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## Assessing the Benefits of the Integrated Project Delivery Method: A Survey of Expert Opinions

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### Abstract

As a way to reduce the conflictual relationships between the parties involved in construction projects, the Integrated Project Delivery (IPD) has been emerging as a promising method to avoid some of the traditional inefficiencies of traditional contracting systems and maximize construction project success. However, IPD is struggling to spread in the industry and there is still the need to understand the value that it can unlock. To this end, a survey is proposed to explore the main benefits and open issues that practitioners face when using the IPD to deliver construction projects. The study reveals that initial high cost, contractual hardships, and complexity of implementation of IPD are the main reasons behind not adopting IPD, while shorter schedules, cost savings, better quality, and increased productivity are some of the main benefits derived from IPD adoption.

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## 1. Introduction

The architecture, engineering and construction (AEC) industry suffers from many problems like high inefficiency, low productivity, adversarial relationships, and contractual disputes between the owner, contractors, designer and, other stakeholders. These factors often generate cost overruns, schedule delays and result in poor end quality. All of that degrade the project value.

Similar to the context that led the software industry develop Agile Project Management methodologies, from these trends arose the need for a new contractual model to deliver construction projects: the Integrated Project Delivery (IPD). The model was introduced by the American Institute of Architecture [1] to upend the often adversarial relationship between the project parties that often happen in most contract models (such design-bid-build or integrated design-build).

IPD calls incentives to all participants to work in a collaborative way to maximize value and minimize waste for the project, and ultimately all participants are called open to directly share data and eliminate the communication barriers.

Aligned to Agile Project Management principles, IPD is mainly based on collaboration and trust, this trust-based collaboration enhances parties to be more focused on project outcomes rather than their own benefits. Without it, IPD will fail and participants will be in an antagonist relationship, which is one of the main factors that ruins construction project value today. IPD has a promising outcome, if the participants understand their missions and perform it in a collaborative way [6].

IPD is defined 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” [1].

IPD principles can be applied to a variety of contractual arrangements and project teams usually include members well beyond the basic triad of owner, designer, and contractor. At a minimum, though, an integrated project includes tight collaboration between the owner, architect/engineers, and builders ultimately responsible for construction of the project, from early design through project handover [6].

However, despite many promises and potential benefits, IPD is still lagging behind schedule in industry diffusion and the value that IPD can unlock is still unclear to practitioners and professionals. Till today IPD is not fully understood throughout the AEC community. Based on a recent study, although 84% of members are aware of IPD, only 40% understand IPD and just 13% implement IPD and actually use it [7].

Previous research has anticipated that IPD is likely to achieve improvements across six performance areas, namely quality, schedule, project changes, communication among stakeholders, environmental, and financial performance [3]. However, further research is still needed to provide satisfactory evidence that IPD will improve profits and reduce cost [8] or provide other tangible benefits that will promote its widespread utilization. The void of IPD research combined with the wide-spread interest of IPD provides an ideal opportunity to make significant contributions to the body of knowledge within the AEC community with respect to the IPD topic.

As a contribution to filling this research gap, this paper proposes a survey among practitioners that aims to evaluate the extent to which the IPD model enables project value and minimize waste, in order to give a recommendation to potential adopters. In particular, this survey seeks to understand what are the main benefits of IPD that are expected by professionals and address the main obstacles that refrain from unlocking the value of IPD as a precursor of a larger adoption in the industry.

## 2. IPD Defined

IPD has been regarded as a viable solution to the industry’s low production and inefficiencies that are still prevalent today [9]. The IPD is the the framework relating the organizations required to deliver a project and the establishment of formal (i.e. contractual) and informal relationships between the involved organizations [10].

The IPD requires defining several components: a multi-party agreement, a team structure, the role of information technology [11]. A multi-party agreement (MPA) among key participants is a bedrock of achieving IPD goals. Participants execute a single contract to define their roles, duties, obligations, liabilities, rights. As a single agreement is formed each party understand its relationship with the other participants. MPA agreements require trust

as overall project success and individual one basically rely on the level of contributions of all participants which means that all members have to work as one team to meet the goals planned. MPA needs a deep planning, intense team building efforts and careful negotiation, this process occurs during earliest stages of project definition, even it could be costly process but it's crucial and its better if the participants have prior experience with each other.

The organization of IPD teams varies significantly based on the size and technical details of the project. The size affects the number of teams, their individual scope, and how they will be directed and coordinated. The technical details of the project will determine how organizations are grouped and whether, and how teams are overlapped. The most effective teams are neither very small (under 4 or 5) nor very large (over a dozen). Very small teams are likely to lack for a diversity of views, and teams of more than 12 have difficulty getting much done [6].

Construction projects involve different stakeholders sharing a vast quantity of information. Traditional IT solutions do not provide the necessary collaborative environment to ensure that IPD participants work closely as a team. The need for a collaborative IT solution has been the driver behind the growth of online construction collaboration technology. Collaboration software streamlines the flow of documentation, communication and workflows; allowing users in different locations to share a common version of documents, drawings, forms and data in one place. Users are able to view and mark up files online without the need for native software. Because of its inbuilt audit trails, the software engenders confidence, minimizes disputes and mitigates risk. Building Information Modeling (BIM) uses 3D digital building models with its parametric information to enable the integration as it enhanced visualization, ease the data sharing and reuse by various members of the building team. BIM is the enabler for integration and open information sharing [5].

IPD offers numerous benefits to all participants in a construction project. The alignment of the interests and risk/reward of participants with the overall project objectives engenders a spirit of co-operation and team work. According to [4], the most influential drivers of IPD performance are in fact communication, alignment of interest and objectives, team working, trust, and gain/pain sharing. The performance of the supply chain is found to drive the project delivery performance. It is not surprising, therefore, that this methodology is gaining wider acceptance in the construction industry, and is starting to be applied to projects of various sizes and not only to larger multi-billion dollar projects. The claimed benefits of IPD are improved delivery process, integrated design, and collaborative fabrication.

### 3. Research Methodology

A two-phase approach was taken to conduct the research. A first phase consisted of a data collection through publishing a questionnaire targeting professionals and researchers who have experienced IPD in either research or implementation. The questionnaire about the benefits of IPD and obstacles of adoption has been designed based on assumptions and results of previous literature. As an attempt to develop confirmatory research, the questions address previous research statements.

A second phase was the analysis of the data obtained from the professionals who already experienced IPD.

The questionnaire was prepared by taking into consideration available metrics to evaluate IPD, from both the scholarly literature and case studies. In particular, the questionnaire investigates the reasons for not adopting IPD, the issues that deter adopting IPD, and the future expectations of IPD adoption.

The survey questions were divided into 5 sections: 1. Information about the respondents; 2. Opinions about IPD in relation to BIM, size of the project, superiority over traditional delivery methods; 3. Comments about the contractual difficulties of implementing IPD; 4. Evaluation of IPD as per performance metrics, such as schedule, waste, quality, and change performances; and 5. Suggestions on the future adoption of IPD.

The data collection process was as follows. Google form was created to make it easy to deliver and fill in 3 minutes. Contact via email and/or phone calls was attempted to some industry professionals who declared using IPD for their projects at least once and major social networks were used to distribute the questionnaire, such as LinkedIn, Facebook, Google+, and Twitter.

At the end, the questionnaire could raise 219 responses out of 2450 invitations sent.

### 4. Survey

The population of 219 respondents results classified as follows: Engineers (77; 35.2%), Project Managers (48; 21.9%), Researchers (28; 12.3%), Construction Managers (25; 11.4%), General contractors (22; 10%), Architects (12; 5%), and Owners (6; 2.7%).

Respondents declare to be Executives (40.64%), Senior managers (46.1%), or Junior staff (13.2%). This is due to the top management’s interest in the topic, as well as in the nature of questions. 44% of the respondents are based in the United States and a major portion are from the UK (33; 15%), Australia (18; 8%), Canada, Sweden and other 16 countries across all continents. Overall, 34% of total respondents are experienced with IPD. The rest of respondents (66%) are inexperienced, saying they have not been involved with an IPD project. 43% of those respondents are both inexperienced, and not informed about IPD while 57% of all respondents are informed but haven’t experienced IPD before and that is a problem we also will investigate the reasons of not adopting IPD in this thesis.

The results show that the good portion of the respondents either do have a direct IPD experience or familiar with IPD concepts and a minority never heard about it and never implemented it. This is an important finding, which shows the need for professional education on this topic as more than one-third of the respondents who never used IPD have no idea about it. Experienced respondents are first asked to provide their preferences about types of project to apply IPD, benefits of IPD, and contractual problems of IPD.

#### 4.1. Reasons of unexperienced respondents for not adopting IPD

Figure 1 shows the reasons that deter respondents from using IPD. The majority say the reasons are its new and many uncertainties, high transaction cost, contractual hardship, and its complexity of implementation. Moreover, respondents give less importance to other reasons so in order to boost and improve the adoption rate in the future the researchers and AIA could work to solve these point as clarifying the IPD and simplifying the concept, publish more case studies that prove the contractual issues and cost problems.

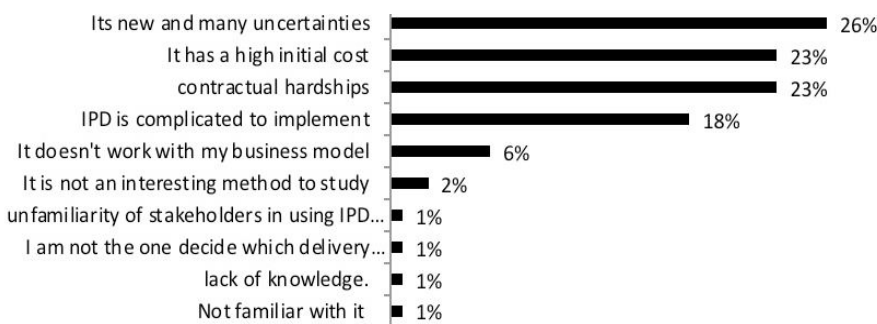


Figure 1 Contractual problems with using IPD

#### 4.2. Types of project

Most respondents are in favour of IPD and reject the idea that IPD should be used exclusively for large and complex projects as shown in Table 1, which illustrates the answers to the statement: “The IPD method should be reserved only for large, complex projects, rather than small, simple projects”.

Table 1. IPD and size of the project.

Size	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Sum disagree
Large	2%	10%	14%	59%	14%	73%
Mid-sized	8%	21%	8%	62%	3%	65
Small	0	25%	0	50%	25%	75%

69% of the respondents who never heard about IPD work for small companies, while 31% of IPD experienced employee work for mid-sized and large companies 23%. This justifies the answers as small construction companies do not have enough financial capacity, staff and abilities to train workers and professionals to understand and apply the IPD model, as these usually stick to traditional models.

#### 4.3. Benefits and contractual issues

The IPD benefits that are reported by experienced respondents include Better quality 68%, Shorter schedule 67%, Cost savings 63%, Improved productivity 59%, Less construction administration 51%, Fewer change orders 38%, Fewer injuries 37%, and More prefabricated materials 33%.

The questionnaire asks respondents to pick the contractual problems that they have faced while implementing IPD in their projects. The main problems reported are those related to Misunderstanding regarding the use of project resources 59%, Interpretations of the contract documents 56%, Lack of definition for the use of the risk contingency 41%, Errors and omissions in contract documents 29%, and No issues faced 3%.

#### 4.4. Expert opinions

Table 2. Expert opinions about performance and value of IPD. Percent distribution of 1-5 scoring [%]

Questions	5	4	3	2	1
The productivity and efficiency of construction projects can be optimized by implementing IPD and using BIM tools together	17%	58	22	2	2
The IPD method should be reserved only for large, complex projects rather than small, simple projects	4	13	10	61	13
IPD creates more value and better outcomes than any other traditional delivery system	14	65	20	1	0
Contractual difficulties and ambiguities stand in the way of using IPD contractual agreements	8	49	29	13	2
The unfamiliarity of participants who use IPD leads to failure of meeting the project goals	20	41	7	31	1
The complexity of IPD insurance contracts is a big obstacle that deters owners from using IPD contracts	14	36	17	32	2
IPD upends the often adversarial relationship btw the project owner, general contractor, and architect/engineer by synchronizing everyone's goals through modeling a system of goal sharing	10	65	24	1	0
Using IPD decreases the number of technical, architectural, schedule, and organizational changes during the execution of the project	17	59	22	2	0
Projects developed under an IPD contract arrangement have shorter schedule than projects using other contracts	14	57	22	4	2
Implementing IPD in construction projects can reduce waste and squeeze out a larger profit	11	65	23	1	0
Implementing IPD can improve the design and construction quality of a project	19	66	12	2	2
Would you stand with optimistic believers who think that IPD has a promising future and will dominate over traditional delivery methods in the near future?	14	53	30	2	1

Experienced respondents are then asked their opinions on several statements about performance and value of IPD on a scale from 1 - strongly disagree - to 5 - strongly agree. The statements and associated distribution of responses are given in Table 2. These empirical opinions can be summarized as follows.

For the benefits, it is recognized that IPD is efficient in optimizing construction planning, reducing waste, cost, time, and risk, and improving the productivity of construction projects. The productivity and efficiency of construction projects can be improved by implementing IPD. Using IPD method decreases the number of technical, architectural, schedule, organizational modifications during the execution of the project. IPD often upends adversarial relationship by unifying goals through goal & risk sharing system. Also, using IPD improve quality, shorten schedule, reduce waste to squeeze profit. As far as some hypothesis are concerned, IPD displays a superior performance over traditional delivery systems and it proves to save time and cost and eventually generate better outcomes. The adoption of IPD is likely to increase in the near future; the size of the project is not a big deal and IPD can be used for all sizes. For the given IPD contractual problems, contractual difficulties and ambiguities are slowing down the adoption of IPD, as well as the unfamiliarity of participants with IPD fails the IPD adoption. Also, the complexity of insurance contracts deters potential adopters.

## 5. Conclusions

This study shows the benefits and obstacles of IPD and how one can implement IPD to add-value to projects in the AEC industries.

IPD adoption is still limited and it is mainly related to awareness and appreciation of industry personnel. Based on the analysis of collected data from a panel of experts and non experts of the IPD method, this research proves advantages of IPD in the opinions of respondents about benefits, performance and issues of IPD implementation. Aligned with previous studies [3, 4], it shows that IPD is an efficient method to optimizing construction planning, reduce waste, cost, time, and risk. Using IPD may result in improving productivity of AEC projects and solving the traditional problems of poor productivity.

In summary, uncertainties, initial high cost, contractual hardships, and complexity of implementation of IPD are the main reason behind not broadly adopting IPD. Shorten schedule, cost saving, better quality, improve productivity, less construction administration are the main benefits derived from IPD. Early involvement, focusing on quality, free information flowing and sharing ideas are the key factors that contribute to adding value to IPD more than any other delivery method.

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