

# INTEGRATED PROJECT DELIVERY IN PUBLIC PROJECTS: LIMITATIONS AND OPPORTUNITY

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## ABSTRACT

One of the major challenges that the construction industry facing is how to improve the effectiveness and performance of construction projects which become more dynamic and uncertain. For this reason, more projects are adopting lean principles which focuses on collaboration and work flow reliability. Due to the limitations of current procurement practices including competitive bidding strategy and fixed price contracts, an innovative project delivery, so called integrated project delivery (IPD) or lean project delivery, has been adopted by project owners. However, most of public agencies have restrictions in choosing a project delivery. In fact, most procurement codes require public agencies to use competitive pricing and bidding, leading to difficulties in using IPD which encourages collaboration among project teams. In this paper, the researchers present the result of a survey aimed at investigating the benefits and restrictions experienced by project participants who have tried IPD or some principles of IPD in public projects. The research is expected to provide a practical view on the opportunities and challenges in applying IPD to their projects.

## KEYWORDS

Integrated project delivery (IPD), public projects, survey

## INTRODUCTION

In recent years, projects have become increasingly complex, dynamic, and fast (Ballard 2008). Integrated project delivery (IPD) has been proved to be an effective way to manage complex, dynamic, and fast projects (Ballard et al. 2011). The project integration requires

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more than just working together. It requires organizational integration, alignment of commercial interests, and management-by-means (Ballard et al. 2011). In addition, Kim and Dossick (2011) and Lee et al. (2013) reported that cultural alignment is also required to make a project integrated let alone management principles, technical support, and contractual arrangements.

Without integrated approach, construction projects (especially complex, dynamic, and fast ones) tend to suffer from adversarial relationships, low productivity, and process inefficiency resulting in projects being overrun and delayed (CURT 2004; 2007). In response to such problems of the current delivery systems, the number of projects adopting integrated approach has increased in recent years (Kent and Becerik-Gerber 2010). One exemplary delivery system is IPD.

IPD is a method of project delivery that is distinguished by a contractual arrangement that aligns business interests among a minimum of owner, constructor and design professional. IPD encourages collaboration throughout the design and construction process, ties stakeholders’ success to project’s success. (AIA/AIACC 2007)

IPD is an alternative project delivery that supports aligning interests, objectives and practices, and it explicitly promotes shared risk and reward and extensive collaboration between project parties (Matthews and Howell 2005). AIA (2007) defined IPD as “a project delivery approach that integrates people, systems, business structures and practices into a process that collaboratively harnesses the talents and insights of all participants to reduce waste and optimize efficiency through all phases of design, fabrication and construction.”

Most notably, IPD distinguishes itself from other alternative project deliveries by supporting multi-party agreements with transparent sharing of project information between project parties (Cohen 2010), and by promoting a list of unique requirements as summarized in Table 1.

Table 1: Unique Requirements of IPD (Adapted from Lee et al. 2013)

<b>Contractual Requirements</b>	<b>Technological Requirements</b>	<b>Cultural Requirements</b>
<ul style="list-style-type: none"> <li>• Multiparty Agreement</li> <li>• Shared Financial Risk and Reward</li> <li>• Early Involvement of All Parties</li> <li>• Collaborative Decision-making</li> <li>• Liability Waivers</li> <li>• Fiscal Transparency</li> <li>• Integrated Design</li> </ul>	<ul style="list-style-type: none"> <li>• Building Information Modelling (BIM)</li> <li>• Project Management Information System (PMIS)</li> </ul>	<ul style="list-style-type: none"> <li>• Mutual Respect and Trust</li> <li>• Willingness to Collaborate</li> <li>• Open Communication</li> </ul>

As the number of IPD projects increases, IPD has gained interests of many public owners in that public projects could benefit from the principles of IPD. However, there are many obstacles for public owners to overcome in applying the principles of IPD to their public projects. To remedy the obstacles, IPD can alternatively be applied to currently available project delivery methods such as Design Build, CM at Risk, and even traditional Design Bid Build. (Sewalk et al. 2016). Projects that employ the principles of IPD with conventional delivery methods are called “IPD-ish” projects.

The objectives of the present study are (1) to understand the benefits of and obstacles to IPD implementation from the perspective of owners, engineers, and contractors who are working in public projects, and (2) to investigate how IPD or IPD-ish is employed in public projects.

## **RESEARCH DESIGN**

This research investigated the perceptions that people have towards the implementation of IPD in public projects. The research specifically sought to identify the obstacles and benefits associated with IPD implementation in public projects. As the main research method, an online survey was distributed to professionals in different kinds of projects and data was collected by using a questionnaire that the respondents had to fill out. The respondents were contacted via emailing lists of lean construction communities including Lean Construction Institute. The questionnaire contained ordinal scale questions, in which the respondents selected the responses from a five-point Likert scale, where 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, and 5=strongly agree.

The questions were divided into five major categories. First, general questions included the type of projects the respondents worked for, the role they had in the projects, and if they had direct experience with IPD contracts. Second, questions asked about the respondents’ opinions about 19 different potential benefits and eight different obstacles associated with IPD in public project. The list of benefits and obstacles were developed based on extensive literature review combined with our collective experience that we gained from getting involved in IPD projects. Third, questions were asked to examine how IPD methods were implemented especially for those who had previous experience with IPD. Fourth, the respondents were asked about the delivery method of projects where the principles of IPD were employed. The researchers assumed that the most procurement codes do not allow multiparty relational contract (e.g., Integrated Form of Agreement). Lastly, the survey concluded with asking about the method of applying the principles of IPD to respondents’ projects. The survey design is presented in Appendix.

## **RESPONDENTS**

A total of 34 respondents participated in the survey. The respondents were all involved in the fields of architecture and/or construction. The majority of them worked in industrial projects (12), school projects (9), and healthcare projects (8). Alternatively, commercial buildings (2), residential buildings (1), and heavy civil works (2) accounted for the lowest numbers of respondents (Figure 1). Additionally, most respondents were owners or owner representatives. Architects (7) and general contractors (7) had the second largest number

of representatives in the survey. Lastly, only one respondent represented an engineering firm. It should be noted that since the respondents were from different countries, this study does not aim to generalize the survey results to specific areas, rather focused on providing generalized insights on what industry professionals in public projects perceive for IPD.

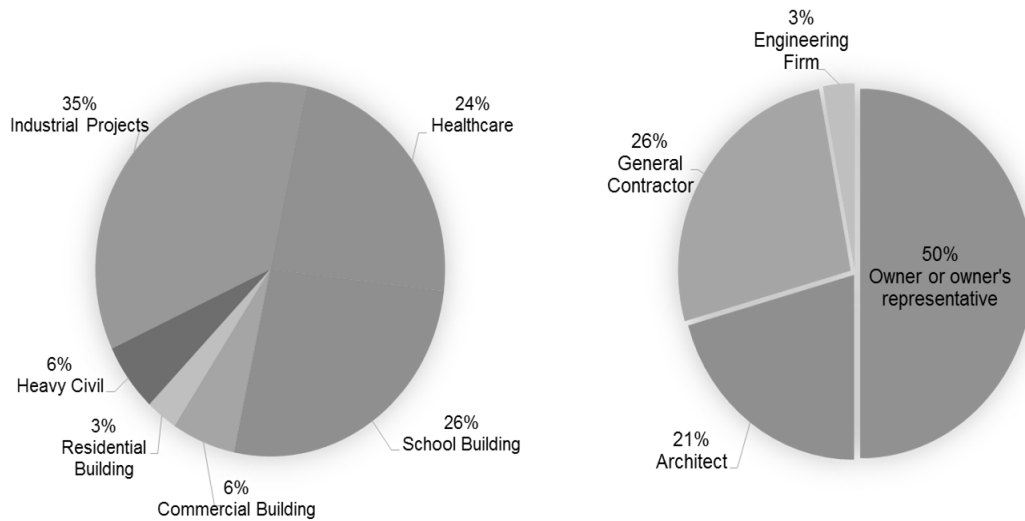


Figure 1: Demography of Survey Respondents

## RESEARCH FINDINGS

### PERCEIVED BENEFITS

In measuring the perceived benefits of IPD in public projects, the survey presented the respondents with 19 different potential benefits. For each of these benefits, the respondents were asked to select one option, indicating the extent to which they could achieve such benefit from IPD implementation.

The survey revealed a large number of responses with high scores in 15 out of 19 benefits, all of which outnumbered the negative and neutral responses for these perceived benefits. Based on these responses with high scores, it appears that most respondents considered IPD to provide those benefits, including improved communication on design issues; better communication between stakeholders; continuity in preferences and objectives in the construction process; a win-win process, early determination of project budget; improved administration; and improved project quality among other issues. Of these options, the respondents indicated that the most commonly perceived benefits of IPD are the reduced number of change orders, a win-win process, the continuity of preferences, and improved communication of stakeholders.

Top 10 benefits are listed in Table 2 based on mean value of each questionnaire.

Table 2: Top 10 Benefits

Rank	Benefits	Mean	Std. Dev.
1	Continuity regarding preferences and objectives throughout the design and construction process	4.09	1
2	Improved communication among stakeholders	4.00	1.13
3	Reduced the number of change orders	3.94	1.15
4	A win-win process: a gain-pain sharing mechanism encourages active participation in design decisions	3.88	1.09
5	Improved communication between owner and designer regarding issues of design	3.82	1.19
6	Improved project quality	3.82	1.11
7	Less chance of claims or litigation	3.82	1.14
8	Reduced project duration	3.79	1.12
9	Cost-effective design due to the designers access to construction information	3.76	1.05
10	Delivery of project within budget with less likelihood of cost overruns	3.74	0.99

## **PERCEIVED OBSTACLES**

The survey also examined the perceived obstacles of IPD in public projects. As with the perceived benefits, the respondents were asked to indicate which obstacles they agree or disagree with the most, through the responses they marked on a scale attached to each obstacles. The survey presented the respondents with eight options, representing eight perceived obstacles of IPD in public projects. Of these obstacles, two had a significant amount of negative responses, which were collaborative decision-making and the involvement of key specialty contractors in the process of design. In contrary, three additional difficulties had a large number of neutral responses.

The perceived obstacles such as internal resistance, industry's resistance, and the selection of service providers without price competition received numerous neutral responses. This demonstrated that many respondents were not sure whether these issues were perceived obstacles to IPD implementation in public projects. Top 8 obstacles are listed in Table 3 on their mean value.

Table 3: Top 8 Obstacles

Rank	Obstacles	Mean	Std. Dev.
1	Multiparty agreement conflicting with the current public procurement law	4.09	0.87
2	Sharing profits and overruns (pain-gain-sharing)	3.59	0.99
3	Internal resistance (authorities do not like the idea)	3.53	0.93
4	Selecting a service provider without price competition	3.5	0.93
5	Lack of awareness or benefits	3.44	0.93
6	Involving key specialty contractors in design process	3.18	1.00
7	Industry's resistance (contractors and designers do not like the idea)	3.00	0.98
8	Collaborative decision making (design and budget) in design process	2.97	0.97

Numerous responses with high scores in the survey indicate that the respondents identified the majority of the perceived obstacles to IPD implementation. According to the result of the survey, three of the eight obstacles had the most respondents' agreement, which are: (1) the participants perceived multiparty agreement conflicting with current public procurement law, (2) internal resistance, and (3) sharing profits and overruns as the impediments to the implementation of IPD in public projects.

### WAYS TO IMPLEMENT IPD IN PUBLIC PROJECTS

To maximize the effectiveness of IPD implementation, project parties especially in the private sector use multi-party contracting, to incentivize collaborative behavior, team risk sharing, and team decision-making process. Whereas in the public sector, such as federal and state projects, Design-Bid-Build is still the most widely-used delivery system that is used to deliver the public projects in many countries. Moreover, many public procurement laws restrict the use of alternative project delivery systems (Azhar et al. 2014), as is the case in the US.

When procurement codes do not allow for multi-party relational contracting (such as IPD) in public projects, public owners should seek alternative ways to implement IPD principles in their projects. Some of the alternative ways are: (1) use an addendum (agreement to implement IPD) to the main contract after the main contract is signed, (2) use an invitation to proposal or RFP/RFQ in which the intent to use IPD is addressed, and (3) use a project specification in which the use of IPD components is addressed. When using such alternatives to overcome the law restriction for IPD, it is called IPD-ish (AGC 2010).

According to the survey results, 17 of the respondents had applied the IPD-ish principles in their projects that were delivered through the following delivery systems:

Traditional Design-Bid-Build, Design-Build, and GC/CM or CM-at-Risk. Table 4 shows the percentage of the use of IPD-ish among the different delivery systems based on the survey. Although the survey has revealed that IPD-ish has been applied on DBB and DB projects, the majority of projects applied IPD-ish were GC/CM.

**Table 4: Type of Delivery System where IPD Applied**

Delivery Type	Number of Responses	Percentage
Traditional Design-Bid-Build	6	35.29%
Design-Build	4	23.53%
GC/CM or CM-at-Risk	7	41.18%

As to examine how IPD principles were applied in public projects while the procurement legislature impeded its implementation, participants were asked to identify the way they implemented the IPD principles in their projects without signing a pure IPD contract..

As a result, Table 6 summarizes how the respondents had implemented the IPD principles in their project contracts. Nine out of 17 respondents used an addendum (#1, #4, and #6 in Table 6) or IPD agreement to employ the principles of IPD in their projects. The invitation to proposal or RFP/RFQ documents was employed by six respondents. Two respondents (“others” in Table 5) chose other ways such as adopting lean principles throughout the construction phase without contractual arrangement.

**Table 5: Implementation Methods of IPD on Contracts**

#	Implementation Method	Number of Responses	Percentage
1	Use an addendum (agreement to implement IPD) only	4	24%
2	Use an invitation to proposal or RFP/RFQ only	3	18%
3	Use a project specification only	4	23%
4	Use both Addendum and RFP/RFQ	2	12%
5	Use both RFP/RFQ and Spec.	1	6%
6	Use both Spec and Addendum	1	6%
7	Use all three methods	0	0%
8	Others	2	12%
	<b><i>Total</i></b>	<b><i>17</i></b>	<b><i>100%</i></b>

## **DISCUSSIONS AND CONCLUSION**

The findings of this study showed how industry professionals perceive the benefits and obstacles of IPD as well as how the principles of IPD are being employed in the project delivery methods that can be used under current procurement laws albeit the limited number of responses. The survey on the perceived benefits and obstacles of IPD identified various key issues related to IPD in public projects. Through the survey, the reduced number of change orders, a win-win process, the continuity of preferences, and improved communication of stakeholders were found to be the advantages that the majority of participants considered as the key benefits resulting from IPD implementation in public projects.

In contrary, the survey also found that many participants agreed that the multi-party agreement of IPD conflicts with the current public procurement laws, with sharing profits, and internal resistance, to be the main obstacles to IPD implementation. How to overcome such obstacles could be a key to making an integrated approach feasible in public projects.

Alternative ways, such as the IPD-ish approach, to the contracts has potential to eliminate the issue of the conflict between multiparty agreement and the current public procurement law. If IPD-ish is implemented, public owners are suggested to use RFP or RFQ to make clear their intention to use IPD principles, in order to minimize the possible resistance from service providers in signing the agreement after a main contract is awarded

Another challenge that IPD teams need to overcome is the sharing of risks and rewards. Though several alternative ways for such sharing mechanism exist, the industry needs to keep working on this issue because an alignment of commercial interests is a key component of IPD. In addition, the issue of internal resistance and the authorities who do not accept the idea of IPD can be resolved with training sessions to improve their understanding and perception on IPD principles in the projects. Future research is suggested for testing the efficiency and effective of such sessions.

This research also confirms that alternative ways to apply IPD principles should be devised in advancing the implementation of IPD in public projects, due to the inherent limitations of such projects. Using an addendum attached to the contract documents, addressing to use IPD by proposing that in the RFP/RFQ, and indicating and consisting to use IPD in project specifications are some of the suggested ways to overcome the restriction of the governmental procurement laws.

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## APPENDIX: SURVEY DESIGN

Table 2: Survey Design

Type of Questions	Classification	
<b>General questions</b>	Type of project Party represented Experience in IPD	
<b>Benefits</b>	<p><b>Improved</b> communication between team members</p> <p><b>Improved</b> communication among stakeholders</p> <p><b>Continuity</b></p> <p><b>A win-win</b> process</p> <p><b>Early</b> determination of project budget</p> <p><b>Cost-effective</b> design due to the designers access to construction information</p> <p><b>Delivery</b> within budget</p> <p><b>No</b> detailed RFP process</p>	<p><b>Improving</b> labour productivity</p> <p><b>Reduced</b> construction costs</p> <p><b>Reduced</b> design costs</p> <p><b>Reduced</b> project duration</p> <p><b>Improved</b> project safety</p> <p><b>Improved</b> project quality</p> <p><b>Improved</b> administration</p> <p><b>Reduced</b> the number of change orders</p> <p><b>Reduced</b> the number of RFI</p> <p><b>Less</b> chance of claims</p> <p><b>Single</b> point responsibility</p>
<b>Obstacles</b>	<p><b>Conflicting</b> with the current public procurement law</p> <p><b>Internal</b> resistance</p> <p><b>Selecting</b> a service provider without price competition</p> <p><b>Sharing</b> profits and overruns</p>	<p><b>Lack</b> of awareness or benefits</p> <p><b>Involving</b> key specialty contractors in design process</p> <p><b>Industry's</b> resistance</p> <p><b>Collaborative</b> decision making in design process</p>
<b>Delivery system that adopted IPD-ish</b>	Traditional Design-Bid-Build Design-Build GC/CM or CM@Risk	
<b>Method to implement IPD</b>	Use an addendum (agreement to implement IPD) Use an invitation to proposal or RFP/RFQ Use a project specification	