

# Exploring the adoption of IPD practices in Chinese construction industry

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**Abstract:** Integrated Project Delivery (IPD) is a procurement method that has been proved to improve construction project performance. However, in China implementation of IPD practices in construction projects is unknown though some researchers have studied the problems and constraints in adoption IPD. The purpose of this study was to explore IPD adoption in Chinese construction industry. Critical components of IPD implementation were reviewed, and questionnaires were distributed to collect industry views. The results revealed that IPD uptake is still low. In particular, the liability waiver and shared risks and rewards have been rarely used. In addition, co-location, value engineering method and the new compensation approach have also been hardly adopted. Some practices related to early involvement of key parties were adopted. Surprisingly, the findings indicate that the client has been continuously involved in the projects. The findings may imply that the legal issues and problems of contractual frameworks are still constraining IPD implementation in Chinese construction industry.

**Key words:** Integrated Project Delivery; implementation; Chinese construction

## 1. INTRODUCTION

The last decade has witnessed that the total output value of construction has been increased steadily. However, in the last three years, the growth rate of construction output has been decreased. Due to inborn fragmented problems, the Chinese construction industry suffered from low productivity, inefficiency, and ineffectiveness. Faced with the poor project performances, Chinese industry participants need to contemplate what kind of strategies and approaches should be applied to address the deep-rooted problems.

IPD is a procurement approach that is different from traditional delivery methods with respect to team organization and contractual arrangements [1]. Considerable evidence has showed that IPD is effective in addressing these deep-rooted problems and reliable in meeting the owner's expectation [2][3][4]. A recent study conducted by Fischer et al. [5] showed that the owners who have used IPD observed the advantages of IPD on reliability, predictability and value creation. Moreover, IPD have been reported to have improved project performances with respect to schedule, budget and quality, and exceled at less legal issues. In USA, the project participants in complex healthcare projects has been implemented IPD and more industry participants are ready to embrace IPD [4][6]. In Canada, some commercial buildings has become the adopters of IPD [2]. In Australia and UK, IPD has been adopted widely in infrastructure projects, including railway, highway and bridge [7].

According to existing literature, IPD relevant researches can be divided into three research directions. The first is related to IPD framework, definitions and components, the second focuses on IPD adoption, including barriers and benefits, while the third research direction is about IPD performance by

measuring and comparing it with other delivery systems. However, in China less research has been undertaken on IPD implementation. This paper aims to explore the level of IPD adoption in China.

## 2. IPD

IPD is defined as a method of project delivery distinguished by a contractual arrangement among a minimum of the owner, the constructor, and design professionals that aligns the business interests of all parties [8].

The term of IPD was initially used by Westbrook Air Conditioning and Plumbing of Orlando, Florida when they tried to align the project interests with the participants' interests [9]. Sutter Health initially created the multi-party contractual agreement-integrated form of agreement that featured in shared risk and rewards scheme, and applied it to several projects, almost all of which were completed with high-performing performances and met the owners' goals [8]. Since then the large complex healthcare projects have become key adopters of IPD. Currently, IPD has been widely implemented in many other projects, including office, residential, commercial, infrastructure, and educational buildings. In addition, even though IPD is considered to work on the projects with high risk and complexity, some researchers stated that IPD can also be applied in small and simple projects efficiently and effectively [2]. After a decade, IPD has become an approach to achieve higher collaboration, closer integration and a path to high-performance building.

The most well-recognized characteristics of IPD are: early involvement of key participants, continuous client involvement, shared risk and rewards and multi-party contract [10][11][12].

**Early involvement of key parties:** designer, main contractor, key subcontractors and suppliers should be engaged and involved from the early design stage [13]. One of the fundamental changes of IPD from the traditional procurement methods is to build integrated organization, in which the knowledge of all experts including the downstream contractors and suppliers can be brought together [14]. Without early involvement of key parties, integrated organization is by no means possible.

**Continuous client involvement:** client should be actively involved in all stages of the project, from planning to project completion [1]. The continuous client involvement can help ensure that the value that the client seeks stays aligned with the design options and construction methods[2]. In addition to the clarity, IPD requires a high capacity and knowledge of the client to empower IPD team to achieve the project goals.

**Shared risk and rewards:** The risk and rewards should be shared among architect, general contractor and client [15]. The rewards come from the risk pool constructed by the profits from architect and general contractor. If there are some cost savings, some portions will be added to risk pool. If there is cost overrun, risk pool will be used to pay for it. The profile of the risk pool should be negotiated in the preconstruction stage. Generally, risk pool team members include the architect and the general contractor [10]. In certain cases, other parties, such as subcontractors and suppliers will attend the risk pool team with the permission of the core group [16].

**Liability waiver:** The contractual agreements of IPD require a liability waiver among the key participants, and any liabilities related to project would be satisfied by risk pool [17]. Liability waivers have been strictly implemented in alliancing projects in Australia. Despite the fact that liability waiver is an important component of IPD, the relevant adoption in the IPD context is not as high as alliancing [18].

**Multi-party contract:** In IPD implementation, a multiparty agreement should be established. The key parties within this risk/reward structure are bound together through a multiparty agreement including a minimum of the owner, designer, and builder. The agreement should also include key consultants and trades, either as signatories to the prime IPD contract or through IPD subagreements [11][13]. In this contract, all elements are clearly stated and normally include incentives and risk sharing, payment method, dispute resolutions, and the responsibilities of all involved parties.

## 3. RESEARCH METHOD

A data collection instrument in the form of a survey questionnaire was carefully designed. The purpose of the survey was to identify the integrated practices. The questionnaire was based on the literature review and a pilot study conducted during December 2016 by interviewing six industry participants and two academics in China [19]. In addition, the questionnaire was pilot tested by two industry experts and improved in terms of the views given by these experts. The improved questionnaire had three main

sections. Accordingly, these three sections focused on (1) the background information of the respondents; (2) the typical performances of projects completed by their firms; (3) the IPD relevant practices and activities implemented by their firms. A seven-point Likert scale was applied in section two and section three. In the second section of the questionnaire 1 represents “other firms are far superior to my firm,” 4 represents “my firm is as good as other firms,” and 7 stands for “my firm is far superior to other firms,” while in section three 1 represents “this practice is never applied in my project,” 4 represents “this practice is applied to a moderate extent,” and 7 amounts to “this practice is applied to a great extent.” In this study, only two parts of the survey is analyzed and reported. The questionnaire was distributed through personal networking of research members in China from May 2017 to July 2017.

One-Sample T-test was conducted to explore the IPD implementation in China. The test value was set at 4, which is the mean of a 7-point Likert scale. When  $p < 0.05$  and the t value are positive, it is considered that there is significantly agreement that the integrated practice or activity has been conducted in China.

## 4. RESEARCH FINDINGS AND DISCUSSION

### 4.1. Profile of respondents

A total of 56 responses were collected from mainland China. The respondents comprised the experts that are interested in project management, design and construction. Table 1 illustrates that the majority of respondents (55 percent) have more than five years’ work experience and ten respondents have more than ten years’ experience. This suggests that the respondents are relatively experienced and professional, and would be able to share their views on the integrated practices. More than half of the respondents have been involved in the residential projects. About 30 percent respondents have participated in infrastructure, commercial and office projects respectively. It can be seen that the respondents have been engaged in a variety of projects. In addition, more than 60 percent have been delivered projects through traditional procurement method, design-bid-build. Around 20 percent respondents ascribed that they have been involved in the projects that used design-build, PMC and EPC respectively. The results indicate that the respondents’ firms have been applied different delivery methods to complete projects.

**Table 1.** Profile of respondents

Description	%
Nature of firm’s business	
Client	42.9
General contractor	8.9
Designer	23.2
Design consultant	7.1
Academia	7.1
Others	10.8
Working experience	
1–2 years	19.6
3–5 years	25
6–10 years	37.5
11–20 years	14.3
> 20 years	3.6
Types of construction facilities undertaken	
Infrastructure	28.6
Healthcare	7.1
Residential	55.3
Educational	23.2
Commercial	30.4
Office	33.9
Others	10.7

Procurement methods used	
Design-bid-build	60.7
Design-build	21.4
CM-at risk	3.6
PM	17.6
PMC	19.6
PPP	8.9
EPC	19.6
Partnering	7.1
Alliancing	5.4
IPD	1.8

## 4.2. Result

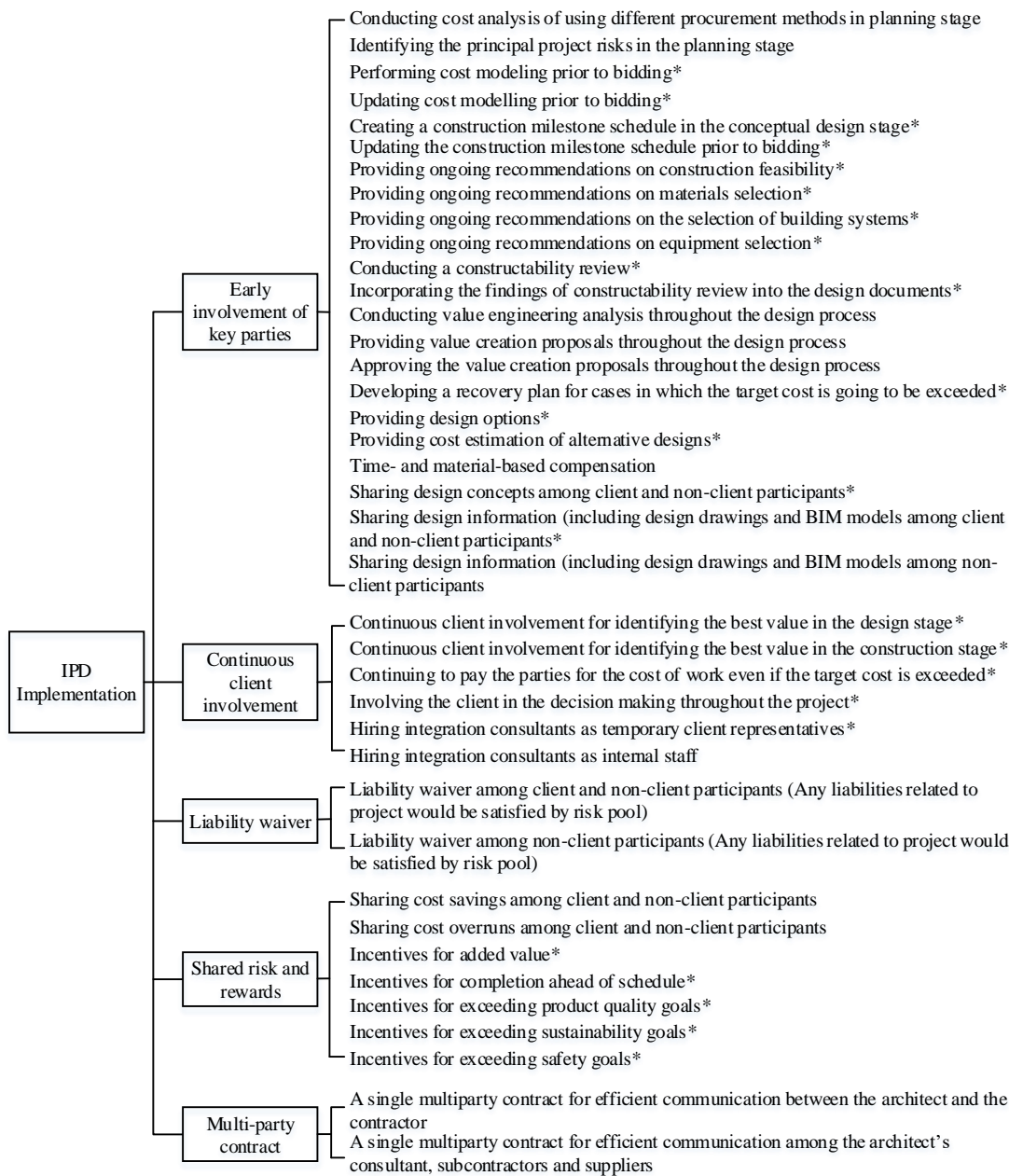
Figure 1 reflected IPD implementation framework in China. Accordingly, the first 23 listed practices from the first one to the 23<sup>th</sup> are related to early involvement of key parties. There are six practices pertaining to continuous client involvement (from the 24<sup>th</sup> to the 29<sup>th</sup> item). The implementation of shared risk and rewards practices are reflected on nine practices from the 29<sup>th</sup> listed practice to the 37<sup>th</sup>. In addition, two listed practices are relevant to liability waiver. The last two items are used to measure the level of adoption of multi-party contract.

Some practices pertaining to early involvement of key parties have been adopted to some degree (see Figure 1). Except the practices related to co-location (time- and material-based compensation), compensation method (co-location of multidisciplinary design team) and value engineering, the significance value of the other practices pertaining to early involvement of key parties was tested to be less than 0.05. Thus, value engineering, co-location and the new compensation method cannot be seen to have been implemented in China. Moreover, the significance value of conducting cost analysis of using different procurement methods in planning stage and identifying the principal project risks in the planning stage is higher than 0.05, which verified that these practices are not perceived to be adopted by the majority of respondents. The other practices have been perceived to be adopted in Chinese construction environment.

The findings revealed that the client has been actively involved in the projects. The practices of involving the client in the decision making throughout the project, continuous client involvement for identifying the best value in the construction stage, and continuing to pay the parties for the cost of work even if the target cost is exceeded are seen to have been undertaken by industry participants in China. The respondents ascribed that the client continuously involves in the design stage for identifying the best value and hires integration consultants as temporary client representatives. In addition, the significance value of these five practices has been tested to be less than 0.05. Thus the continuous client involvement was perceived to have been adopted in China.

It is interesting to note that the practices relevant to shared cost overruns and underruns have rarely been adopted, while the incentives have been actively applied in the projects. The results also revealed that the practices related to liability waiver have seldom been conducted. The respondents estimated that the two practices relevant to shared cost overruns and underruns (sharing cost savings among client and non-client participants and sharing cost overruns among client and non-client participants) is applied to less than moderate extent. Based on the significance value, shared risk and rewards is seen to be hardly undertaken by Chinese project professionals. Regarding the incentivized activities in construction industry, except incentives for exceeding sustainability goals, the significance value of other four incentivized practices including incentives for exceeding product quality goals, incentives for completion ahead of schedule, incentives for added value, incentive for exceeding safety goals is tested to be less than 0.05. Thus the incentives can be considered to have been applied in China. In addition, it is interesting to note that liability waiver among client and non-client participants and liability waiver among non-client participants were considered to have the least possibility to be implemented in China.

In addition, the multi-party contract is considered by the respondents to have been seldom used in the projects. A single multiparty contract for efficient communication between the architect and the contractor and a single multiparty contract for efficient communication among the architect's consultant, subcontractors and suppliers is perceived to be adopted to a small degree.



\*indicates that the significance value is less than 0.05

**Fig. 1.** IPD implementation framework

### 4.3. Discussion

The results revealed that the practices related to shared risk and rewards, liability waiver, multi-party contract and co-location have been rarely implemented. Some practices of early involvement of key parties and continuous client involvement have been applied in the projects to some extent. In regard to liability waiver, the survey results are consistent with the research of Cheng et al. (2012) that the owner is reluctant to waive liability of non-owner participants. With respect to co-location, the on-site facilities and space of the projects may have limited its adoption. In addition, there is no significant agreement among the respondents on that value engineering has been undertaken in China. Considering some researchers stated that client's unwillingness has blocked the implementation of IPD (Ghassemi and Becerik-Gerber 2011; Rached et al. 2014), it is a little surprising that the survey results showed that the client has been continuously and actively involved in the projects. The findings may imply that the legal issues and problems of contractual frameworks are still challenging IPD implementation in Chinese construction industry.

## 5. CONCLUSION

IPD is an efficient and effective delivery method in improving project performance through organization integration, process integration and information integration. The aim of the study is to explore the level of IPD adoption in China. A structured questionnaire is carefully designed and used to collect data from Chinese industry participants. 56 responses have been collected and the approaches of one sample t test and SD are applied to examine the research results.

The findings indicate that in general the level of adoption of IPD in construction projects being executed in China is still low. Some practices pertaining to early involvement of key parties have been adopted, while other practices related to early involvement of key parties including value engineering, co-location and new compensation method have been hardly adopted. The results showed that client has been continuously involved and engaged in the project stages. However, the other strategies like multi-party contract, liability waiver, shared risk and rewards have been rarely implemented. The low level of adoption of the integrated practices may give rise to the poor project performance in China. The research also highlights the need to work on the contractual framework of IPD that fits Chinese construction environment.

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