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Preparation Process for Integrated Project Delivery (2PIPD) for the small construction companies and projects: Analysis of Case Study

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ABSTRACT

Traditional construction project agreements are complex in nature and when ill-managed, most fall behind schedule and exceed the projected budget. Integrated Project Delivery (IPD) agreement aims to rebuild the relationship among the construction project stakeholders to prevent such project failures. This paper analyzes and examines the IPD using three small-sized construction projects. A trust list and the Construction Trust Code (CTC) are also proposed as permanent parts of the preparation process prior to IPD agreements. CTC is utilized as a tool that measures the performance, engagement, conflict tendency for all project stakeholders whereas the trust list is used for mapping the project's stakeholders in the groups by specialty, so it is easy to compare by CTC. The focus of this research is on startup companies conducting small-sized projects.

KEYWORDS: Integrated Project Delivery (IPD), Trust List, Construction Trust Code (CTC), Performance Management, Engagement, and Conflict Measurement.

INTRODUCTION

In addition to being associated with high levels of uncertainty and shorter completion times, today's projects are also characterized by their complexity. Several parties in construction projects, including architects, engineers, managers, and even owners search for ways to complete construction projects efficiently and effectively since a significant number of these projects are either canceled or they exceed their time and budget limitations. The responsibility of this failure is shared among involved parties and the consequences usually involves loss of reputation, revenue and time. Mathai (2010) presented common issues that are faced during the construction projects as in the following.

- One-third of the construction projects do not receive a schedule or a budget.
- Majority of project owners firmly believe that architect designs are inadequate.
- One-third of materials that are used in construction projects end up as waste.

Most of the sub-contractors do not rely on the drawings and prefer to cut and redesign their materials in the field resulting in 10 to 15 percent of the material being wasted (Mathai, 2010). The Project Management Institute lists poor communication as the main reason of project failure

since it leads to unpredictable delays often increasing the project's cost . Project failure also occurs due to varying levels of engagement of key stakeholders. That is, a project's success requires proper identification and classification of the stakeholders. Involving these parties at the early stages of the project is essential to achieve this success (Carlson, 2013). However, the hierarchical processes create gaps among stakeholders. For instance, in construction projects, when the architect is the sole creator of the design, proper implementation becomes more challenging without the input of the constructor and the owner. This is mainly because the design is implemented according to the ideal settings according to general codes and calculations. The lack of involvement adversely affects the satisfaction of the owners as well since they were excluded from the decision making process in the early stages of the project. This lack of transparent and continuous communication prohibits a consensus among the designer, the constructor, and the owner. One reason for this is the conflicting objectives of the parties. The contractor usually focuses on profit more than meeting the owner's expectation . Aiming at providing a more meaningful decision making platform, the American Institute of Architects in collaboration with other consultants published a guide of Integrated Project Delivery (IPD) that organizes the relationship among the project participants. Following its introduction, IPD has been integrated into several projects to achieve quality, and to reduce time and cost . This paper highlights the limitations of IPD for small projects and startup companies and details additional steps which are required prior to implementing the IPD agreements. The research also focuses on increasing the performance of startup companies involved in small construction projects while making sure that IPD requirements are satisfied before its implementation. In this regard, a Construction Trust Code (CTC) that would increase the trust level of the various stakeholders in such projects is created and analyzed.

LITERATURE REVIEW

This paper reviewed the suitability of IPD for small construction projects and companies. Table1 provides a summary of literature review.

Table 1: Summary of Related Research

YEAR	REFERENCES	TITLE
2007	American Institute of Architects (AIA)	Integrated Project Delivery (IPD):a guide
2008	American Institute of Architects (AIA)	Integrated Project Delivery (IPD): Frequently Asked Questions
2012	Taylor & Olsen	Integrated Project Delivery: Not a Panacea for Everyone
2008	Sive	Integrated Project Delivery: Reality and Promise

American Institute of Architects (AIA) introduced Integrated Project Delivery (IPD) guide as a solution to the issues that face the construction projects. This guide adjusted the relationship among the designer, contractor, and owner for more engagement (AIA, 2008).The institute also supported the idea that IPD had be created to fit all construction projects and companies regardless of the size of these projects and companies.

According to AIA (2008), fundamental principles of IPD include:

1. Mutual respect and trust
2. Mutual risk and reward
3. Collaborative innovation and decision making
4. Early involvement of all key participants
5. Open and enhanced communication (AIA, 2008).

Since the process in focus requires particular characteristics for IPD to be effective the tool might not be selected for implementation in every project. Stating this, Taylor and Olsen (2002) argued that, in such cases, IPD would still be able to provide useful information to a large variety of decision makers and could still be beneficial in improving individual steps of various processes (Taylor & Olsen, 2012).

Sive (2009) stated the importance of team work and defined IPD as “a family of activities and particular tools fostering greater team collaboration and efficiency, which can be undertaken in a variety of traditional or modified traditional contract formats.” Pure IPD refers to collaborative teams (including A/E/C firms and the owner) working in a *contractually* connected manner, generally within a risk/profit sharing format. IPDish teams improve collaboration and efficiency with tools like BIM”. Building information modeling (BIM) is a collection of the tools like Revert and AutoCAD that facilitates the fulfillment of many of the IPD requirements (Autodesk, 2017). “Pure IPD builds on these tools by legally and formally connecting individual firms into a shared entity where success for the individual can only come through success by the team”.

METHODOLOGY AND DATA COLLECTION PROCESSES

The objective of this research is to answer whether IPD is a suitable approach for all kinds of construction projects and companies regardless of the size of these companies and projects. The research further investigates possible solutions to overcome the challenges if the tool is not a natural fit for every project at hand. In order to address these two issues three independent construction projects are investigated. The following describes the projects and related data in detail.

Multiple Construction Projects: A Case Study

This section presents three case studies using the traditional contract approach with a Construction Trust Code (CTC) and trust list. Resulting waste and the limitations of this approach are also discussed in this section. This paper highlights three small construction projects from Sandy Disaster Recovery Program. The projects are sponsored by the Department of Housing, Connecticut. The general contractor is Vase Management Company, LLC, a startup construction company with less than 10 employees, also located in Connecticut. Table 2 presents the data for these projects.

Location	#1-1068-8 Tremont Street	#2-5053-39 Cooper Ave.	#3- 1511-58 Harbor View Ave.
Project Location	Milford, CT	Milford, CT	Norwalk, CT
Project Type	House lifting - Construction	House lifting - Construction	House lifting - Construction
Contract Type	Design-Bid-Build	Design-Bid-Build	Design-Bid-Build
Project Funder	City of Milford, Building Department, Sandy Hurricane Program	City of Milford, Building Department, Sandy Hurricane Program	City of Milford, Building Department, Sandy Hurricane Program
Project Architect	Martinez Couch & Associates, LLC	Lothrop Associates LLP.	Martinez Couch & Associates, LLC
Project Contractor	Vase Management, LLC	Vase Management, LLC	Vase Management, LLC
Project Start Date	January 2016	February 2016	May 2016
Estimated Completion Date	November 2016	October 2016	February 2017
Status by the end of January 2017	Closing phase	Closing phase	10 days behind schedule

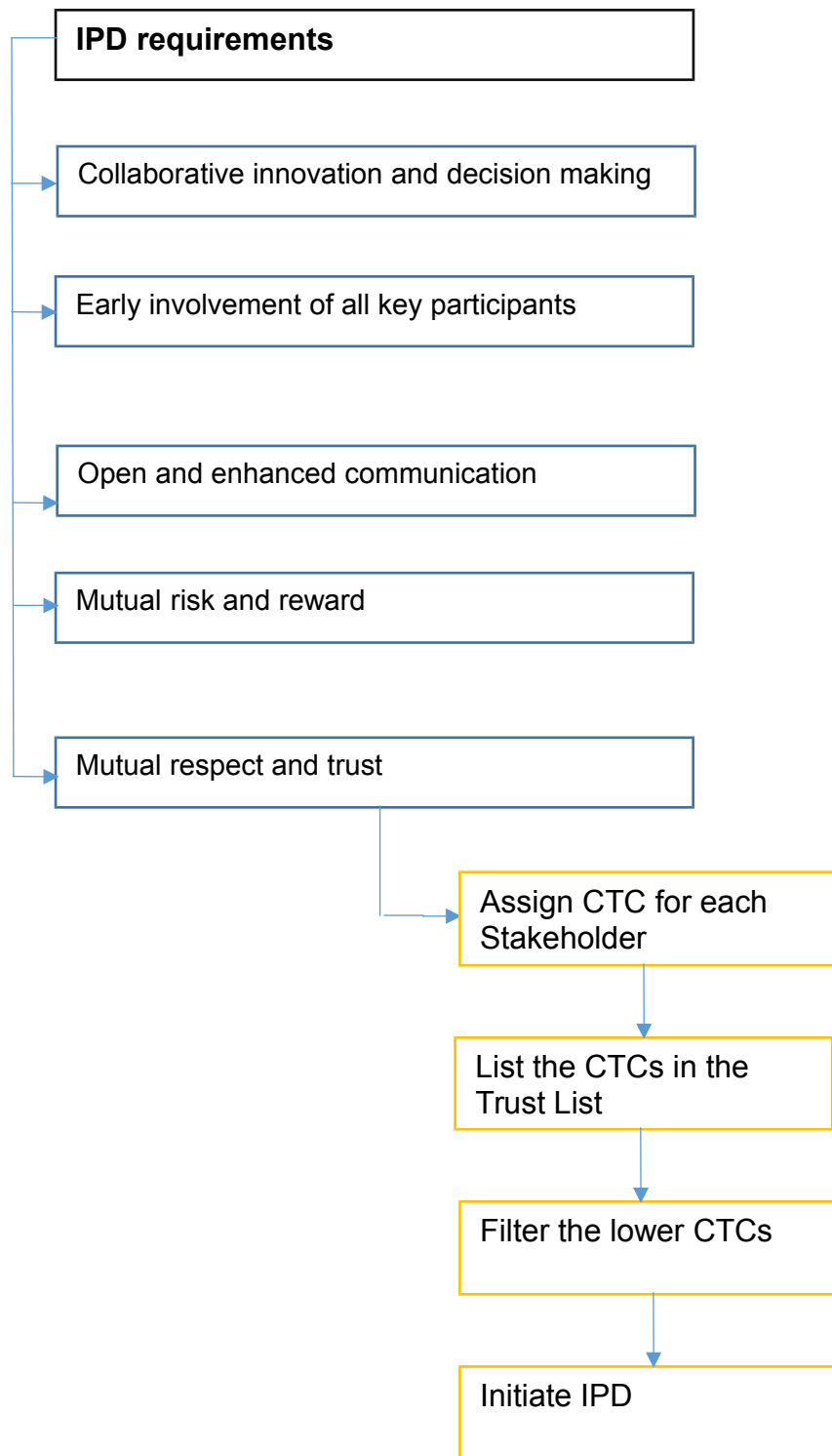
Following the data collection process, in order to evaluate the familiarity of various construction professional with IPD, a survey has been conducted among 55 companies. The details of the survey are presented in the Appendix. These companies consist of small, medium, and large size firms. The responses indicated that 40 percent of the companies were not familiar with IPD. Furthermore, 20 percent of did not appreciate the change in the IPD contracts due to several reasons. 95 percent of these companies that were not familiar with IPD or did not appreciate the process came from small sized companies. After further analysis, the main reasons are categorized into four groups:

- Legal concerns
- Fear of change
- Lack of trust
- Limited financial and resource capabilities.

PROPOSED MODEL

The steps of the proposed model is provided in Figure 1. As it can also be observed from the model, the CTC process is initiated by mapping the requirements of the IPD. The following five steps involve continuous communication with the interested parties to build trust among the key players of the construction project. A CTC is then assigned to each stakeholder to rank the participants which would eventually generate the Trust List. Low ranking parties are eliminated from the list to increase the success rate of the project to initiate the IPD.

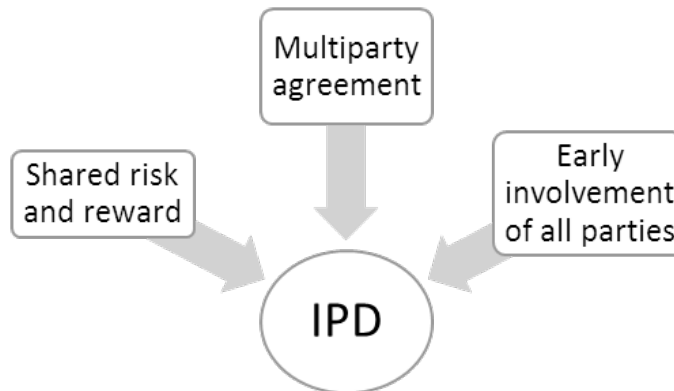
Figure 1: Proposed Model for Integrated Project Delivery (IPD) Readiness



INTEGRATED PROJECT DELIVERY (IPD)

Integrated Project Delivery (IPD) is a process to create an effective team leader who could manage and direct the construction project efficiently . The purpose of building this team is to increase the quality of work and to reduce the overall project waste. Another goal of IPD is to keep the project under budget and ahead of schedule . Figure 2 represents the main principles of the IPD.

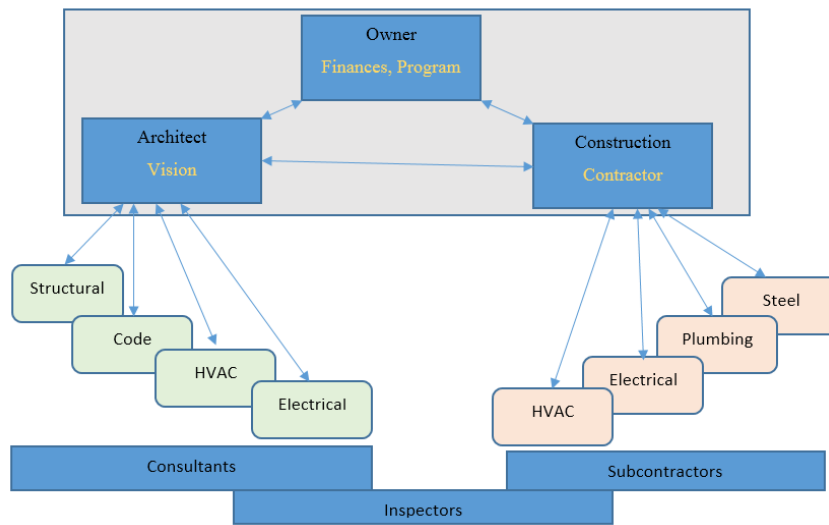
Figure 2: Main principles of the Integrated Project Delivery (IPD) .



IPD has been developed to enhance the performance of projects by providing an integrated decision making framework that would ensure effective communication among interested parties. There is, however, still a lack of consensus on how this system works despite the several theories. As part of these efforts, the General Performance Model (GPM), a simulation based method, is applied to analyze and review the impact of IPD on the construction project .

The strategy of IPD involves highlighting the pre-contractual activities to achieve further engagement between the key stakeholders and to increase the ability to resolve the underlying issues that may rise in the construction phases. “The keys to success for IPD projects, not surprisingly, are identical to the ones used in other delivery approaches: choosing the right project, selecting the appropriate delivery and contracting strategy, engaging the right team (external and internal), understanding the project risks, and having an operating and governance structure in place to support the delivery approach (KPMG, 2013)”. Figure 3 depicts the relationship among team members according to IPD’s vision.

Figure 3: The relationship diagram according to IPD's Vision (Winstanley, 2011).



The main idea of IPD is to build trustworthy relationships among the key players of the construction projects by setting up third-party contracts that shear financial responsibility to mitigate risk. Although the homeowner, contractor, and designer have different levels of insight regarding the project, IPD requires their early engagement and suggests Building Information Modeling (BIM) as a solution for common misunderstandings. BIM modifies the communication among the key stakeholders and brings all them to same level of understanding. In short, BIM focuses on human actions and communications that eventually address significant differences of processes in construction projects . Furthermore, IPD needs a lean construction process to achieve good results. Lean construction is a process that aims at reducing waste and cycle times as well as increasing the quality and ensuring continuous improvement. Lean construction use methodologies and tools such as just in time (JIT), total quality management (TQM), and value based management .

According to McCurley and Powell (2014), consultants at CBRE Healthcare, IPD has originated as a result of lean methodologies and as with all lean approaches, its main focus is on the elimination of waste and duplication. One of the most efficient ways of eliminating waste is to avoid multiple entities by creating different versions of the same drawing. The authors argued that Building Information Modeling (BIM) was useful in achieving this goal (McCurley& Powell, 2014).

SUITABILITY OF IPD FOR SMALL CONSTRUCTION PROJECTS AND COMPANIES

First of all, small construction companies are often startup companies with zero to one hundred employees, while the medium sized businesses usually have between one hundred to one thousand employees. Small and medium-sized businesses, SMEs (Cloud, 2016), suffer from finance, infrastructure, taxes, regulations, and policy instability . Furthermore, SMEs focus on small projects that is compatible with their financial and work force capabilities.

AIA firmly believes that IPD contracts and agreements can be used for any project regardless of its size and regardless of the size of the company implementing these projects. According to AIA, BIM is not essential for IPD. The main idea of IPD is to build a designer/owner/builder

team. Even though using BIM is important to achieve project success, it is not necessary to shift the contract from traditional stockholders to IPD. Furthermore, IPD produces a wide range of forms such as C195, C191, and IFOA that provide the key stockholders with a certain degree of flexibility (AIA, 2008). However, according to the survey results and other considerations that are listed in the following, it is concluded that the IPD is not part of the regular contract between the designer, builder, and homeowner. It is in fact a revelation in the construction processes that aims to overcome the issues that are encountered during the construction projects. These issues can be addressed under three main categories: Trust, BIM, and lean construction.

Large and medium sized companies generally possess these three criteria even though the majority of the small companies lack all. According to the AIA, when the project managers are asked whether they feel like BIM has a liability implication for early specification, cost estimation, and overall management of the project that may unduly expose the designer, (AIA, 2008), they state that BIM is not required. However, trust has a vital role in an IPD agreement (AIA, 2008). In fact, trust builds gradually along with the maturity of the company. "Trust isn't automatic. Using IPD won't automatically make team members trust each other" (Contractors Insurance, 2016). There are five levels of maturity stages in construction processes. The startup companies start at the first level, and on this level, there is a lack of knowledge of construction practices with anxiety in few area . Therefore, the trust between the startup company and other stockholders in the construction field is at the lowest level. On the other hand, one cannot accurately evaluate the stockholders and build a strong relationship with them during the limited duration of small-sized projects.

PREPARATION STEP: BUILDING THE TRUST LIST

How can startup companies build a trust list by which they can recognize disappointing or trustworthy stakeholders to include them or not in the next project? With this motivation, this paper developed and examined a code to measure the trust in small construction projects called Construction Trust Code (CTC). CTC assigns (I) for Internal stakeholder, (E) for External stakeholder, and (K) for Key stakeholder.

Conflict tendency: One of the important concepts that leads to project failure is conflict. There are nine different kinds of conflicts in project which are: "schedule, priorities, resource, technical, administrative, personality, cost, performance, and supplier selection ". Previously, one of the authors of this research published regarding the effect of the Conflict Tendency to fail the projects. The Conflict Tendency weighs how many claims or issues that the stakeholder caused during previous projects. Conflict credit scale is given from 1 to 10 (Najjar & Awad, 2016).

Performance: The performance metrics vary from stakeholder to the other in the same project. For instance, for subcontractors and vendors, timely deliveries within the estimated budget and with acceptable quality is called the three traditional indicators of performance (Mohsini & Davidson, 1992). Furthermore, many general contractors fail to put a value metrics to evaluate the stakeholders in the project and avoid 'lagging metrics' (Ghalayini & Noble, 1996). In general, the performance of the stakeholders during the phases of the project includes: Quality, Capability, and Availability.

Engagement level: CTC presented the Engagement Level as an additional factor to measure the supportive level of the stakeholders. A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition explained that there are five levels of engagement, so CTC gave (U) for Unaware, (R) for Resistant, (N) for Neutral, (S) for Supportive, and (L) for Leading stakeholder (PMI, 2013).

RESULTS

To compare these results, this paper focuses on examining the CTC on the General Contractor (GC), which includes Vase Management Company as GC and the architects, inspectors, structural engineers, and sub-contractors on these three projects. The project 1068- 8 (Table 3) Tremont Street, Milford, CT, considered to be the first project contracted to Vase Management as a GC.

Table 3: CTC for the stakeholders in project 106

Stakeholders	Description	Classification	Quality	Capability	Availability	Engagement	Conflict	CTC
Terrence McConville	Home owner	K	-	-	-	S	6	KS6
Martinez, Couch & Associates	Architect/ Designer	K	8	9	9	L	8	K899L8
Cuoco Structural Engineers	Engineers/ inspector	k	8	6	8	L	5	K868L5
Material Testing	Inspector	K	6	7	9	L	4	K679L4
A-Preferred Construction	General Trade	K	3	5	5	R	6	K355R6
DiCamillo	Site work	K	7	8	9	S	4	K789S4
High Caliber	House lift	K	9	9	7	S	4	K997S4
MDW Abatement Services	Abatement service	K	8	8	9	S	3	K889S3
MS Home Improvement	General Trade	K	7	6	6	S	4	K766S4
Pearl Electric	Electric	K	9	9	2	N	4	K992N4
Straight Line(SLB)	General Trade	K	7	7	9	S	2	K779S2
Voka Mechanical Corp	Plumbing	K	7	8	2	N	4	K782N4
Wilson's Welding	welding company	E	8	8	8	N	4	E888N4
Malin& Sons	Excavation service	E	9	9	3	N	4	E993N4
Nutty Company	Fastener supplier	E	9	9	9	N	3	E999N3
HAVC Gorge	HAVC	K	8	9	9	S	3	K899S3
Mohican Valley Concrete Corporation	Concrete supplier	E	9	9	7	N	3	E997N3
Alvarez	rebar and concrete service	E	9	9	8	N	6	E998N6

The second project (Table 4) for Vase Management is Project 5053- 39 which took place in Cooper Ave, Milford, CT. The Project 5053 started one month after the first project with no time to evaluate the stakeholders in project 1068.

Table 4: CTC for the stakeholders in project 5053

Stakeholders	Description	Classification	Quality	Capability	Availability	Engagement	Conflict	CTC
Wladyslaw Gebuza	Home owner	K	-	-	-	S	3	KS3
Lothrop Associates, LLP	Architect/ Designer	K	8	8	9	L	3	K889L3
Material Testing	Inspector	K	6	7	9	L	4	K679L4
A-Preferred Construction	General Trade	K	3	5	4	R	9	K354R9
DiCamillo	Site work	K	7	8	9	S	3	K789S3
Payne Construction	House lift	K	7	9	6	S	5	K796S5
MDW Abatement Services	Abatement service	K	8	8	9	S	3	K889S3
MS Home Improvement	General Trade	K	7	6	6	S	4	K766S4
Tarala Electrical	Electrical	K	9	9	8	N	3	K998N3
Straight line(SLB)	General Trade	K	7	7	9	S	2	K779S2
Voka Mechanical Corp	Plumbing	K	7	8	2	N	4	K782N4
Wilson's welding	welding company	E	8	8	8	N	4	E888N4
Malin& Sons	Excavation service	E	9	9	3	N	4	E993N4
Nutty company	Fastener supplier	E	9	9	9	N	3	E999N3
Hudson Construction	concrete service	K	2	6	9	N	6	K269N6
HAVC Gorge	HAVC	K	8	9	9	S	3	K899S3
Mohican Valley Concrete Corporation	Concrete supplier	E	9	9	7	N	3	E997N3
Alvarez	rebar and concrete service	E	9	9	8	N	6	E998N6

Vincencia Adusei, the founder of Vase Management, was searching for efficient subcontractors to meet the requirements of the Design-Bid- Build contract with the MCA, the designer of the project. In the preconstruction meeting, most of the stakeholders met for the first time. In the third project for Vase Management, Project 1511 (Table 5), the company started to filter the inefficient stakeholders and continued working with stakeholders which are perceived as “trustworthy”.

Table 5: CTC for the stakeholders in project 1511

Stakeholders	Description	Classification	Quality	Capability	Availability	Engagement	Conflict	CTC
Lucy Ackemann	Home owner	K	-	-	-	S	2	KS2
Martinez, Couch & Associates	Architect/ Designer	K	8	9	9	L	8	K899L8
Material Testing	Inspector	K	6	7	9	L	4	K679L4
DiCamillo	Site work	K	7	8	9	S	4	K789S4
High Caliber	House lift	K	9	9	7	S	4	K997S4
Tarala Electrical	Electrical	K	9	9	8	N	3	K998N3
Straight line(SLB)	General Trade	K	7	7	9	S	2	K779S2
Wilson's welding	welding company	E	8	8	8	N	4	E888N4
Malin& Sons	Excavation service	E	9	9	3	N	4	E993N4
Nutty company	Fastener supplier	E	9	9	9	N	3	E999N3
HAVC Gorge	HAVC	K	8	9	9	S	3	K899S3
Mohican Valley Concrete Corporation	Concrete supplier	E	9	9	7	N	3	E997N3
Alvarez	rebar and concrete service	K	9	9	8	N	6	K998N6

DISCUSSION AND CONCLUSIONS

It is almost impossible for small sized startup companies to achieve all five requirements of the IPD. Startup companies often need 2PIPD prior to engaging parties in the IPD's agreements. 2PIPD builds a trust among the construction project's stakeholders through the utilization of established Trust Lists and CTCs. CTC provides these companies with numerical measures regarding the overall project performance, levels of engagement and the conflict tendency of the stakeholders. Through the projects, CTC empowers these companies with the ability to select suitable partners that would be included in the IPD agreements.

CTC also adds additional value by establishing trust among the stakeholders which would be then serve as an important criterion in future projects. For instance, even though there were several obstacles in the previous projects, the designer Martinez Couch & Associates with K899L8 CTC, built a strong relationship with Vase management. The group is now ready for the next step which is the IPD agreement. On the other hand, Vase Management dispensed the stakeholders such as K354R9, K782N4 and K269N6 that had low CTC scores and high conflict tendencies classifying them as “untrustworthy”.

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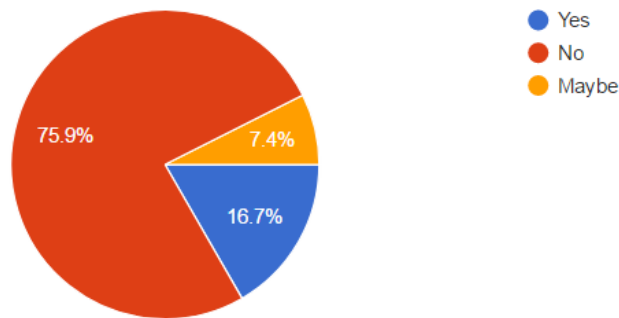
APPENDIX

The survey results are located at:

<https://docs.google.com/forms/d/e/1FAIpQLSeEKcXJvTA2ym2KF4j-sUBkh9yTVODxIEe7iOr0Ot3WlUX9eA/formResponse>

Do you think that Design-Bid-Build contract is the best way to organize the relationship among the designer, the contractor, and the homeowner?

54 responses



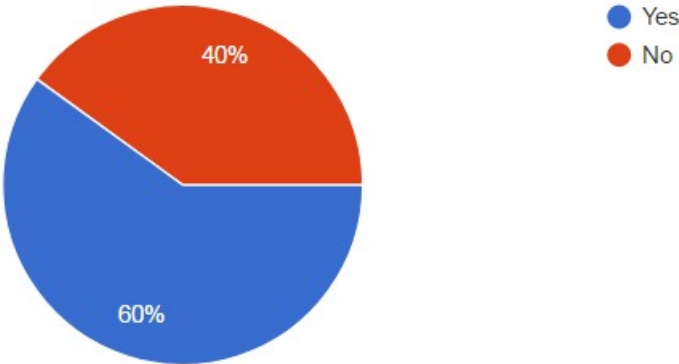
what are the criteria you use to evaluate the stakeholders in the project such as contractor, subcontractor, architectural, homeowner?

35 responses

Availability (6)
performance (5)
conflict (4)
Engagement (3)
Quality (3)
Time (2)
quality (2)
capability (2)
Capability (2)
time and quality
Time and cost
Conflict

Are you familiar with the Integrated Project Delivery (IPD)?

55 responses



What are the obstacles that face the implementation of IPD?

27 responses

Lack of trust (11)
Fear of change (6)
Limited financial and resources capabilities (3)
Limited financial and resources capabilities. (2)
Legal concerns (2)
It is perfect
Legal concerns, Lack of trust