the project team. And not necessarily decision maker, but we manage changes, we manage schedule, budget, and if there *are* requests for changes or there are questions in the scope, my role is to come back to the stakeholders at the hospital and gain either support or find another solution.

Interviewer: And other people that I've interviewed have mentioned that you guys maybe had a not-so-great experience with like a previous Design Build project and that (kind of) informed some of your involvement and practices *this* go around. I obviously don't need you me… to go into details with me, but like would you explain that at least a little bit to me? Kind of tell me what your history is with that.

Interviewee O 2.1: I don't really have any history with that.

Interviewer: Oh, okay.

Interviewee O 2.1: I was working *at* [Owner] during the time but had no involvement in… anything to do with that initial, call it Phase 1 project is I think what you're referring to.

Interviewer: Yeah. I don't know if it was the Phase 1 specifically. They just mentioned it was at a time in the past and I was like "oh, okay." Because they were telling me about not only your involvement now and then kind of your participation, but then also the interview process. Were you a part of the team like the construction team, Design Builder interview process?

Interviewee O 2.1: I was, yeah.

Interviewer: Could you kind of outline that for me just a little bit because it's *unique*. I mean, not everyone has done that.

Interviewee O 2.1: Yeah. Definitely. Yeah, [Owner] went out and (kind of) talked to market specialists and other owners and consultants on… and (kind of) get an understanding of what… what are other people doing and what (you know) this type of project what… what has worked for others and (kind of) the general consensus was a Progressive Design Build model was (kind of) where people are heading and… and it's worked well for others, so that's the way we went.

We invited some… several teams to participate. We ended up with two… that continued on through the interview process and that was a multi-week, -month, multiple sit downs to talk through what the… what the (I guess) program looked like, how the team would approach a project like this, what each team brought to the table, et cetera. And… and we made a decision based on that.

Interviewer: And so, did they give you like one final one- or two-hour presentation, or were you guys like in the room while they were doing some kind of interactive game or problem solving?

Interviewee O 2.1: We did tour both companies' existing… a… an existing project from both companies. Both were hospital projects with teams they had proposed for our project. So, that was one… one piece of that. But no, it was more of a sit down and talk through (you know) each person's approach to the project. It wasn't really any like interactive work per se going on or…

Interviewer: Yeah.

Interviewee O 2.1: …modeling or anything like that.

Interviewer: And what would you say were some of the more critical or defining factors in that for you guys?

Interviewee O 2.1: I think it was really the… the team and… and the projects and… and the company's approach to the project. It was bringing the right team at the right time and everybody seemed to… to have the right attitude towards it and that was really the difference maker.

Interviewer: So, a lot of it was just attitude or something that you would say is not quantifiable maybe?

Interviewee O 2.1: [Nods] Right. Yeah. I mean, both companies are very capable and could probably have done the project well either way, but (yeah) it was the culture and the team approach that they had.

Interviewer: I guess that's a really good point 'cause [Interviewee C 2.1] kind of mentioned the same thing is like when you get to something of this magnitude like, hopefully everyone is coming in with *about* the same budget, *about* the same schedule…

Interviewee O 2.1: Yeah.

Interviewer: …so it really kind of comes down to the literal people. Like the humans you will have to deal with regularly. When you guys were going through this refinement process, you said you were considering different project delivery methods, did you consider IPD or just like CM at Risk or anything else?

Interviewee O 2.1: Not particularly, no. This was kind of the… the consensus.

Interviewer: When you had talked to other people, other owners they said "yeah Desi-…

Progressive Design Build" rather.

Interviewee O 2.1: *Yeah.* Yup.

Interviewer: I think I kind of got an idea of this from [Interviewee C 2.1], but I just wanted to probe you a little bit about it. Did you guys have any specifically (you know) Design Build *training* or Design Build like team building exercises or integrating or whatever?

Interviewee O 2.1: I don't… I know I wasn't a part of any. I don't think we did any collaborative with [General Contractor], but at [Owner] we *did* bring in a representative from the DBIA who did some (I guess) classroom work. But (you know) we… it was more presentation classroom style, sit through and… and (you know) listen to his talking points and what lessons learned from him about…

Interviewer: Is that like…

Interviewee O 2.1: I think that was about it.

Interviewer: Was that like a *one*-day thing?

Interviewee O 2.1: There were multiple sessions. It… Maybe two or three.

Interviewer: Okay. And who all was in that?

Interviewee O 2.1: That was our… just our [Owner] team. Our project managers, VP, director, we have a director of design.

Interviewer: Did you find value in that?

Interviewee O 2.1: Yeah! Yeah. It wa-… it was good. (You know) Somebody from… had (you know)… The gentleman had real life experience and had devoted his (I guess) a-… post-construction career to the… to the DBIA, so yeah. It was interesting to hear what he had to say.

Interviewer: I have a question on here… So, you guys have mostly been the driving force behind the Design Build method….

Interviewee O 2.1: [Nods]

Interviewer: With the overall budget and the overall duration of the project, was that just determined internally by you guys? Like you had plans for capital outlays?

Interviewee O 2.1: Correct. Yeah, that… that gets determined in house early on and (you know) we use our cost history and… and internal estimating to develop that. And then, *usually* we're close to where (you know) where the final numbers end up and… numbers and schedule. But yeah (I mean) there may be some… some adjustment needed at buyout or (you know) time of contract.

Interviewer: Yeah. Have you guys had issues with like material escalations or anything?

Interviewee O 2.1: I don't know that I'd call it issues, but yes it's a… an ongoing…

Interviewer: *Opportunity*?

Interviewee O 2.1: …challe- Challenge. [Laughs] Yeah.

Interviewer: [Laughs] How was the RFI process for this job? What is that like by the time it gets to you and do you think it's better or *worse* than other jobs that you've been a part of?

Interviewee O 2.1: I would say it's… it's *average* I guess in my mind. I don't that it's any better or any worse than any other job. By the time it gets to me… Typically with… (You know) they're using Procore as I assume most larger companies are doing at this point for RFIs, but typically the- the team makes a determination whether it needs owner input or not. And… So, I don't see all of them. I have access to all of them but if they determine owner needs input, it comes to me and I will (you know) either answer it myself or… or get input from whoever I need to from my end to get those answers. Keep things moving. But in… a… it's… it works.

Interviewer: Yeah. I talked to some other team members about various technologies that they've used for achieving collaboration on this project. Are there any technologies that you guys are using toward that end?

Interviewee O 2.1: I don't think so. I mean…

Interviewer: I mean, this could literally be something as simple as Teams. Like it often is…

Interviewee O 2.1: Yeah.

Interviewer: …Teams or…

Interviewee O 2.1: *Sure*. I mean, yeah. We use Teams every day. Our… myself and the other project managers at… at [Owner] sit (you know) on campus, so we are on site not far from the sit- (you know) from the construction trailer, so we try to meet in person as much as we can. Yeah. Te- Teams was a big part of the design collaboration (you know) through the pandemic and all that, so… From the owner's standpoint, that's probably about it (you know). Getting into the BIM and… and the Procores and all that… Yeah, I'm sure [General Contractor]'s already touched on all the technology that they use 'cause it's a lot.

Interviewer: So yeah, I mean, I have a few questions about BIM. Obviously, I don't think many of them apply to you. Do you have some exposure to that in a week or in a month, or is it just kind of them showing you things occasionally?

Interviewee O 2.1: So, what we've set up is… It's every floor gets coordinated. The BIM manager will do a flythrough with our team, the facilities folks, and there's a handful of others

invited, but generally that's who shows up to those. And it's really just a (you know) an above-ceiling flythrough as they're ready to sign off on each floor to say it's coordinated. We d-… do that final flythrough and if there's any (you know) adjustments to… to (you know) maintenance spaces or (you know) VAV boxes. Just general get a… get a final buy in from facilities before it gets built.

Interviewer: So, on that note, what has been the process on your part (meaning all of [Owner]) with incorporating end-users into this whole process? So, like doctors, nurses, nurse managers.

Interviewee O 2.1: So… are you… What are you asking? H- How much are they involved, or…

Interviewer: I think…

Interviewee O 2.1: …how do I…

Interviewer: Yeah. I think I *am* asking how much they're involved, but then also (maybe what you were going to say) which is how do you coordinate that? How do you make that happen?

Interviewee O 2.1: So, generally that… We have a team of planning folks that is very engaged during design that will coordinate that effort. So, they do (you know) schematic design, design development. That is when the majority of end-users (doctors, nurses) get input into the… the design of the project. Once construction documents are complete, generally we try to keep them *out* of that as much as possible because (you know) a project of this magnitude, there's probably…

Interviewer: Way too many cooks.

Interviewee O 2.1: (You know) There's… Most of those people will not be here when that building opens. So, you start getting input and they want to change things… It's just generally we try to keep (you know) plans are set, you had your input, and… and we're building what… what you asked for.

Interviewer: Do you know if they used VR at all?

Interviewee O 2.1: We did not.

Interviewer: Okay. I know in some medical projects they've done that where they'll give the doctors and nurses like a VR walkthrough of a space.

Interviewee O 2.1: Yeah.

Interviewer: It's a lot easier for them to pick out different things faster (vis a vis ligature points or whatever).

Interviewee O 2.1: I think that's… *Will* be a very useful tool in the future. We *did* have that conversation, but it was late in design and it was at a point where (you know) we don't want to

open that up because it's… it… we're likely to end up with a bunch of changes that we're too late to do.

Interviewer: Did you do *surveys* of like the doctors and nurses or was it interviews?

Interviewee O 2.1: They actually sit in design meetings *with* us.

Interviewer: *Okay.* I think we hit on quite a lot of the stuff here. So, really, to conclude it, from your perspective (from ownership) what do you think, if any, are some of the primary barriers and/or challenges to people *using* these collaborative styles of delivery more often. I mean, I will pause for a moment, backfill you with a little bit of my research which is that, in general, we know that there are all of these positive things associated with collaborative delivery methods (meaning Progressive Design Build and IPD), but they are *not adopted* nearly as much as Design Bid Build or even CM at Risk. IPD I think still accounts for like one percent of all deliveries, Design Build is increasing, but it's still (I think) lower than most of the others. So, my research is *probing* why that's the case like what is (kind of) preventing people from using these things. And it's not to say that this is the only research ever to do this – people have done this a lot in the past, but a lot of it at this point is nearly a decade old or older.

Interviewee O 2.1: Yeah.

Interviewer: So, we're trying to see, in 2023, (you know) are the issues still the *same*, are they *different*, are they maybe a different shape or *color* of what they used to be? And for the purposes of my research a barrier is typically something that is outside of your control, right? So, if there is a statute in [Project's State] that says (you know) "you can't use anything but Design Bid Build," like okay, that's a barrier. You could *possibly* change that in your lifetime, but it's not really *feasible* that you're going to – it's beyond your agency. Whereas a challenge is something kind of internal meaning (you know) how do you work with your *team*? How do you solve problems *interpersonally*? That kind of thing. Or what are even (you know) *daily* stresses that you might experience as an individual project team member *because of* the delivery method. So, that's kind of the really quick overview of what I mean by these (sort of) broad ideas, right? Like "barriers" and "challenges." So, yeah. Take it away if you want to.

Interviewee O 2.1: Yeah. So, speaking to like what you're referring to as a barrier, I don't have a lot of input there. Is something that is legally or otherwise preventing a Design Build or IPD project. I… I… I can't speak to *that*. What I would say is that from an owner's perspective, a challenge or maybe (in my mind this *is* a barrier) that trying to get buy in from everybody on an owner's *team* that you're giving up control of the project. *Quality* control, *quality* assurance. (You know) Y- everybody's used to hiring your own architect, your own engineer. They work for you, and they are your eyes and ears on the project that the contractor's building what you paid for. And obviously, Design Build, they all work for the contractor. I think that (in my mind) that *is* a barrier to a lot of owners getting… getting over that hump to Design Bid… or Design Build model.

Interviewer: So, you would say they're maybe not comfortable with that level of vulnerability?

Interviewee O 2.1: Right. In my mind it gives you m- (you know) the flexibility to have as much or little of involvement as you want (you know). In a Design Build project the owner (you know) you could write a GMP or contract and… and sit off to the sidelines if (you know)… if that was your intent. We're *heavily* involved with pro- with this particular project, but (you know)… Other challenges I see are within the Design Build *team*. I think there's a lot of routines or (you know) people are stuck in their ways trying… trying to (you know)… I see it a lot on this project of (you know) everybody's in their silo still. And it's… it's been (you know)… It's coming together *really well*, but… Y- y- you've… I've seen (you know) especially [Interviewee C 2.1] working with their team on… on getting (you know) getting out of your old habits. This isn't (you know) y-… Architect you're not… you're not working for the owner, you work for us. And even the architect coming back to us for questions or information when really they shouldn't be coming to me, they should be going to [General Contractor]. So, that… And I mean, that's (you know) I think a challenge I think within… within the team I think that's something that (you know) in this area is… that (you know) there's not a ton of huge Design Build projects.

Interviewer: Where you are, it's mostly still Design Bid Build? *Just* hard bid?

Interviewee O 2.1: *Yeah.* Yeah. I mean, even (you know) we… we have a couple hundred projects a year we execute and a majority of those are Design Bid Build.

Interviewer: Would you say with that, a lot of it comes down to just project type? That's something other interviewees have mentioned to me where they're like "not all projects need high levels of integration."

Interviewee O 2.1: Yeah. I- I think… There's pros and cons to… to both, but yeah. I mean, the mo- the majority of our projects are renovation projects with (you know) a bunch of existing conditions and (you know). Would it pay to have a contractor involved early on? Probably. And a lot of times we do, it's just not necessarily a Design Build contract.

Interviewer: Yeah. You mentioned (talking about Design Build) this (sort of) potential for some owners to be completely hands off versus you guys being involved. And that's something other people have mentioned sometimes as a *detriment* to Design Build is that owners will just *not* participate versus IPD where you are a stakeholder and are *required* to be involved. But you're saying (from your perspective), even though, contractually, you could just like write checks and walk out of the room, you as a company have decided to like *be* very involved in this process.

Interviewee O 2.1: *Absolutely*. Yeah, that wa- that was part of the.. the (you know) the initial RFP process and… we (you know)… that was… that was stated early on. We planned to be very engaged.

Interviewer: And you also mentioned that a challenge is getting buy in. Probably not just from trade partners, but also from *your* project team specifically. How did you guys get through that or *are* getting through that or what would your *suggestions* be for achieving that in the future?

Interviewee O 2.1: Yeah, I… I think that comes down to having… having the right team managing the project. (You know) The team [General Contractor] has is… has a good culture.

They've created a good culture on site and is very collaborative. And that's been (from day one and continues to be) just generally. And then (you know) the inner workings of Design Build contract. That's still (you know)... we're still working through that, but (you know) specifically I… I don't know that I have specific examples or suggestions. I think… I think ultimately it's creating that collaborative culture. (You know) Them… they… The Design Build team sits (you know) on site together. I think that's a big part of it.

Interviewer: Forgive my ignorance…

Interviewee O 2.1: I think.

Interviewer: …you've got a really fancy backdrop right now. Are you collocated on site?

Interviewee O 2.1: We're not in the trailers, but yeah. We are on site. Not necessarily (you know) a quote unquote "construction site," but yeah, it's a three-minute walk.

Interviewer: Oh, okay. Yeah. One piece that I want to hit on before we really kind of wrap things up. The financials. I think [Interviewee C 2.1] told me that there is a cost savings… that they're… they're doing like a cost sharing or something?

Interviewee O 2.1: Sure. Yeah. Yup. There's a shared *savings* program.

Interviewer: Shared savings. Yeah. So, what is (sort of) the perspective on that from you as an owner? 'Cause I know sometimes owners will mention things like "why am I paying these people *more* to do something they were supposed to do already?" or "why am I incentivizing them to *do their jobs*?" Essentially.

Interviewee O 2.1: So, I think (you know)… There… We have… *sticks* in the contract and we have *carrots* in the contract. And (you know)… There… there's a lot in the contract that [General Contractor] has to live up to and there's also the carrot at the end of (you know) you do a good job (you know), they'll be rewarded for that. That… (you know) that was the general approach to it.

Interviewer: And did you guys… Was there a *lot* of back and forth on (kind of) figuring that out, or was it pretty cut and dry?

Interviewee O 2.1: The detail… (you know) the shared savings, no. That was pretty cut and dry. We… we came in with what it was gonna be and that was that. The… the details of some of the other incentives and… and *damages* in the contract, yeah. That was a lot of negotiation. But generally, we knew what was… it was gonna be.

Interviewer: Yeah.

Interviewee O 2.1: And it wasn't (you know). That wasn't something hidden from day one. It was very… very *open*.

Interviewer: For sure. Are there any closing thoughts or anything else that you want to add before we wrap it up here.

Interviewee O 2.1: No, I don't think so. I think we… we hit on everything you had there.

Interviewer: Very cool. Alright [Interviewee O 2.1], thank you for taking the time to meet with me today. I appreciate it.

Interviewee O 2.1: Yeah. Absolutely. Have a good one!

Interviewer: You too, man! Have a good weekend.

Interviewee O 2.1: Alright. You too. See ya.

End

Appendix L: Transcript of Interview TP 2.1

The date of this interview was March 17, 2023. The venue of the interview was over an online Zoom meeting. Interviewee TP 2.1 joined the call by phone while driving. The interview started at 2:41 PM CST. Interviewee TP 2.1 is a Senior Project Manager for the electrical subcontractor and is working on the Progressive Design Build project located in a Central US state that is at the focus of Case Study 2. Interviewee TP 2.1 has worked in the AEC industry for nearly eight years. Prior to the Case Study 2 project, Interviewee TP 2.1 had worked on both Design Build and IPD projects.

Interviewer: It's March seventeenth, 2:41 in the afternoon. And I'm here with [Interviewee TP 2.1], and what specifically is your position/title?

Interviewee TP 2.1: I am the senior project manager for, in this case… It's kind of funny. For [Electric Company A], but actually [Electric Company B] is the parent company to [Electric Company A], so I technically work for [Electric Company C] who's part of the same family as [Electric Company A] underneath [Electric Company B], so it's kind of confusing. On this job, I'm working for [Electric Company A], but I'm being farmed out to [Electric Company A] 'cause they're a sister company of ours underneath the umbrella [Electric Company B] which owns four electrical contractors nationwide. So, technically I work for [Electric Company C]. On this job I work for [Electric Company A], but technically we all work for [Electric Company B]. If that makes it *any* clearer at all.

Interviewer: Yeah, so you're just a senior project manager though for…

Interviewee TP 2.1: Correct.

Interviewer: …specifically the electrical trade?

Interviewee TP 2.1: The electrical scope, yeah. Sorry. So that would be the *high* voltage and *low* voltage scopes. I'm in charge of those being installed in the [Project] hospital.

Interviewer: Okay. And then how long have you worked in the AEC industry?

Interviewee TP 2.1: I started with a small contractor when I graduated from college in 2014, and I've been at [Electric Company C] (which is now again slash [Electric Company B]) since then. So, I've been with them for about eight years now.

Interviewer: Okay. And then, have you *ever* worked on projects prior to the [Project] that were (sort of) collaborative in nature, meaning like IPD, Design Build?

Interviewee TP 2.1: I have done IPD for sure. I've done an… an IPD on two jobs. And I've done Design Build on one job.

Interviewer: Okay, so this is not your first *rodeo* when it comes to collaborative deliveries?

Interviewee TP 2.1: Correct. Now, I will say in… in respect to this particular project, [Project], the design-assist portion was (what we call our "Part A" services)… I wasn't *as* involved with that as I have been on other jobs-I was wrapping up a hospital out in Philly. So, I… there… there is other people within our company who were there from day one who are no longer… They turned it over to me now, but as far as the processes and those things, I know a lot about what happened. Again, I have experience *in* these types of delivery methods.

Interviewer: And so, with you guys being the electrical scope and a subcontractor, how *early* in the process (I mean, I know that you came on in the Part B) but like how early in the process are you guys involved with…

Interviewee TP 2.1: So, the…

Interviewer: …the owner and [General Contractor]?

Interviewee TP 2.1: Oh, sorry. So, from the *DD level set* is kinda when we got hired to start doing it. So, essentially [Engineer] who's the engineer on the job, took the drawings to *DD*, and then collaborative approach *with them* was to take it from DD to CDs.

Interviewer: Okay.

Interviewee TP 2.1: So, we go brought on when it was just still very… not *quite* schematic. It's… it's the DD, so Design Development. You got, most of your like "backbone" I'll call it – the infrastructure to get power throughout the building kind of designed, but like circuiting of the floors and receptacles and pieces of equipment are still lacking and that's information that you get through the process working with [General Contractor], the owner. What they're looking for. As well as the other trade partners like mechanical, plumbing, and… and those types of things.

Interviewer: And so, how did you guys go about like integrating project personnel for [Project]?

Interviewee TP 2.1: When you say project personnel, are you talking about… like bringing people in and out that worked for us, or what? Just…

Interviewer: Oh, sorry. I mean like *you* and *[General Contractor]* and the mechanical/plumbing people… Like how do you guys coordinate stuff, and how does that *happen*…

Interviewee TP 2.1: They had… they had quite a few *focus groups* where they would have (you know) the owner would come it. Let's just say you were talking about a patient room and the owner's done their meetings with their user groups which is typically the nurses and the doctors or the *head* nurse and doctors or however it is, I wasn't really a part of that one. They get what they need in the rooms done. There's also the coordination with the (like I said) the various trades that will tell us like (hey) the mechanicals say "hey, we're gonna have three chillers that are this… this amperage or this voltage." So, through those focus groups and working through the building on a floor-by-floor basis. That and we were able to take the notes and then start placing the devices or pieces of equipment or whatever on the drawings as the first step. And as that gets finalized, then we start looking at how we're going to circuit those 'cause you have to

have… certain panels can feed certain things in a hospital, right? You have life safety and critical stuff that has to be fed out of specific panels and it has a different way of being installed than if it's just normal power doing your lights in a corridor. So, numerous, *numerous* focus groups. And *long* meetings between all of the partners going through-painstakingly-all the floors and all the different rooms and areas on those floors is where that coordination process happened. Not to mention-obviously-at the same time you're simultaneously working in the model to update the 3D model with the various stuff.. Starting to populate it with our conduit runs and our *panels* and all that stuff. So it's kind of… those two things were happening concurrently as the design developed. And we're still doing *BIM* quite a bit, but that's just for clash detection and coordination. Make sure that our racks aren't running into mechanical's racks aren't… you know what I mean?

Interviewer: And so, you guys are kind of building your models and then uploading them to Revizto, and that's how that…

Interviewee TP 2.1: Correct. Yup! A hundred percent. And then they have constant meetings with [Contractor's VDC Manager] who's the spearhead of that… that program for [General Contractor] and they just, again, go through where the clashes are at, where the issues are at. Figure out solutions as a team. And right now, we're currently… I think it's… We're coordinated through up to level one, and we're *populated* pretty much all over the building. So, that population's kind of the same thing I talked about where we know there's a piece of equipment in this room, how we're gonna feed it, how that conduit's gonna route maybe isn't finished yet, but we have *placed* everything that we need to place already in the model.

Interviewer: And with the level of detail, do you guys literally go down to the conduit line?

Interviewee TP 2.1: So, on this job… *It depends on the job*. They… they… they… What I'll… What they call it is "Level of Detail." And the LODs could be 100 through 500. 100 being the least amount of stuff in the model. You know, at that point, it might just be feeders or something like that like big distribution conduits. All the way to level 500 which is down to the minute detail. In this situation, it's essentially a Level of Detail 500 with the exception of our *conduits*. We… we have to model anything that's a 1" or larger, or groups of ¾"… ¾" conduits, four or more. If it doesn't fall under one of th-… If it's a single ¾", *technically*, it might not show up in the model. 'Cause we don't owe it per the… But that's still eighty-*five* percent of everything's gonna to be in the model by just being... Essentially a conduit stub of something coming out of a room to tie-in to a box in the hallway, that might *not* be modeled, but all the conduits that run into that box, *would* be modeled, if that makes sense?

Interviewer: Yeah. And this is kind of just a random side question, but do you guys also do like equipment controls wiring, or is that a separate subcontractor?

Interviewee TP 2.1: We… we *do*. I mean, we have the capabilities of doing it. Like in this situation like you're talking about like a BAS system type of thing or a BMS (Building Management System) type of system?

Interviewer: Yeah. And then sometimes I know like people will like hire [Equipment Controls

Subcontractor] or someone…

Interviewee TP 2.1: *That's* who's… It's funny you say that: [Equipment Controls Subcontractor] is who's doing BAS on this job.

Interviewer: *Yeah.*

Interviewee TP 2.1: So, they're… they're… they're responsible for almost all the mechanical controls like temperature controls and things like that. We have the *capabilities* of doing it, but we… [Equipment Controls Subcontractor] hired one of the companies that we're actually working with on the job as well, [Equipment Controls Subcontractor 2], to do that scope of work on this project.

Interviewer: Okay

Interviewee TP 2.1: But we do have *ability* to do it, we're just not doing it on this specific project.

Interviewer: Yeah. And then, with the kind of different electrical systems that you guys have, do you have like *main* power, *backup* power, *generator* power?

Interviewee TP 2.1: So, there's normal power which is…

Interviewer: Yeah.

Interviewee TP 2.1: …*just* the stuff like in an office building. You have your service coming in from the utility company, feeding your lights in the building, *not* backed up by anything, so if the power went down, the whole building would be dark (or the normal power) would be dark. Then we have critical and life safety. Critical is stuff for within the hospital like ICU rooms, receptacles that need to be on 'cause maybe there's a ventilator there or something like that that… is… is needed for patient care. And then the third, the life safety, is to get out of a building. In the event of an emergency, you have like exit signs and certain lights that are backed up on life safety to allow you to exit the building safely in the event of an emergency. Life safety and critical *are* on generator back up. And then the fourth system we have as far as hospitals go is the equipment branch which is things that are not necessarily *for the patients*, but they are *required* for the hospital to stay functioning. So, a prime example of that is, we have chillers, right? For… for cooling and all that stuff? So, they have three chillers. Two of those chillers might be on generator back up because they can get by with the whole hospital running on two chillers and one might not be… it's kind of… the mechanical… the mechanical or the equipment portion of electrical in hospitals is kind of dictated by what the hospital wants to make sure stays running in the event of an emergency, right? So, the two most critical that *have* to be on generator backup and have very specific things, are the critical and the life safety. The mechanical has st-… or the equipment branch has stuff, but that's dictated by the hospital on what they would like backed up and it's also considered the lowest priority. So, in the event of a real, *real* emergency, let's say they didn't have enough generation backup to backup the entire *building*, there's something called load shedding that's done through controls where the… it'll

identify that they only have this much power to use and this money… this much is requiring a demand. If that's more what's being supplied, they will literally *shed load*. Like literally shed load. They'll say, "Okay that's a low priority thing, that's getting taken of the generator. *That's* a low priority thing, that's getting taken of the generator." Until they've shed enough load so that what the generator's backing up falls within the parameters of what the generator can output, if that makes sense.

Interviewer: Yeah.

Interviewee TP 2.1: Now, in hospitals, usually they try to back up the entire hospital because in the event of an emergency (you know, I mean), at that point, you just want… you want *everything* working and they have the resources and the planning and facility staff to understand that and… and accomplish that.

Interviewer: So, sort of more to the project specifically, do you know if there were any (sort of) like team building exercises between you guys and the other trade partners or like core trade partners or…

Interviewee TP 2.1: There *was*. I wasn't a part of 'em and I couldn't… There is other people within [Electric Company A] that I could get you in touch with if you wanted to get a better understanding of *that* side of it. I do know that there was those types of events, those types of training sessions or whatever you want to call them…

Interviewer: Yeah.

Interviewee TP 2.1: …I'm just not privy to exactly what they were… entailed, I guess.

Interviewer: For sure. I have some question on here about BIM models, but it looks like you guys are pretty familiar with BIM and that I don't think anyone on your team is "unfamiliar with it" or "reluctant toward using it."

Interviewee TP 2.1: No… no. I mean, in this day and age, BIM is literally an essential part of any project that… that you have. I mean, any… any project that… I mean, you could do commercial buildings probably without a lot of BIM. Some of that plus… imp-… I'm not gonna… I say "important," I don't mean to make it sound *rude*, but it's just not as important as like a *hospital*-the functionality. What it…what it's serving isn't as important, so you might get away with some not-very-well-BIM'd jobs when it comes to commercial buildings, but anything critical (data centers or hospitals) in this day and age, you're BIMing pretty much everything.

Interviewer: Yeah. And then, let's see… With collaborative technology, you said… Do you guys use Mural with the [General Contractor] guys?

Interviewee TP 2.1: We… *They* use it for a *ton* of things. And they have… They've used it for so much that I've lost track of how many different reels they have. But we do, as far as the scheduling process… So, the way we're doing the project, we're utilizing *Takt scheduling*, and that is done, the Takt schedules live on Mural.

Interviewer: Okay.

Interviewee TP 2.1: That we develop as a team together.

Interviewer: And did you guys like did the electrical trade specifically come to this Takt scheduling conclusion or was that a [General Contractor]-driven thing?

Interviewee TP 2.1: It… So, [General Contractor] is the one… They had already planned on doing that. Me and the superintendent… On my job… We've done a couple other jobs together, and some of the best, cleanest-ran jobs I've ever had (which is actually… they were actually happened to be IPD jobs as well) utilized Takt scheduling, and when done right, I've never seen a schedule in construction that works better. *If it's done right*.

Interviewer: Yeah.

Interviewee TP 2.1: It's a lot about accountability and things like that. So, it requires everyone's buy-in. It requires a lot… real collaborative, open approach between the trades and the general contractor, and…and it requires *reliable* commitments. And that's, if you don't have that, then the Takt schedule will fall apart like no one's business.

Interviewer: And how do you guys… I mean, how *did* you achieve that? I mean, getting that buy-in?

Interviewee TP 2.1: So, we're still working through it.

Interviewer: Okay.

Interviewee TP 2.1: But we go on a floor-by-floor basis. [General Contractor] essentially draws up a floor showing the different Takt areas the way they see it as far as how we flow through that floor, and then we put together our budget as far as a workforce and the amount of days we think that workforce is gonna take to get a specific task done. And then once we… [General Contractor] has all that information, they put it in the Takt schedule through just sequential things of activities, right? I mean, it's the same activities on every job: priority walls go up, upper… top track goes up, then like… conduits and all that stuff start. Like they just put that in the sequence… The get it into a schedule and then they compare that to their CPM schedule that the.. that we as a team are contractually obligated to and we look to make sure that it works within that timeframe, and if it doesn't, then we as a team talk about "okay, where can we gain time in the schedule to get it to within the timeframe that we need to do to meet the CPM contractually obligated schedule?" So sometimes it's staggering. Instead of doing a Finish to Start, maybe it's "hey, this trade is… they're gonna need two weeks in there, but after a *week*, you can come in *behind* (while they're finishing up the other area of the Takt) you can come in behind and now we just bought ourselves a week." If that…if that makes sense to you.

Interviewer: Yeah, that makes sense.

Interviewee TP 2.1: Yeah.

Interviewer: So, this is actually really good that you've done *other* IPD projects. So, you've got (you know) a lot of familiarity with working this way. What would you say… in (sort of) your opinion, has been your experience with like what are the barriers and challenges for people with project delivery methods like this. And so, kind of to give a little clarity on that, for my research, a barrier is (sort of) something that's *beyond* your control, and a challenge is something that's sort of *within* your control. So, like, if the law says you can't use anything but Design Bid Build, like that's a barrier. But managing (you know) people, process, flows, teamwork, that's a *challenge.*

Interviewee TP 2.1: Right. So… In my experience with an I-…(And I'm just going to IPD 'cause that's the most collaborative project approach.) I mean, to me, IPD is to some degree even more collaborative than Design Build. Having… The first most important thing that I've seen ('cause I've definitely seen people within my industry work on projects that weren't successful from those types of standpoints) and number one is the… the *trust* in the team.

Interviewer: Yeah.

Interviewee TP 2.1: Is the number one thing that… In order for it to be successful, you have to trust that your partners are on board, that you're on board, that the GC's on board, that the owner's on board. And you gotta trust your partners, because… And again, in an IPD where there's shared-risk/shared-reward at the end, if you have a bunch of trade partners that aren't being open and communicative, you're gonna… it defeats the purpose *of* this program, right? I mean, the whole point of it is a collaborative of… a collaborative approach. So, on a job… The most successful job I ever *did*… I mean, like if there was an issue out in the field, (let's just say me and the plumber were clashing, or something was going on in the field), we'd go out there and look at the issue, and instead of being selfish, we would look at what's the *best* solution for the *project*. 'Cause ultimately whatever we can save as a… I might go over, you might go under, but at the end, as long as my… you going under is more than my going over, we have a shared *pool* of money that we're capable of getting. So, on like a typical just a big job, every contractor's kind of on their… they're looking out for only themselves, right? You wouldn't go out there on a… on a hard money job, go look in the ceiling, and have the plumber tell you what you're gonna do, and they're not gonna… and conversely they're not gonna do the same. They're gonna stick up for what's best for them. So, then you end up running into this thing where everyone's worried about themselves and it's like first in, we're the one's… we're doing it my way because we were the first people there. Not because it's the right approach, but because no… there's no incentive to anyone changing or looking at alternative ways of doing it unless absolutely necessary. And that's what I find with a lot of the *older people* are not used to this collaborative approach (and it's not a knock on them) it's just they grew up… their career the whole time has been in more confrontational type of delivery methods that don't necessarily… That… That are not *pushing* the collaborative approach as much as these newer… And Design Bi-… Design Build's not new, but like the IPD thing is a fairly new delivery method in the scheme of the con-…industry as far as being adopted and utilized to some degree. And I think the *younger* people are better-equipped just 'cause they don't have the bad habits. And I fall somewhere in the middle. I'm middle aged, right. So, I have the bad habits, but I also have some

of the good habits as far as how that correlates with one another.

Interviewer: Yeah. And so, I've heard this brought up time and again by people who mention that like *trust* is the biggest thing and kind of getting people to shift their mindset from adversarial one to a collaborative one is *really* the biggest hurdle…

Interviewee TP 2.1: Yup!

Interviewer: …Like, what do you think would *fix* that? Or what do you think *helps* with that, in your experience?

Interviewee TP 2.1: So, it… it… In my experience, at least for me, the fact that I can speak on the *success* when it's done correctly and can personally say that I've witnessed it, I've been a part of it when it's done correctly, I think buys a lot of credence with people just because it's not just some person telling you… It's kind of like one of those things… Someone tells you a *theory* about something, but then you actually have to try and implement it in some practical fashion, and that theory isn't necessarily… doesn't hold true. So, sometimes the people who haven't experienced it, they think of it as a theory, great, that sounds great from a theory standpoint, but is it really practical? Well, I can actually speak up from experience and say it is really practical and here's why. So, *that* is a big help, but really, other than getting experience doing it, and actually seeing it in action, and actually seeing how good it can be when all the trade partners are aligned, and the GC and the owner… It… it *is* hard to get them to buy… Even right now on [Project], we sit in these Takt plan meetings and there's other various trades filled with some older guys who really are… they *do* struggle to wrap their heads around it… and it's not because they're not smart-these guys are way smarter than I could ever hope to be… It's just, their whole life, they've just got in this mindset of "I have to lookout for myself… Being collaborative and working with the trades isn't what's gonna make me money at the end of the day; it's getting my work in and getting out of the way." And for those guys that're still struggling with it, they're not really gonna see the benefits of it until further along in the project when they're really seeing like… the reason that you do Takt area scheduling is 'cause it allows you as a trade to be in that area by yourself. So, it eliminates trade stacking, it allows for a more efficient installation. We're not at the point on the job yet where they're gonna see that, 'cause we're not really in the building (that's coming up in the next like month or so), but until they see that, I… I don't know what the right way to get them to buy-in to that is.

Interviewer: Well, and I think you mentioned a good point with the… like, once they *see* the Takt planning happening… 'Cause, I mean, once you get a sense for that *flow* and it's like "oh, hey, everything is *running smoothly*." Like, you have the opportunity to do things at a particular place, and like you said you're not all on top of each other, so then it's *safer* and like…

Interviewee TP 2.1: Yup!

Interviewer: …I think, again, it's one of those "seeing is believing" sort of things and maybe people just have to *be there* and *see it*.

Interviewee TP 2.1: And… and… and then personally (like I've said) because I've had

experience, I've been able to get people to buy over to other… to giving it whirl and being more open-minded about it, but they're people that I have relationships with like, right? Whether it's a field guy that I've worked with before or something like that. A *cold stone* stranger is a little bit different. Where they're not gonna necessarily take me at my word. I'm just some electrical PM, right? But… when done *correctly*, you will see it, and they will see it, and they will start to buy in. The first one I ever did I had the same issue. The GF for me did not buy in to it, he was an older guy. By the end of the job though like the fact that he could look at his watch and know in one month *exactly* where we were gonna to be and we were meeting that and hitting that every time… He became a believer *instantly*, right? I mean, the fact that you can truly plan for when you were gonna be in areas which then helps you with your ability to fabricate the prefab on time, or to have this done on time like… You're not… You're being *proactive*. And in construction, being *proactive* is where you make money, being *reactive* is where you end up losing money. If you just sit there and wait for things to happen, usually you're not going to do that well from a financial standpoint on the job. For *any* trade. So, when we're all being proactive together, working together, that allows *all* of us to make money. And that's the other thing that people lose sight of. This collaborative approach, *yeah, it might cost you money here*, but it might also save you money in a different instance down the road where you have another clash where it makes more sense for *them* to move. It's not just one thing happens and you're like "oh, we're losing money!" It's like, you gotta look at the more global, overall picture. 'Cause yeah, you might take some hits here, but you're gonna win some here, and at the end the hope is that it kind of evens out to zero, right? Within reason. And that… I…I… I could make a change that cost me a hundred thousand dollars and have a good reason to make that change, but (you know) if it's a five thousand dollar thing here, who knows, there might be something down the road that's a ten thousand dollar savings, so now that one thing you're pissed off about we actually ended up being five thousand dollars in the good because we took…took that approach and had team approach with the other trades.

Interviewer: Yeah. I mean, I think it's a… that perspective shift too, where it's like, it shouldn't be "me against you," it's "you and me together doing the project." And like…

Interviewee TP 2.1: Yup! But that's where, to me, where the *IPD* is more conducive to that type of mentality. 'Cause Design Build is still ultimately kind of a… During the *preconstruction and getting the CDs*, it's much… a very collaborative approach, but once they turn it over to the execution team, it's not like that struct-… There is no financial risk or benefit to being super collaborative. Whereas the IPD, with the shared-risk/shared-reward, it's…there *is* incentive. There's a *financial incentive* that's very clear. If we can come in under as a team (even if one trade partner maybe goes over what they said it was gonna be but another trade partner comes in way under), we *as a team* stand to gain. And that's where I-… the IPD approach if you wanna talk about collaborative (I think) is far more conducive to the collaborative approach a Design Build. I think Design Build is very collaborative on the *upfront*, but doesn't necessarily transition over to the execution side as well. Whereas an IPD is a collaborative approach from the beginning to the end. Everyone has skin in the game. I can't have my trade partner, my fellow trade partners, fail because that's gonna impact *me* financially. I mean…

Interviewer: Yeah.

Interviewee TP 2.1: In the IPDs I've had, I've luckily have always had ones that went *well*, but just…just the same, at the end if we go over, everyone has to kick money *in.* So… I… I… I know IPD and Design Build are two (kind of) separate things when it gets to *that* conversation. In *my opinion*. 'Cause there is no financial incentive to have that collaborative approach in Design Build once you're getting to the execution… Unless there's something special written in the contract or something like that, but from a historical standpoint, there isn't that incentive.

Interviewer: And so, you mentioned sort of like a field instance of clash detection or whatever… Are there other examples that you have of like how being in an IPD environment *literally* changes your day to day.

Interviewee TP 2.1: Well, I mean… From a very *basic* thing that doesn't have to do with construction, because you're so collaborative and you're talking *so much* with all these various people, just the… culture on site tends to be significantly better. 'Cause now, instead of "hey, and there goes that… that dick PM from whoever who I *hate*." You've worked with them so much that you start to understand who they are and what they are. And you actually… It… It becomes more like you work for the same company for the best way I can describe it. Where… you *talk* to each other a lot more, even if it's not about work. That culture, that's a culture of what I'll call "belonging," where everyone feels like they have a part of this family. And I think… I know that's not necessarily something that is a construction thing, but it does have a huge impact on any project that you do. I've been on jobs that had a *bad* culture; I've been on jobs that had a *good* culture. I've never seen a bad culture job be successful. I've seen a *ton* of good culture jobs. So, setting that culture is another thing that really helps with… 'Cause it *forces* you to have those talks and it *forces* you to get to know each other 'cause you're gonna be talking a lot throughout the project-that's the whole point of it. Just in how we handle issues and problems as a team. Instead of all of us being in our own little silos.

Interviewer: Yeah. I mean, I think that's all an excellent point. I mean, we've really kind of hit on everything in thirty minutes here. Are there any (sort of) final thoughts you'd like to share with me about IPD or anything like that? Oh! Actually, hold on, before we get to that, let me *stop* myself. Did you guys, meaning the electrical trade, did you prefabricate anything or are you planning to prefabricate or modularize anything for [Project]?

Interviewee TP 2.1: Absolutely. *Absolutely*. I mean… That… This job, because of the tight logistics being that it's in the city environment and it's… They tore down a building to build up a new building, so it's not like there's laydown space, it's not like there's space to store stuff…

Interviewer: Yeah.

Interviewee TP 2.1: We… We're probably gonna prefab more on this job than I've ever prefab'd before just out of necessity. So, we have an offsite warehouse that essentially we make installations or we… we call it "kitting," we'd do this process anyways, even if there was space, but… We call it "kitting" which I'll… Like at a patient room floor, a kit will come up that'll have everything you need to rough-in a patient room. It'll have all the *wire* that you'll need, it'll have all of the *boxes* that you'll need, it'll have all the bells and whistles that you'd need. And you… We do the same kitting for every room and even for stuff like the corridors where we have

big conduit racks, we're gonna to prefab those, bring 'em out to site as a completed assembly, and then use [Indistinguishable] or what the tin knockers use to lift duct up, we're gonna do the same thing with our conduit racks. So, instead of doing a hanger and then doing the conduits individually on the hanger, we are… that's gonna come as a preassembled unit from our prefab shop. All we gotta do then is slide the threaded rod up into the anchors, twist 'em, and that's installed, right? So, you're moving all your hours into a controlled environment. So, as a company, we do prefabrication for that specific reason. Controlled environment means more efficiency, better quality, better safety… I mean, all those types of things. So, this job is kind of what we would normally do, but a little bit more on steroids, just because of (again) the *necessity* of… When it comes out to site, it needs to be what's for that…*that* week for example. We can't bring out all the material we need for two months 'cause there's nowhere to put it, and if every trade did that, there'd be no where to walk, there'd be nowhere to… And that requires a significant amount of planning that all (again) ties to the Takt 'cause we kind of have a standard within the company of the beginning process to get from the beginning to where we're *building* the kit and getting ready to install is about ten to twelve weeks, depending on what it is. So, now, with the Takt scheduling, we have these specific weeks (that's what I'm telling you about) having… making people be accountable is *critical*, 'cause that Takt schedule, it *drives* all these other activities that people don't necessarily see. So, if that starts slipping, then the fabrication of things slips with it and… or we're overbuilding and now we're trying to store this stuff, but we're not… Can't bring it out to site, and you only have a finite space… amount of space to store stuff you know what I'm saying? The… The likelihood of… If there's no accountability for that Takt scheduling, the trainwreck that fallows behind it is just it… it's inevitable. So, yeah, prefabrication on this job. I bet we're going to prefabricate probably seventy percent of the stuff that gets installed.

Interviewer: And so with that I'm gonna kind of get kind of granler…*granular* here, but… So, with the kits that you were talking about, do those… Are those like *per* work crew a kit or kind of how big are they? Is there a sort of standard size?

Interviewee TP 2.1: And so, a kit would be any single individual room by itself would automatically be a kit. Now, within a *Takt area*, there might be ten rooms, right?

Interviewer: Yeah.

Interviewee TP 2.1: So, a Takt area made up of just ten rooms (of just arbitrary numbers here), we would have ten kits: one kit for each individual room. And then we would have another kit for when… So, there's the rough-in kits, and then there's the finish kits. So, the *rough-in* kits and then there's the *finish* kits. So, the rough-in kits would just be all your conduit, or MC wire, or boxes that you need to get in the wall before they close the walls up. And then the fin kit would be receptacles, light fixtures, cover plates – the things that finish the room off after the painting is done. So, we have basically two sets of kits for every room and then within that Takt dictates how much… how many kits there are, right? Some rooms might only have two rooms some… because the rooms might be really big, or there might be twenty rooms, but each room would get its own kit and then there would be kits for the corridors as well.

Interviewer: And so you guys, with the Takt planning, say we're going with this theoretical ten

rooms a floor, would you just have *one* crew and go like room to room to room, or would you have like three or four crews…

Interviewee TP 2.1: *Depends on the size of the Takt*. The…

Interviewer: Yeah.

Interviewee TP 2.1: The thought was is… The thought is that you have one person do a room…

Interviewer: Okay.

Interviewee TP 2.1: …Depending upon the size of the Takt and the time you have. Now, everything in a Takt should be based off week increments. But if it's ten rooms, we'd need… we'd need two guys. Each guy would be responsible for five rooms in a week.

Interviewer: Okay.

Interviewee TP 2.1: You know what I mean? So, that kind of dictates how many people we'd have working on it. But the kitting process that we do makes it so that we don't necessarily need to have *two people* in a room working like if you're doing it the… (what I'll call the) "brick-and-mortar" way, you'd have to have two people in a room to rough-in a room probably. But because everything is literally plug-and-play (you have a drawing that tells you *exactly* the dimensions of everything you need to know and where it needs to go), one guy can go out there… or one person can go out there and do a room by themselves. So, it also helps out with that (you know)… It… it creates efficiencies with the… You know as well as I do, if I'm working by myself versus working with somebody, inevitably I'm going to be a little less efficient because I'm going to be talking to some degree…

Interviewer: Yeah.

Interviewee TP 2.1: Still might *get work done*, might not be a big deal. I'm just saying, inevitably, I'm more likely to talk, communicate with the person which slows down work, potentially. And kind of… creates *issues* sometimes. So, the more you can minimize, or keep to a minimum, the amount of people who that have to actually work together in the same area, the more efficient (historically) we see things be. That's why we always try and shy away from having (*if possible*) the… the… the more you can minimize the amount of people you have working on site, the more *efficient* you're going to be. So, that's another reason to push things into prefab. Again, in a controlled environment where you can see everybody, you know what everybody's working on versus a seventeen story building where (unfortunately) there's people that like to play hide and seek for a grand a week. You know what I mean? It… It… It allows… It allows a better grip on where everyone's at and what everyone's doing. When you take it out to the field, there's a lot of places on a construction site people can *hide*, they can go visit with other *trades*, they can go visit with their *friends*… And you really don't *know* unless you're watching that person specifically. But there's so much going on, no one has the ability or the *money* to sit there and babysit *every single person*. There's got to be a level of *faith* that they're doing what they need to do. So, *kitting* (kind of again), minimizes what our onsite needs are

gonna be, which is where we usually see the inefficiencies versus a prefabrication shop.

Interviewer: I mean, in a way, it's sort of like you guys have engineered a system by which it's less likely to have these problems. So, that makes a lot of sense. And then the kit, (I mean) is this something that it's like you can pick it up with a pallet jack, I guess?

Interviewee TP 2.1: Yup! It's literally like the plastic totes you would go and get from Home Depot when you're moving or something like that. Literally something like that.

Interviewer: Yeah. And then do you guys… So, with (sort of) all of this prefabrication and with the Takt planning, you're still gonna *bend pipe* on site, but just considerably less?

Interviewee TP 2.1: What we do is because we have the *model*… What we're gonna do is we're gonna… And… So, I should take that back. If it's up to an inch, we would send out straight pieces of conduit and they would do their bends onsite because they have a hand bender. Anything over an inch though, you don't, there's no hand benders for it…

Interviewer: Yeah.

Interviewee TP 2.1: …So, that would come out…out of the *model*. The prefab shop would know the… what the bends need to be and how like the distances between where the ninety starts and an offset and all that stuff… That would be prefabricated and marked as like… We… We have what we call "spool drawings" that denote a conduit is this… Denote… Or… Notation that it comes out like "okay, this is conduit 2, this is conduit 4," and it has the bends already *in it* once you get over that one inch. Anything one inch and under though, it'd be a straight stick of conduit, and they'd bend it however they need to bend it in the field based off field measurements.

Interviewer: Gotcha.

Interviewee TP 2.1: On a previous job, we tried to do the bent conduit of an entire room, like a patient room, and actually have it so that they put it together like *Legos*, but we found that there's just too many variables with a hard piece of pipe that a lot of it got wasted and we had to re-bend it anyways. Like if the studs weren't lined up exactly perfect…

Interviewer: Yeah.

Interviewee TP 2.1: …Things like that can throw what you think's the right measurement off.

Interviewer: Well, I mean…

Interviewee TP 2.1: So, we *did* try it on a job, and it just caused… It… We spent… We seemed to spend more money than it would have been to just go bend it in the field.

Interviewer: Yeah. It seems like even if you had absolutely *perfect* as-builts, something could still go wrong, like…

Interviewee TP 2.1: Whereas MC… Like in a… In a… If you have MC in the room. Okay, it says we need a fifteen foot whip up to that light, you make it twenty. No matter what happens, they're gonna have enough footage and you just cut off what you don't need.

Interviewer: Yeah.

Interviewee TP 2.1: So, there's a little bit of waste. But again, the little bit (that…that ten feet of it or five feet of MC) cost me ten dollars, whereas an hour worth of an electrician's time is ninety dollars.

Interviewer: Yeah.

Interviewee TP 2.1: So… And then you… You scrap the wire and get money back for that too anyways, so it's…

Interviewer: So, yeah. Now I think we can get there. Any *final* thoughts or like closing remarks?

Interviewee TP 2.1: The one thing I'll say is (again) a well-ran IPD is the best projects I've ever been a part of and I am a huge proponent of IPD so as long as they're *ran* correctly. And I don't say that to mean that the GC is responsible for ensuring everything-they're responsible for the accountability portion, but everyone's responsible for the reliable commitments, the col-…being willing to *talk*, willing to work through the issues as a team and not in your own *silos*. But by far, without a doubt, if you have those… the right *team* (and that's why the team is very important on those projects) … If you have the right team, there's not a better project out there than an IPD project. I mean, it's just bar none. The owner gets a better product. They usually end up getting savings as well. And there's an incentive to really (you know) *be* efficient and… and… and figure those things out because *you* have a financial incentive as well. And everyone seems to wait on the ones that have done good and the owners that have been involved with them *love* it. But again, it's very… it's… it's very much matters who your team is when you go and if you're gonna have that approach, you can't have a lone wolf out there doing their own thing while everyone else is marching to a drum. That instantly *negates* any of the value that you would find in a… in an IPD.

Interviewer: Perfect. Alright, well [Interviewee TP 2.1], thanks for meeting with me today. I appreciate it.

Interviewee TP 2.1: Yeah, no problem, dude!

Interviewer: Have a good weekend!

Interviewee TP 2.1: Yeah, you too, man! Good luck with everything!

Interviewer: Thank you!

End

Appendix M: Transcript of Interview TP 2.2

The date of this interview was March 20, 2023. The venue of the interview was over an online Zoom meeting. The interview started at 2:00 PM CST. Interviewee TP 2.2 is a Project Executive for enclosures subcontractor and is working on the Progressive Design Build project located in a Central US state that is at the focus of Case Study 2. Interviewee TP 2.2 has worked in the AEC industry for nearly eighteen years. Prior to the Case Study 2 project, Interviewee TP 2.2 had some working familiarity with collaborative project delivery methods, specifically Design Build.

Interviewer: So, what is your position and title?

Interviewee TP 2.2: So, I'm a Project Executive with [TP 2.2] and I've been together with them for… August will be about five years. Overall, have been in the façades (curtain wall, window wall) industry for about eighteen years now.

Interviewer: Okay. And so, eighteen years is how long you've been like in the construction industry too?

Interviewee TP 2.2: Yup. Yup. The whole… Almost right out of college I've kind of been in construction, so…

Interviewer: And then, how long have you done work with projects involving collaborative delivery? So, like, this one is a Progressive Design Build, we're also doing research on IPD. Is this your first (sort of) *collaborative* project delivery?

Interviewee TP 2.2: So, we… I've don't a *couple* now. Actually, have done probably *three* of them now. And one of the jobs actually didn't end up moving forward, the other ti-… two that we moved forward with previously. Successful jobs. I mean, they were… Any time we have the opportunity to get out and get out and get involved with the design on a project, that's what we would prefer. I mean, our company name is [Company Name] Design-Build Systems, so the more we get out in front… We're able to work with the architect, the client, and the owner, and give them the product that they need and tailor it specific to… to their needs for the ultimate end result, we definitely want to do that. It's very beneficial for us, the relationship with everybody. And overall, it just makes for a more successful project.

Interviewer: Okay. So, that kind of pivots into the next question which is "what is your understanding of and familiar… *familiarity with* collaborative delivery methods?" and you said that you guys try to instill some of that sort of into every one of your projects if you can. I think your name harkens to that too.

Interviewee TP 2.2: Yeah. And it… It… Obviously, doesn't *always* work like that. (You know) Sometimes we're just out there competitively bil-… *bidding* a job and (you know) we're able secure the award through (you know) both the *schedule* and the *dollar amount*. Obviously, we're… we proceed. But, typically when we have the opportunity to be a part of the Design-Build process, we generally start out with (you know) a dollar amount or are able to function and perform the natural or the natural or the necessary duties of design-assist, Design-Build up

front, and in turn, that… that turns into (you know) a larger contract for award of construction and product to be provided for the job.

Interviewer: And so, with this project you are part of that (sort of) core group of trade partners that [General Contractor] brought on early, correct?

Interviewee TP 2.2: Yes.

Interviewer: Have you guys done anything to (sort of) integrate the project personnel like team building exercises, stuff like that?

Interviewee TP 2.2: So, when you say team building, you're talking about with some of the other *trades* or some of our *own personnel*?

Interviewer: So, yeah. I think I would like to hear first across the trades, and then also within your own personnel.

Interviewee TP 2.2: Yeah, so. We did design-assist for… I was involved with design-assist from the beginning and that was roughly a year and *half*, maybe a little less than eighteen months of when we started. And we were the primary focus on the façade since we have scope for roughly… probably a little more than ninety percent of it which is curtain wall skin, but the other trades that are involved… There's actually another glazing contractor that is providing louvres for the job, there's a metal screen at the roof that's also being incorporated part of their, there's the mason that's out there, and I think they had the carpenter involved with some of it. So, those were the main four, five subcontractors involved with [General Contractor] and [Designer] for the job here, and yes, we certainly have areas of the podium and some of the roof level where it's not continuous curtain wall that's wrapping the whole building, so… Basically, we would have weekly design meeting. We would go to [Central US City A]. I'm up in [Central US City B] and I would bring my systems-design engineer he's actually out of Birmingham and he would come with me or one of his partners would come out to the weekly meetings in [Central US City A]. And yeah, we would work through and try to troubleshoot what the design intent was from the architect and what the owner *wants* and we'd work through items like performance, we'd work through thermal requirements. You know, things that can and can't be done. Or even materials or sizes… Where there's limitations that they might have (the architect might have) an idea where they want a large aluminum composite metal panel, or a really large oversized leaded glass in order to meet aesthetic purposes, but there's also conditions (especially on this job) where we have triple insulated glass where they're trying to meet some acoustical performance. There's also an added performance from thermal involved with that, so some of these things that even though they have a vision of… or an idea of what they want, it gives is an opportunity to say "hey look guys, this sounds great and maybe you've heard from a particular vendor that says 'hey, we can do A, B, and C, but we can't do A and C together, but we can do A and B together.'" So, sometimes it gives us an opportunity to go through and explain to them a little more where someone that's in sales from some of these companies that are doing presentations typically to architects are maybe not. And it's not that they're not being truthful I should say, I guess. But they're not explaining the full extent of their capabilities sometimes. So, we are able to bridge that *gap* and then sit down in these meetings and go through (you know) the design intent and on this job especially, we were able to work through some of the

specifications and *performance requirements* of "hey, this is capable" or "this is not capable" based on (you know) sometimes it's availability (like I said) of materials, sometimes it's availability of machining fabrication limitations, sometimes it's just "hey guys, the technology to produce or get down to a certain performance value of what you're looking for (whether it's between glass, aluminum) just isn't readily available." So, we like that opportunity to share with them and say, "hey guys, here's what we're seeing right now" and we can draw upon our previous *experiences*, we can draw upon our *expertise within the industry*. And we can *do that*. We can do a lot of things through analysis and comparison and modeling that we can show them real, hard figures and then, ultimately, when we're doing some of this collaboration *with* the other trades, and *with* (obviously) the architect and the design team group, we end up getting a BIM model established, a 3D BIM model. So, we can run that through at some point and try to establish if we have clashes with the other trades. If we have something that needs to be coordinated on detailing amongst a louvre that's adjacent to our system, how some of our waterproofing details work together. So, there's a lot of these (you know) maybe things that aren't really visual to general public that, or even some of the people in the industry that aren't' familiar with the façades systems and how these work, where it gives us an opportunity as *subcontractors* to really kind of (you know) work through these challenges and problems that (you know) don't snowball into something much larger *during construction* or even after the building's turned over. I mean, ultimately, our goal is to produce the highest quality product we can within a budget and schedule that meets the owner's needs and then we want to… We like to look at these buildings (you know) twenty-five, thirty years down the road and not only take pride in what we've done, but to be able to say "hey guys, we did this job. It was design-assist. It was with a great client, a great architect. The owner got the product that they wanted, and they expected and it's… it's not anything that has any issues, system issues or individualized issues." And if they do, (you know) there's something that hopefully we can work out during the upfront process, and that's why we… we like doing the upfront planning and detailing with everybody.

Interviewer: It kind of sounds like… What a lot of you… *A lot* of what you've mentioned has to do with like *alignment*. And not only like aligning expectations, but also aligning understanding when it comes to like what performance can do…

Interviewee TP 2.2: Sure.

Interviewer: …And like what is possible, and maybe even helping to redefine to the owner what they *actually* want. Because sometimes (like you said) you can have a vendor that comes in and has sold people A, B, and C, but it's like (hey) really what you need is like *L, M, N*, but you didn't know that those existed, because you never made it all the way to those options.

Interviewee TP 2.2: Right. Exactly. And… and sometimes (you know), it's just a function of what are the capabilities of… of our system and from an engineering standpoint, what is structurally gonna work. We've got some conditions out there, we've got some spans of twenty-plus feet (I think we've got twenty-two-foot-tall vertical mullions on the first floor). Well (I mean), the architect drew it without any type of midspan supporting for our system. And would it work from a structural standpoint? Yeah, we could make it work. But there's also limits of deflection that you don't want to have and push the system too far where we could have permanent set and deflection. We've come into some other issues where people are just *physically uncomfortable* with that much deflection within the system. So, some of that stuff is

just what we like to share and show and talk with the architect of what's your *intention* here, right? Here's what we can do. If we've got to go (you know)… And that's sometimes part of that difficult conversation within these design-assist meetings, or Design-*Build* meetings, is "hey guys, we can *do* this, but it's gonna cost this much more money." So, we're always in that constant (you know) state of trying to be within their budget, be reasonable, and meet what… what ultimately they're looking for on the job that supports it. So…

Interviewer: And you mentioned a *BIM* model. Do you guys… [Interviewee C 2.1] and [Interviewee C 2.2] told me about Revizto, do you like make a BIM (your package) and then put it into the Revizto cloud file?

Interviewee TP 2.2: Yeah. Exactly! So, [General Contractor] has a VDC person that's fulltime VDC manager that was, [Interviewee C 2.4], that was involved involved with the beginning of the job and they built the framework with [Designer] for this 3D model and then we go ahead and pull our units together. We integrate *our* 3D modeling into the Revizto model. And then from there, the other trades obviously are doing the same things. We're looking for (like I said) *clash*, we're looking for (you know) *structure* that might not be shown or missing. And we've been able to identify a *lot* of different items throughout the process that otherwise, without it, are difficult to pickup within just standard paper drawing, 2D drawing review. And until you're out there and you get there you're like "wow." And sometimes we'll get architectural drawings, and we'll get the structural drawings that actually *don't match*. They could have a difference. Like the architectural drawing might show something that's reflective, but the structural drawings that is being built off of by (you know) either the concrete or the structural iron workers out there can be different. So, the BIM model does give a significant amount of forefront looking in trying to resolve any issues. Obviously, there's some challenges with using BIM, but the biggest one is time and schedule. And then money's not far behind that 'cause if you don't have enough time in your project's schedule to build a BIM model and… and manage it properly and have that… that money set aside, it's… it's not going to help you as much on the job. So…

Interviewer: Yeah.

Interviewee TP 2.2: But they've done a great job on that, I will say. [Interviewee C 2.4] did an *awesome* job. I mean, it's impressive the level of detail that *I've* seen from when BIM kind of first came out and it was more of like general wiring, framing, just general *lines* as opposed to the level of detail that… that these models have now is really impressive.

Interviewer: Yeah. And they kind of mentioned that to me too. Is that it was like… They told me to seek you out specifically because they were like "yeah, [Interviewee TP 2.2]'s really like seized on to this whole collaborative, integrative process like he's one of the few people you really *have* to talk to." So, the fact that you're like mentioning this *alignment* and using these BIM models to like really get this stuff together. And I think you guys also have *mockups* out there right now, right?

Interviewee TP 2.2: Yeah, so… We do, we've actually done *three* different mockups on it. The first one we did was a… a visual, an aesthetic mockup of the… it's called ultra-high performance concrete (we just call it UHPC), but it's basically like a faux stone, precast type product that we did for ownership to view texture and color and a little bit of the joint spacing,

to see full-size panels of what they would get on the building. So, we did a couple different renditions of *different textures*, a couple different *colors* with some *samples*. And then after we… we did actually… we reskinned it *three* times? And the owners obviously selected color and texture and that's what's still standing out there and will be used as a basis for comparison on the… on the building and the project. And then from there, we did a performance mockup at an independent third-party test lab. This one is in West Palm Beach, Florida. So, we build full-scale units and we put them together and assemble them in a *wall*. And this one happened to be (I think) we're about *fifty feet wide*, two stories *tall*, and they had *ten*-foot return walls on them so there was two offset, just like a shortened U kind of. And basically, it gives us an opportunity to prove out and vet out the quality of our fabrication assembly that's under our… our scope and then the quality of our installation too. So, it gives us an opportunity (on both of those things) to vet out that we're building this correctly, the aesthetics still are matching what the architect is wanting and requiring. And then after it's all installed, the third-party independent test lab puts it through a rigorous test where we test it for *air performance*, we test for water performance *with* air. So, we're basically pulling a vacuum from the inside and we're applying water from the outside and we're trying to make sure that they system (as designed, and as installed) is gonna pass. And then they end up doing what's called a "dynamic test" and it's literally a… an old airplane engine from… It might even be like World War Two, but it's there to simulate *wind-driven* rain. And there's different criteria from ASTM and AMMA that govern all the procedures of pressures, durations, water, how much. And then we end up going through a series of vertical and horizontal jacking where we're trying to simulate when the wall is moving. It's a little bit of a reduced… I guess it simulates seismic activity, not to the scale of the seismic activity that occurs out in like California region, for instance. But we did… The baseline for design was a half inch and then at the end of it we took it up to three quarters of an inch which was one and a half times the design. And then we go through some of these cycles. They end up doing air. They test for water and dynamic again just to make sure that once they move the wall and jack the wall around that it still can perform for air and water. And then it goes through a thermal cycle where we leave and they insulate the whole outside of it, they pump liquid nitrogen, bring the temperature all the way down, and they take readings, and then we go through another cycle of air, water, and dynamic testing it again. And then we do some of the overload where we'll put one and a half times the design pressure from a *positive* and a *negative* impact on a wall and we're trying to do things like see if we're gonna have permanent deformation in this system. We're gonna test to see what our seals on our glass… We use structural silicon to put the glass in place to make sure that we don't have any issues with that. And obviously our design has a bunch of safety factors in there that we can withstand *way* beyond what's being tested, but it's a very rigorous test, it's expensive. It's (again) one thing that takes… it takes a lot of time involved with your schedule between (you know) you've gotta do the design, the engineering upfront, you've gotta fabric-… you've gotta *source* and then fabricate and assemble the materials, and then you've gotta install. So, it's approximately (you know) an eight week, call it a seven… (sorry) week. Seven to eight *month* process that's all inclusive of that. So, you've got some reviews obviously in there from the drawing standpoint, and then you gotta execute. So, that's the second mockup we did on that. And then, the third mockup was, again, another aesthetic mockup that was for the different wall types out there. So, I think we simulated the two different patient tower conditions with the curtain wall down there in [Central US City A] across from the project site. We did a podium level condition with the big twenty-two-foot-tall curtain wall units and then we did also a… a soffit condition that's on the west side and it's… it's got some very detailed and intricated ways of how it comes together,

how it gets installed. So again, it gives us an opportunity to vet out some of the challenges that we'll see when it comes to the project time, so it's an excellent opportunity for us to learn and then obviously at the end the ownership team, the architect, the client also, they come out and they check. And again, "hey, this is what we've designed, this is what our vision is" for those types of things and then ultimately our quality, right? So, it gives them a great chance… And it's a *huge* expense to ownership, right? I mean, they've probably put over a million dollars in mockups in between those three. And some of the other trades were involved in the *last* mockup where they had some stone, the did some louvres, obviously some of the carpentry work involved with that as well. But, it gave all of us a chance to work together and the ultimately it's… it's nice to be working on a job for so long and then put it… put what's on paper and then see it in person.

Interviewer: So, in your role, how does your position (sort of) morph now from the design perspective into the delivery phase? And then how does *this* job compare to other (maybe like) hard bid jobs that you've had to do in that aspect, in that respect?

Interviewee TP 2.2: Sure. That's a good question. So, we have… I have a project manager that's on the job as well, so [they]… Once we've kind of transitioned out of the design phase of the job and through some of the mockups that [they] were… [They] weren't involved with the design, but [they] were involved with the mockups. So, [they're] basically our day-to-day person, project manager that's on the job and dealing with the general contractor's staff, but I… I basically have the responsibility and oversight for the whole job, and I talk with [them] multiple times a day with "hey, what are we doing," "what's on the forefront as far as schedule that we need to be ahead of," (you know) "where is our… our vendors-predominately our fabricator," (you know) "are we sourcing the materials," "are those submittals done," (you know) "where do we track [their] schedule?" So, my… Mine is more of the just high-level operations. At this point I do have three other jobs that I'm dealing with, so touching all of them with the project management team on a weekly basis. Or if we're going to a vendor, usually attend with them, whether it's something we're checking on quality, progress… We like to try and go to all our vendors and check in, see where they're at. And then, in terms of (you know) how this relates to other design… upfront design that I've done… I mean, I'll… I'll say this (and not just 'cause (you know) *we're* talking) the team that [Interviewee C 2.1]'s put together there is one of the more, if not the most impressive, team that I've seen. [They've] got very detailed project management staff. [They've] got a number of people. [General Contractor]'s not afraid to go out and hire some people and get the *value* that they need. (You know) I've been involved with some other jobs where they don't… the contractor might not *staff* it correctly. And (you know) all this upfront work that we've done, we may have some things that trickle through the cracks, that just *hasn't happened* with this team. And (you know) it's easy to say that too obviously we haven't gotten to the field. But I genuinely believe and say that… The team that [they] have, and the things that we've… we go through are… are way above and beyond what I've done on some other jobs. I mean, the level of detail that they do and were checking across the board is… is impressive.

Interviewer: And then how would you compare these collaborative jobs to like a Design Bid Build or a hard bid that you guys have done?

Interviewee TP 2.2: So, there's… There's certainly some challenges that… that come across

there when it's a hard bid job. Usually what… what we do if we have some qalifi-… if we have specifications that may not be something that we're previously experienced with or we know that our system just can't perform to. And again, it's typically a… a U-value with thermal where everyone's trying to (you know) how low can I go and still keep within budget? We have to make a lot of qualifications within our… within our bids of saying, "hey, look guys, this is what our… we know our system *can* do." Or from an acoustic standpoint, that's kind of a hot topic. I'm in [Central US City B] and there's been a lot of jobs that have been near the [Transit System Abbreviation], the train station here, so they're trying to say, "hey, well performance from an acoustic standpoint (you know) ITC or an S… STC has to be this." Well, the only problem with that is you *can't* really vet that out without doing a full out mockup of your interior components…

Interviewer: Yeah.

Interviewee TP 2.2: …your exterior… So, we kind of just go through the process of saying, "hey, we can do this through maybe engineering *analysis*, but it's something we don't want to try and absorb a lot of *liability* on." Versus (you know) being able to do some of these design things up front and say "yes, absolutely we can do that. We proved that. Or we can schedule this *into* the project and keep that within the budget." But some of the other things are just (you know) a lot of times *they* want to build the job quick, right? If we can build this job (you know) people are always like "hey, can we get this job start and installed in twelve months?" (You know) And it's like the first question I ask is like "okay, do you… are you going to have a performance mockup?" 'Cause sometimes they'll do the performance mockup at the lab, and.. and then they'll be like "alright, we gotta go right away." And a lot of times we have to have a lot of caveats just saying, "guys, if something doesn't go right here, your schedule could bump." So, there's a lot of risk involved with that stuff, *but* alot of times… We've been around for a while and our guys have been in the industry forever that it… we typically have a good idea of what is and isn't possible. So, if there's something crazy that they're asking for (you know), we're able to get ahead and say "look guys, this just isn't possible with what you're asking for." (You know) They might be asking for a mullion that's (whatever) six inches deep, but it spans twenty feet tall. Well, I can't put enough steel inside of the mullion to get you at a comfortable and safe deflection level. So, might be like alright, we got to go to an eight-inch mullion. And a lot of times (you know) these qualifications and stuff we identify within our scope they turn into scope reviews and they're able to compare (obviously) against the other contractors that we're bidding against and trying just to make sure that they *have* the right products. 'Cause, a lot of times (you know), you'll see guys out there just like "well, this guy's a million dollars lower." And it's like okay, well *why* is he a million dollars lower…

Interviewer: Yeah. *Why*?

Interviewee TP 2.2: …is there some magic *bullet* that… that's happening here? And… and that's not always the case. I mean, sometimes people make mistakes (*obviously*). Sometimes people are just hungry to get a job and they're willing to take it at a much lower margin. So… Yeah, I mean, I think they design-assist also is important 'cause it gives us an opportunity to *work* with the team, understand their expectations of what they need from *us* and how we are able to serve them. So, (you know) there's… there is a lot of value in that in us being able to have a successful job because, ultimately, if… if the contractor and some of the other trades

aren't doing their job or they're able to have a successful job, typically we don't do well either. And same goes for if… if we don't have a great job, usually the general contractor doesn't have a great… great job too. So, by all means, we… we prefer to do curtain wall jobs. We prefer to do design-assist when possible. And we prefer to have a performance mockup in there that shows them what they're doing. I mean, we have supporting test reports from other jobs or old jobs that are close in terms of system types or what the requirements are that they can… that sometimes they'll accept or use, but that's not always what we do. I mean, if we have a repeat customer that's using the same system maybe they'll jump on board with that, but ultimately it comes down to ownership and schedule of what they would want to do in terms of performance mockups. So…

Interviewer: Do you think that…

Interviewee TP 2.2: …always something new.

Interviewer: Oh. Do you think a lot of that *eagerness* on the part of ownership is just like the lack of education and understanding? Like they simply don't know that what they're asking for is maybe unrealistic?

Interviewee TP 2.2: Well, I'd say *yes* and no, maybe.

Interviewer: Okay.

Interviewee TP 2.2: And… and I'd say… I'll say *no* in the… in the first, just because if they're being told from (you know) their architect or their contractor of "hey, this isn't necessary" then in their mind, it's "okay, we're gonna use the opinion of the experts." And sometimes I'll honestly say that it's *not* necessary, but when you're going into a… a custom… a very highly customized job especially like [Project] here, that it is a hospital, right? There's… there's another things that could be affected here if we don't have the right contractor, the right system, and we're meeting the performance requirements. So, it just depends how involved. Some owners are certainly more involved than others. I'm in a weekly call where the owner's on every call. And then other ones where they've got a competent enough general contractor or an architect that they're able to handle it. Sometimes they'll have consultants involved (you know), third-party consultants. Where… On this job we do have one and [they're] obviously highly involved with the design upfront as well. [They're] involved with the performance mockup and just getting (you know) an outside opinion from the owner's perspective to… to cover their tail, right? And then sometimes we'll have jobs where… I've got another job where I've got *three* different consultants: the owner has one, the architect has one, and the general contractor has one. And that creates a different type of complication, but… I guess where I go with this it just depends on (you know) what type of owner you have and… and what… what do they want? What are they buying? I mean, I've got one guy in [Central US City B] here, small developer. He only has one job, and this is kind of his *baby*. So, he's… he's on it all the time. And maybe more interested, maybe he has a construction background, but… It's on a case-by-case basis. I mean, even the ownership team… And [Interviewee C 2.1] sees *way* more than we do as a… a subcontractor… that they're dealing with ownership, but (you know) most of the time, they like to be involved with the façade, right? I mean, it's… It's what they're gonna look at every day. They want to have input. They want to make sure we're gonna be on schedule. (You know)

There's nothing worse than going through design and then they end up getting a big bill for cost, *massive* cost increases. And that… that was a job I… I was involved with design-assist out in Massachusetts, outside of Boston at one of the colleges. And we went through the whole design, we got shop drawings done, we were ready to go into the performance mockup phase, and I got a call (I was out of town) and they say, "hey, you're not gonna believe this, but they just canned the architect and canceled the job" because they ended up going *that* far over budget. So, it's a rarity and (you know)… A lot of people have, at least in… in… in my age, they have visions of (you know) the late 2000s (kind of) crash and crisis of things went sideways after (you know) some of the financial collapse of real estate, so… I don't *think* we're in that same mode here at this day and age. (You know) There's certainly some concern, but (I mean) I have a lot of bidding activity still going on out there and we still… We're still landing jobs all over the country right now, so… But going back to that it's all dependent on (you know) the size of the job too, what type of project it is, and really what… what involvement the ownership wants in it.

Interviewer: Yeah. And are you guys bonded on this project?

Interviewee TP 2.2: Yes. We *do* have a bond on this job.

Interviewer: Okay. And then, in your part of the world, are your laborers or anybody working in your (sort of) trade, is that a union job? I'm just curious.

Interviewee TP 2.2: So, we… We do both. We prefer more of the *union* markets, only because if we're traveling like we're doing some stuff out in Baltimore and DC right now. Chicago, St. Louis, Detroit. We *do* subcontract out our erection and our labor – we don't self-perform that. But *I* prefer the union market. They're typically more skill tradesmen available (and women). But (I mean), we're out in Phoenix right now doing a high rise with non-union. We just did something in Atlanta. So, sometimes it just depends on the type of job it is too. If it's not the right scale or the right fit for what we're trying to do (you know). Sometimes we might just price or budget the job for a client and maybe take a pass or kind of "hey, this isn't the right job for us in this market."

Interviewer: Yeah, and then… So, the whole thrust of my master's thesis is outlining (sort of) the contemporary barriers and challenges to these collaborative styles of construction project delivery, meaning Progressive Design Build and Integrated Project Delivery. Definition wise, barriers would be something that are like external to your agency. So, like, if law says "you can't use Design Build," that's a barrier, you know? That's one of those things you simply *cannot* change. Versus a challenge is more something internal like (you know) "what is something you as a team might struggle with or individuals struggle with because of that project delivery style?" So, in your opinion, what are some of those things (do you think) that maybe are preventing (really *anyone* involved in this entire process from adopting these collaborative delivery methods), but also (I mean), more specifically, to *your* experience like trade partners, individual *trade partners*? What do you think those things are if they *are* there?

Interviewee TP 2.2: Yeah, so one of the things I'll say about [TP 2.2] is we've got… we've got some pretty experienced people that have done some really large-scale jobs across the country. And even our design and engineer may be one of the smartest guys I've ever met. (You know) He's… he's a guy that did a lot of the design out in the Pentagon and was consulting after 9/11

on that level and… I guess what I'd say in terms of just generalities of maybe other façade contractors of why *they're not* involved with some of these types of jobs, I think, is maybe some of that expertise, experience of *what* their capabilities are from their team. I think… I think everyone's kind of got their niche market of what they're… they're going after in terms of a… a business model (you know). There's plenty of guys out there that will go after just a square, rectangular glass building, a *box* that's continuous and typical going up the whole building. And we don't… we don't really do that. I mean, we… we pride ourselves on being more customized and trying to do some of the more difficult and challenging jobs out there. We did this [former project] job right down the street in [Central US City A] there that's… (I don't know) They kind of refer to it as an upside-down pineapple stem. But we do some complex things that… We don't shy away from (you know) challenges. One of the… One of the big things that we are a little bit different too is that (like I said) we outsource our… our labor, our erection. And we also outsource our fabrication, so we're constantly trying to find… qualify the right people whether that's domestically or internationally. We work with China a lot, a lot of vendors over in China. We're working in Mexico right now with some fabricators. So, we have a lot of resources also across the world where we have opportunities to maybe shift or change that maybe some other companies are not as… as rounded as we could be. But in terms of some of the (you know) the integrated project management and how that (kind of) all works together for the project in the upfront, (you know)… I think that's probably more of (you know) [Interviewee C 2.1]'s team and how they structure all that as opposed to us being (you know) a subcontractor. We obviously are very involved with that and provide as much input as possible because those guys obviously are covering everything from electrical (you know), to plumbing, and concrete, and landscaping ultimately at the end of the day. So, we try to provide as much of an education as possible to their team. And, again, we kind of look at it as the more educated they are in knowing and understanding of how our system functions, how *we* function, how we *operate*, we can manage expectations, right? And (you know) knowledge is power, really in this. And that whole design-assist *process* for (you know) sometimes… I think [Interviewee C 2.1]'s probably been on this project for three plus years already. (You know) it's a *giant puzzle* that you're putting together, and when you have the opportunity to coordinate and schedule and sit down in meetings, in my mind, only good things… Can have a better outcome for the job. So, I think [Interviewee C 2.1]'s team has done a great job. I think that the architect is (you know) they've got (you know) early from the beginning they had three or four guys that were involved, so… Everyone's drawing on their best and brightest to try and get this done correctly right out of the gate and that's kind of the message that I give even to my project managers is "guys, spend the time upfront, learn the job, get organized, and if you can do that (you know), you have a better chance of success." And it's the little things that you *don't* know or you're *not* planning on having a problem with, but (you know) if we can go and "hey, go visit the vendors," "go check on your product, your material." (You know) We have the saying of "trust but verify" is kind of our own little internal message that we like to produce. But (you know) we like to say that we go the extra mile. And not to say that we don't have our challenges too and trying to fight through, but if we can communicate internally and work through shared experiences that we've done in the past… I mean, there's plenty of things that I've made a mistake on previous where I'm like "I will never forget this for the whole rest of my career and I will never do that again" and you can share that with someone else (I mean)… Some of the times I tell the younger guys too I'm like "your most challenging jobs where you have difficulties are probably gonna be the most (I guess) rewarding from a… from an educational standpoint because *you're* gonna learn how to deal with people and you're gonna learn how to deal with *vendors*, you're gonna learn to

deal with challenging *situations*." And I think that just kind of with… Going back to the upfront design of (you know) we certainly had challenges that (you know) we didn't see… I'm not gonna say eye-to-eye with the architect on what *they wanted*, but some of it was "hey, this is what's possible" or "this is what's capable of" and trying to get them to understand you have the time to do that versus (you know) the… the competitively bid jobs where "hey, it's plans and specs: this is what we bought, this is what you need to provide us" type of situation. So, yeah. I'm all for the… the fully integrated project management roles that not only [Interviewee C 2.1]'s team provides but we try to match that on our side, but much… at a *much* smaller scale too. (I mean) We… We manage our own vendors and subcontractors with erection, but again, communication is key in ours… and that design-assist upfront just only improves that across the board.

Interviewer: Yeah. When do you guys actually start *skinning* this thing?

Interviewee TP 2.2: Yeah! So, we are starting mid-June. Fabricator…

Interviewer: *This June*?

Interviewee TP 2.2: Yeah! Yup. Start… *it's coming quick*. So, the fabricator which is… We have a domestic fabricator in Indianapolis for this job. They just started cutting some anchors and parts actually, recently here. And those go into full scale assemble of the unitized curtain wall frame (the aluminum) and putting the glass on it, putting the UHPC on it in probably late April, early May. But right now, we just… We're taking our first glass for a delivery down there in two weeks. They have the extrusions first four *floors* already. And the UHPC which is coming out of South Bend is already… He's got forty percent of the job made already. So, there's a lot of this upfront planning and scheduling that's finally starting to come together here and then hit the ground running when we reach the field.

Interviewer: Very cool. I think I have everything *I* need. Is there any like closing comments you want to share about integrated projects or Design Build or anything like that? I mean, I think we've *really* hit a lot of it.

Interviewee TP 2.2: No, I mean I… I… I… it's funny that (you know) we were talking about *BIM* and how far *that's* come in terms of improving the projects to be more successful and transparency and coordination amongst trades… But, I'll say that, aside from that, the experience of Design Build that I did on a project ten years ago versus now is… is… is *very similar*, so aside from some of the technological advances in softwares that have made our lives easier (like Revitzo and BIM modeling that's…that's out there). I mean, we use other things like Plan[indistinguishable] and Bluebeam, but the whole process of sitting down, communicating, and getting together early… We went from (you know) *paper drawings* to everything's electronic now, so… I think there is certainly some… some other technologies that are starting to come out and along with construction that are only going to keep improving the process as we move forward here. But, I mean, and I think the l-… I shouldn't say *limitations*, but now, as far as Rezitso… *Revitzo* and the *BIM* modeling, you just gotta have a computer that can… can render and process everything quickly, 'cause otherwise, if you're not up to date with it, or you have a lower performing computer, that's probably the only limitations that… that we *have*. But we're big with going (like I said) meeting in person, getting together, working through. I mean,

we basically had all day working sessions every week for (like I said) almost a year and a half. I highly encourage that. (I mean) Something we want to be a part of on… on any job. And… and I'll say this too (I mean), even though we have a… a *contract* to do design-assist on a job, we're not necessarily guaranteed to get the construction-scope contract either. So… *We know that*. (I mean) It's… it's rare. I know it happe-… it has not happened to us or anyone that I'm aware of, but I've heard of stories of where a certain contractor that though they were capable and had the ability to *do* design-assist upfront and really pull it together was not able to secure the actual construction-scope for the project. So, it's… it's a lot of hard work and it takes a lot of commitment from both sides (I guess all sides) that are involves with it, but ultimately you know the value coming out of it is… is… is way more beneficial than (you know) sacrificing to have to travel to [Central US City A] (you know) every week. So…

Interviewer: Yeah.

Interviewee TP 2.2: Yeah! Nope. That's… That's it. I mean, I… I encourage… If they can do it, certainly get out there and try. But I know schedule limitations, and know it's a larger expense cost, but… (You know) They also could *probably cut* some expense cost from the architect's side, 'cause a lot of the stuff that we detail in design ultimately turns out into some of the architectural details that… that they're using in the *drawings*, the contract drawings. So, there's a lot of value in it. Again, it just… Depending on the job, the owner, and how much time they have to make it happen, can really change that decision one way or the other.

Interviewer: Alright. Perfect. [Interviewee TP 2.2], thank you for meeting with me.

Interviewee TP 2.2: Yeah! No problem. Glad I could be a part of this. If you've got any other questions, feel free to shoot me a call or text or email.

Interviewer: For sure! Thank you.

Interviewee TP 2.2: Hey, no problem. Talk to you. Bye.

End