

A STUDY ON THE FEASIBILITY OF IPD METHOD IN CONSTRUCTION PROJECT IN CHINA

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ABSTRACT: Project delivery systems have evolved over the years. Continuous changes in technology and the increasing sophistication in buildings required specialization of design and construction services. IPD as a delivery method has been used in the USA and other countries. With the development of BIM, lots of construction companies have been realizing this method since BIM came out in China. However IPD are not considered with BIM, IPD will be an important role in management system of construction. This study introduced the definition of IPD and based on the flow process of IPD, compared the process in china and other countries. Through the real project and the condition in China this paper analyzed the feasibility of IPD in China.

Keywords: IPD(integrated project delivery), Design-Building, management system, BIM

1. INTRODUCTION

Project delivery systems have evolved over the years. The medieval master builder was hired by an owner to design, engineer, and construct an entire facility. This system was common until early in the 20th century. Continuous changes in technology and the increasing sophistication in buildings required specialization of design and construction services. Designers and constructors began to specialize in the design, fabrication, and/or construction of particular building systems [1].

Construction management (CM) was introduced in the 1960s as a solution to these problems and has been providing value to owners ever since, but has not changed the underlying problem of fragmented project teams and information. In the 1990s, design-build was established [2]. This delivery method seeks to improve project outcomes through a collaborative approach of aligning the incentives and goals of the team. With the development of technology, Project alliancing is the model for a new project delivery method that has recently emerged in the construction industry, commonly referred to as integrated project delivery (IPD).

The design-building (DB) delivery system has been widely used and gained its popularity overseas. According to the Design-Building Institute of America (DBIA), about 40 percent of all nonresidential construction projects in both public and private sectors in US now use this approach. The DB system also develops rapidly in construction market in China; especially it is used in the large, complex projects in China construction industry. It is estimated that there are about 30 percent of the projects are suitable for Design-Building. In 2003 Building Information Modeling (BIM) came out in

China, with the development of BIM, the traditional delivery methods do not keep up with the new project concept, at the same time the new delivery method IPD was been put forward and has been using in some countries. As a developing country, China is looking for the new system to suit the development of construction industry.

2. WHAT IS IPD?

2.1 Definition of IPD

Integrated Project Delivery (IPD) is 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.

Integrated Project Delivery principles can be applied to a variety of contractual arrangements and Integrated Project Delivery teams will usually include members well beyond the basic triad of owner, architect, and contractor. At a minimum, though, an Integrated Project includes tight collaboration between the owner, the architect, and the general contractor ultimately responsible for construction of the project, from early design through project handover [3].

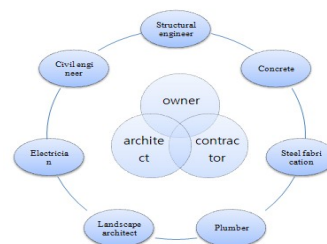


Fig.1 the IPD structure

2.2 The Feature of IPD

It is the feature of IPD and the success point:

- 1) Early Involvement of Key Participants
- 2) Shared Risk and Reward
- 3) Multi-Party Contract
- 4) Collaborative Decision Making and Control
- 5) Liability Waivers Among Key Participants
- 6) Jointly Developed and Validated Project Goals[5]

3. DELIVERY SYSTEM IN CHINA

Although most of the domestic civil buildings are delivered in traditional design-bid-build method, the government of China has always been pushing forward the DB system in the large and complex projects for 2003, recently the DB method as a main method is used in the international projects and large projects.

In China, the DB system is defined as “one of general contract systems under which the contractor performs both design and construction practices and take responsibility of project quality, safety, schedule, and cost under one single contract”[Ministry of Construction of the P.R.CHINA,2003]. Based on the situation of the different projects and the different design stages the design-builder undertakes, the design-building projects can be classified into different variations. The Chinese construction industry formed the DB process in china as shown in under table. However the DB system is not perfect now; the DB represents the original design building in which the design builder takes full responsibility of design and construction. The responsibility of the each party is not definite and clear so that the construction risk is increased, when the problems of construction or design come out, they are not solved as soon as quickly. All of parties are not collaborative completely, the owner may not be guaranteed that all his interest and requirement are fully satisfied.



Fig.2 the classification of design-building projects in China

4. DELIVERY SYSTEM IN OTHER COUNTRIES

DB is success on increasing on-time deliveries and reducing costs, clearly DB was an improvement over DBB. And now DB as an old method is applied on the most of projects in the developed countries. However, while the BIM came out, get teams to work together and collaborate –was the jumping off point from DB to the IPD.

In 2009, Structural Engineer conducted an online survey about BIM and IPD, the results that are 60 percent of the engineers are familiar with IPD, although more than half of the engineers have not used IPD on the project, and 20 percent have used it in USA. Based on the result of this survey, the structural engineers are also quickly coming up to speed on IPD, and more and more projects are used in this method.

In America, for IPD projects, AIA has two forms of Agreements: C195-2008, standard form single purpose entity agreement for integrated project delivery and companion agreements and C191-2009 standard form multi-party agreement for integrated project delivery.



Fig.3 the IPD projects process

Condition of the other countries

5. A STUDY ON THE CASE OF IPD PROJECTS

5.1 Study Methodology

This paper applies the case study approach to analyze the database of the real projects to define the advantages, features and good results. This study summarizes three cases from seven aspects: early involvement of participants, risk and reward, contract, collaborative decision making, liability waivers, jointly developed goals, technology. The cases are from the IPD case report of AIA council.

5.1 Case Study

CASE#1: Autodesk Inc. AEC Solutions Division Headquarters

The Waltham project is a 55,000 square foot, three-story interior tenant improvement that uses all of the space in a new speculative office building near Route 128 in Boston’s technology corridor. Program elements include offices, conference rooms, training facilities, a cafe, and a 5,000 square foot customer briefing center featuring an electronic gallery of design work done with the company’s products.

CASE#2: Cardinal Glennon Children’s Hospital Expansion

. The project is a 138,000 square foot, \$45.5 million children’s hospital expansion consisting of a surgical suite, a 60 bed neonatal intensive care unit (NICU,) a central sterile unit, 10 new surgical suites, 10-bay post-anesthesia recovery rooms, a video integration system, and shell space for future relocation of radiology and laboratory functions.

medical office building housing primary care medical practices and laboratories, with pediatrics, oncology, rheumatology, and cardiology departments and administrative offices. The owner, Sutter Health, is one of the largest not-for-profit health care providers in Northern California. This project is the first built component of a \$6.5 billion capital program of which, at the time of this study, several subsequent projects are in advanced stages of design

CASE#3: Sutter Health Fairfield Medical Office Building

The project is a three-story, 70,000 square foot

| | Case#1 | Case#2 | Case#3 |
|-----------------------------------|--|---|--|
| Early Involvement of Participants | | | DB subcontractors very early in the design process, smaller sub trades were bid with lump sum prices. |
| Risk and Reward | The contract establishes an Incentive Compensation Layer (ICL) in which the architects’ and builders’ anticipated Profit is put at risk. | | |
| Contract | IPD agreement: a three way contract between the owner, the architect and the builder | IFOA (Integrated Form of Agreement) is a four way contract among the owner, architect, MEP engineer and builder. | IFOA is a three way contract between the owner, the architect and the builder. |
| Collaborative Decision Making | A project management team(PMT) was established to manage the project and make decisions: owner, architect and builder | The IFOA established an IPD field team and a core team to manage the project. Field teams resolve routine issues. | An integrated project team(IPT):Sutter, HGA, Boldt, and the major subcontractors, Rosendin Electric and Southland Industries |
| Liability Waivers | The parties waived all claims against each other except those arising from fraud, willful misconduct or gross negligence. | Each party carried typical general and professional liability insurance. | |
| Jointly Developed Goals | | The budget a scope had established by the same project team as part of an earlier campus master plan. | |
| Technology | 3D modeling | 3D modeling | 3D modeling |

Table.1 the case study analysis

5.2 Result

CASE#1:

- The entire process of contract negotiation, design, construction and move-in had to be accomplished in 8 1/2 months, a schedule which would not have been possible with design-bid-build or CM-at-Risk, the delivery method typically used by

CASE#2:

- Autodesk.
- 60 percent of the saving is added to the ICL (Incentive Compensation Layer)
- Incentive Compensation Layer
- The “pure” IPD model had no provision for change orders, but there were owner-initiated scope additions.
- About \$400,000 was saved out of the

- approximately \$1million contingency
- The core team was highly motivated to find the optimum solution for the project.
- The designers were incentivized to be part of the larger team they were able to make the necessary design and coordination changes in just three days. In the end, the project was occupied six weeks earlier than planned.

CASE#3:

- IPT provided significant cost savings due to increased field productivity, tighter schedule, more prefabricated work, and less redesign.

6. THE FEASIBILITY OF IPD IN CHINA.

6.1 The feasibility in China

The construction of The Shanghai JinMao Tower foundation stone was laid on May 10, 1994, in China and completed on Aug 28, 1998. Total built floor area: 290000sq.m. It was a super tall skyscraper and designed by SOM, an American firm. DB system was used in this project. The general contractor group consisted of SCG (as the main contractor) and Obayashi of Japan, Campenon Bernad SGE of France and Chevalier of HongKong. It is a huge and complex project including many design, construction, supervision and supplier companies that caused easily lots of problems on the management and communication. As for this problem, the owner organized a core team which manages the project process. The core team includes the designer, architect and builder; it forms a system between DB and IPD.

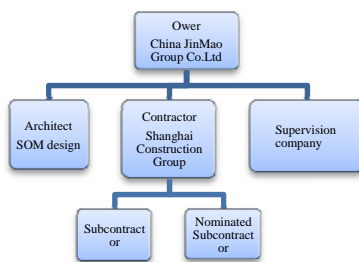


Fig.3 JinMao Tower DB system

With the development of BIM in China, more and more complex projects need integrate management system to do with the problems that meet in the construction. The ministry of construction of China had published the planning on BIM and spread it in China. The government encourages the owners use the IPD system to match the BIM project in complex projects.

6.2 The problem

Though the case study above, we get lots of information about IPD. Some owners had successfully used a form of contract that involved more than two parties to the agreement: “multi-par contract” that allowed multiple parties to all agree to a common set of terms and expectations.

Based on principles of trust and mutual respect, mutual benefit and reward, collaborative decision-making, early involvement of key project participants, early goal definition and intensified planning, and open communications, IPD is emerging as an effective project delivery choice for the industry. [4]

Change is most often motivation by dissatisfaction with the status quo. While the studies show that this delivery system (IPD) routinely result in safer, faster, lower cost and higher quality projects, the large and complex projects are delivered in the Design

Building system in China, when the traditional system no long fit for complicated modern buildings, the DB variant systems are used and developed for the projects. However in the development of the systems, we also meet lots of problems.

Firstly many of the contractors in China lack the ability to integrate the design and construction adequately, most of clients are unfamiliar with IPD process and agreement and some clients worry about losing control of projects.

Secondly policy about this aspect is not perfect; one of the greatest difficulties is how to use this stands or agreements including traditional insurance, bonding mechanisms, construction standard to define the risks, responsibilities, expectations, project goals and liabilities. Based on the situation of construction industry and DB system in China, we need a new system to coordinate these aspects.

7. CONCLUSION.

Construction project delivery methods have come a long way. The latest, IPD promotes true collaboration between the team players and gets the right people involved at the right time: the beginning. Although it is used in the oversea widely, it is still a relatively young approach, especial in China.

This conclusion of this study is that there are many feasibility development spaces in the construction industry in China; although the owners are not unfamiliarity with IPD system and lots of contractors lack the ability to combine the design and construction. According to the situation of Chinese construction industry and the database is from advanced experience of foreign countries; the IPD system will have the new development in China.

Finally there are still cultural, procedural, and organizational barriers to widespread use of IPD within the industry in China.

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