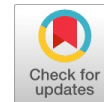


# Barriers for Adoption of Integrated Project Delivery in Indian Construction Industry

Jaya Surya R, M. Kranti Kumar



**Abstract:** *The ever-changing nature of a construction project demands a management system that actively strives to minimize or eliminate the changes and updates from the start of a project. The approach to collaborate the primary participants of a project notably the client, designer, and builder is still lacking in the traditional construction processes. The use of an Integrated Project Delivery (IPD) process, rather than a traditional approach, provides an appropriate platform for the free flow of information between the stakeholders and to share the risk among all the stakeholders involved in the project. The early involvement and evaluation of the design and program of a project is an important advantage of the IPD process. This paper aims to study the concepts of IPD and the barriers to adopt the IPD in the Indian construction industry. Through literature review, data about the IPD, barriers for the adoption of IPD, and its comparison with other traditional project delivery processes is collected. The current practices and barriers in India are known from various stakeholders through a questionnaire survey. Data analysis is done using the data collected from the literature review and the questionnaire survey. This study highlights the issues in the implementation of IPD in the Indian construction industry. This study concluded that a cultural & behavioural shift is required in the Indian construction industry and also government should make a strong policy push for the successful implementation of IPD in India.*

**Keywords:** Barriers, Indian Construction Industry, Integrated Project Delivery, Project Delivery Systems.

## I. INTRODUCTION

Traditional project delivery methods in the architecture, engineering, and construction industry include design-build, design-bid-build, and construction manager at risk. Many stakeholders in the industry, on the other hand, are unsatisfied with project deliverables, claiming that projects always get delayed, over budget, and are of poor quality [1]. Because each team is accountable for its own bubble of work and tries to increase their own profit in their field of expertise, the AEC sector is too segmented, inefficient, and combative.

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Integrated project delivery (IPD) is a new project delivery strategy that aims to eliminate the AEC industry's waste, inefficiency, and combative relationships while also increasing the probability of project success. During the initial phases of a project, IPD is a highly collaborative process that combines the experience of project teams. At the start of the project, professionals from every field are present to ensure that the overall design decisions fulfil the needs of all parties involved. Despite the endorsement of various organisations and earlier research initiatives demonstrating its merits and limitations, the number of projects utilising IPD remains minimal. Researchers also collated empirical findings on attitudes and levels of experience in the AEC industry regarding IPD and found obstacles to its widespread acceptance; these obstacles have caused IPD's infancy stage to last longer than predicted. Although much has been published about IPD and its benefits, there are only a few standards that specify the criteria that lead to multifunctional IPD project success. The chosen project delivery method is one of the key causes of poor productivity [3]. The first factor is traditional methods are splitting the parties engaged in the design and construction processes, such as design-bid-build etc., In the construction industry, there is a growing tendency toward integrated project delivery [2].

## II. OBJECTIVES

- The primary goal of this research is to identify and assess the barriers in adoption of the integrated project delivery in the construction industry of India.
- A survey of numerous stakeholders concerning IPD in the Indian construction industry is undertaken with an emphasis on its barriers and its impacts.

## III. METHODOLOGY

Data on IPD from various recent literature sources are collected and reviewed. This study involves an assessment of the Integrated project delivery method to find out the barriers in the adoption of IPD. The entire procedure is made up of a series of steps that must be completed in order. It begins with a review of the literature to determine the many elements to be addressed before the selection of the appropriate project delivery method and to identify the various barriers for the adoption of IPD. The questionnaire is sent to several stakeholders involved in construction in various regions throughout India and the responses were taken. Data analysis is done using the literature review and the questionnaire survey.

Conclusion and recommendations are drawn from the analysis, thereby the barriers for adoption of IPD in the Indian construction industry are found and assessed.

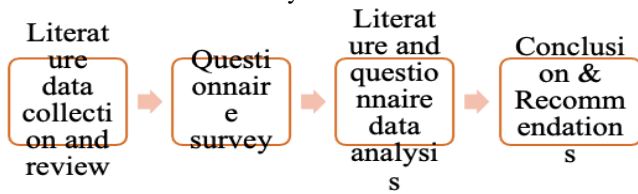


Fig. 1. Methodology flow diagram

## IV. LITERATURE REVIEW

A project is a one-time endeavour to generate a one-of-a-kind product, service, or outcome. Appropriate project delivery methods and contract management are required to meet project objectives effectively, efficiently, and on time.

### A. Integrated Project Delivery

According to the Design-Build Institute of America (AIA, CC), a project delivery method that integrates people, systems, business structures, and practices into a collaborative process that reduces waste and optimises the efficiency through all stages of design, fabrication, and construction.

The following are the components of the integrated project delivery method [2]:

- Owners, planners, and contractors are all involved in the project from the beginning to the end.
- Owners, planners, and contractors work together to control the project.
- Risk/reward aligns with common corporate objectives, including financial gain at risk based on project outcomes.
- Interconnected agreements or multi-party agreements.
- There is a limited amount of obligation between the owner, the planner, and the contractor.

The project cycle for an integrated project, from conceptualization to implementation and closure, is considerably different from that of a non-integrated project. The following are three positive value propositions provided by IPD for the project's three key stakeholder groups:

Owner: Early and transparent exchange of project information streamlines project communication and enables owners to effectively balance project possibilities in order to fulfil their company's goals.

Constructors: Contribute their building engineering expertise in the early design stage, resulting in better project quality and financial effectiveness during construction.

Designers: To benefit from the constructor's early input during the design stage, such as accurate financial estimates to guide design decisions and the resolution of pre-construction design challenges, which leads to enhanced project quality and financial performance.

### B. Principles of Integrated Project Delivery

The construction sector is no exception when it comes to the importance of principles in business implementation. To make IPD more effective, nine basic principles are needed [4]. If all are adopted and used effectively, greater collaboration is achieved, resulting in improved project

outcomes in both design and construction. The American Institute of Architects & AIA California Council (2007) adopted the nine IPD principles which are:

- Mutual trust and respect
- Sharing of risks & rewards
- Collaborative decision-making and Innovation
- Involvement of key participants at an early stage
- Establishing goals earlier
- Extensive planning
- Open lines of communication
- Leadership and Organization
- Multi-party agreement

Although the list is not in any particular sequence, these nine principles are critical when attempting to apply IPD as a design process.

### C. Key Participants of Integrated Project Delivery

The people involved are the most important aspect of IPD success. The 'core group' is the group of people who are involved.

These people are involved in the project from the beginning to the end, from design to construction to occupancy and operation [5].

The owner, architect, and general contractor are generally the people engaged [6]. The core group is made up of these three people.

If the owner lacks the technical skills or time to engage, he or she can appoint a representative to act on his or her behalf to serve in their role within the core group [7].

The owner's representative is generally well-educated or skilled in the construction field as well as tuned in to the owner's requirements, allowing them to make reasonable, informed decisions on the owner's behalf.

The terms owner and owner's representative are used interchangeably in this context. Designer and architect are two more terms that are interchangeable.

Some sources use the term designer instead of an architect to allow any member of the design team to fill this function, but the architect is more generally used.

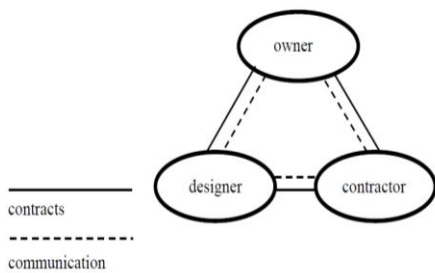
This is due to the architect taking on the job of the head designer in other design methodologies. This isn't required in IPD, but it's how it's always been done.

The architect is better equipped/trained to work in this capacity than the engineer because of his or her experience as a project administrator.

The core group is intended to serve as a decision-making body and a conduit between the owner and the other design/construction companies.

In IPD, the contractual connection is depicted in Figure 3. From design discussion to administrative details, the core group is in charge of every phase of the project.

In most cases, if the core group is unable to reach a consensus, the owner reserves the authority to break the impasse.



**Fig. 2. Contractual relationship in IPD**

#### D. Differences between IPD and Traditional delivery methods

"A project delivery approach that integrates people, systems, business structures, and practices into a process that cooperatively optimize the performance of all project stakeholders to optimize project outcomes, raise the value to the owner, minimize waste, and maximize efficiency through all stages of design, fabrication, and

construction," according to the American Institute of Architects (AIA 2007). IPD is a new method for organizing and executing construction projects, and it differs from traditional delivery systems in the following ways: Early involvement of important participants; A multi-party contract; Control and decision-making by a group of people; Risks and benefits are shared; Waivers of liability among essential participants; Project objectives that were developed together.

For IPD to be accomplished in its purest form, all of the aforementioned traits must be included in a project. Many IPD projects in some countries do not use all of these features; instead, they sample a subset of them to increase efficiency. Traditional delivery techniques and IPD have significant variations, particularly in terms of contracts, project team interactions, and remuneration structures.

**Table- I: Comparison of IPD and Traditional delivery methods [4]**

Comparison Item	Project Delivery Methods			
	DBB	DB	CM at Risk	IPD
Contractual Relationships	> Owner & Designer > Owner & Constructor	> Owner & Design-Build Entity > Design-Build Entity & Designer > Design-Build Entity & Constructor	> Owner & Designer > Owner & Construction Manager	> Owner & Designer > Owner & Constructor > Designer & Constructor
Advantages	> Owner gets to choose most competitive bid	> Transfer risk from owner to DB entity > More parties involved earlier in project	> More parties involved earlier in project	> Collaborative & innovative design > Better buildings, faster, for less
Disadvantages	> No early collaboration > Could result in project delays, change orders, etc.	> Early Cost Commitment > No competitive bid for owner	> Early Cost Commitment > No competitive bid for owner	> Early Cost Commitment > No competitive bid for owner > Obstacles that need to be resolved

#### E. Identification of Barriers

**Table- II: List of Barriers**

Category	Barriers	Source
<i>Technological</i>	key participants involvement timing	[8]
	Early defined goals without complete design	[1]
	Unestablished BIM standards & procedures	[9]
	Knowledge & Information management systems integration	[10]
	Slow decision making due to ineffective feedback system	[9]
	Less emphasis on aesthetic components in design due to early involvement of all stakeholders	[9]
	Lack of experience in appropriate technology	[10]
<i>Cultural</i>	Providing collaborative project environments	[1]
	Training & skill improvement	[1]
	Inexperience with each other in the project team and also with the IPD	[9]
	IPD is meeting intensive process	[11]
	Lack of trust & open discussions among parties	[1]
	Fear of change	[9]
<i>Financial</i>	Inequitable profit and loss distribution among stakeholders	[1]
	Parties may not accept to defer profit in larger duration projects	[11]
	Financial constraint of owner	[11]
	Non-adjustment of project goals	[1]
	Sharing of financial risks & open book accounting	[7]
<i>Legal</i>	Criteria for choosing the agencies based on value/cost	[9]
	Handling of third party claims	[11]
	IPD contracts not understood or tested	[12]
	Aspirational language in contract	[11]
	Multiparty agreement throughout the project lifecycle	[1]
	Not having coverage for IPD in insurances	[1]

<i>Others</i>	Combined ownership of documents	[11]
	BIM ownership & payment	[11]
	Commissioning by the third party	[9]
	Framing procedures for problem-solving	[1]
	Choosing the appropriate team early & based on the quality/values	[12]

## F. Preparation of Questionnaire

An important phase in the research's success is the identification of critical barriers and the preparation of a questionnaire. There has already been a lot of research done to identify the barriers for the adoption of IPD, and there is a well-documented set of barriers from the literature review. The questionnaire for this study was created by combining the critical barriers identified in the literature. There are 29 barriers in total, divided into five major categories: technological, cultural, financial, legal, and others. Personal interviews with some of the Indian construction stakeholders were also done to provide a cross-section of the currently available barriers in the Indian context. Based on these inputs, the final questionnaire was framed. Respondents were asked to rank the importance on a five-point Likert scale (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly agree).

## G. Ranking of Barriers

Many researchers believe that the mean and standard deviation of each attribute are insufficient measures to evaluate overall rankings because they do not represent any link between them, so Relative Important Index (RII) is adopted, which can be calculated using the following equation:

$$RII \text{ (Relative Importance Index)} = \frac{\sum W}{A \times N}$$

where, W - Weight given to each attribute by the respondent, A - Highest weight, N - Total number of respondents.

The mean of a factor's relative importance index gives its weight in respondents' perceptions. The relative importance

index (RII) is a mechanism for determining the relative relevance of defined characteristics. The RII approach is used in this study to determine the relative relevance of the various barriers for the adoption of IPD using a Likert scale. When the RII value is the highest, a cause or effect of the barrier is considered the most important, and vice versa. The RII approach is used to examine the data received from the questionnaire survey. Each factor is then prioritised based on the RII value assigned to it. The barriers are arranged in ascending order of ranks, the attribute with the highest RII or rank 1 indicates that it has the maximum impact while the barriers with the lowest rank indicate that it has the least impact.

## V. RESULT AND DISCUSSION

The questionnaire was sent to 95 stakeholders approx. in which 52 people gave their responses, hence the response rate for this survey is 55%. Respondents are chosen from a diverse group of experts working in the Indian construction industry. Clients, architects, project managers, engineers, contractors were among the participants (*Clients* - 7.6%, *Architects* - 40.4%, *Project managers* - 5.8%, *Engineers* - 27.0%, *Contractors* - 19.2%). In the Indian context, all of the respondents have worked on quite significant construction projects (*1-5 years of experience* - 61.6%, *5-10 years of experience* - 27.0%, *More than 10 years of experience* - 11.4%). As can be observed, the sample has a well-balanced mix of disciplines. With some respondents, telephonic conversations were made to explain the research objectives clear in order to get the best possible response corresponding with their experience and knowledge.

**Table- III: RII value and Rank of Barriers**

Category	S.no	Barriers	RII	Rank
<i>Technological</i>	1)	key participants involvement timing	0.5077	27
	2)	Early defined goals without complete design	0.7000	15
	3)	Unestablished BIM standards & procedures	0.6500	19
	4)	Knowledge & Information management systems integration	0.6346	20
	5)	Slow decision making due to ineffective feedback system	0.6692	17
	6)	Less emphasis on aesthetic components in design due to early involvement of all stakeholders	0.7115	14
	7)	Lack of experience in appropriate technology	0.7846	9
<i>Cultural</i>	8)	Providing collaborative project environments	0.4269	29
	9)	Training & skill improvement	0.5654	25
	10)	Inexperience with each other in the project team and also with the IPD	0.9077	2
	11)	IPD is meeting intensive process	0.6538	18
	12)	Lack of trust & open discussions among parties	0.9000	3
<i>Financial</i>	13)	Fear of change	0.9538	1
	14)	Inequitable profit and loss distribution among stakeholders	0.7885	8
	15)	Parties may not accept to defer profit in larger duration projects	0.8538	5
	16)	Financial constraint of owner	0.7423	11
	17)	Non-adjustment of project goals	0.7962	7
	18)	Sharing of financial risks & open book accounting	0.7654	10
<i>Legal</i>	19)	Criteria for choosing the agencies based on value/cost	0.5346	26
	20)	Handling of third party claims	0.6038	22
	21)	IPD contracts not understood or tested	0.8731	4
	22)	Aspirational language in contract	0.4923	28
	23)	Multiparty agreement throughout the project lifecycle	0.8346	6



	24)	Not having coverage for IPD in insurances	0.6154	21
Others	25)	Combined ownership of documents	0.7192	13
	26)	BIM ownership & payment	0.6808	16
	27)	Commissioning by the third party	0.5923	23
	28)	Framing procedures for problem-solving	0.5769	24
	29)	Choosing the appropriate team early & based on the quality/values	0.7346	12

From the literature study, Principles of IPD, Key participants of IPD, Differences between IPD & traditional delivery methods were studied and various barriers for the adoption of IPD were listed down by the review of literature. From the questionnaire survey, perceptions of various diverse & experienced stakeholders about the barriers for the adoption of IPD are captured. They gave their ratings for all the 29 barriers using a five-point Likert scale (1-Strongly disagree, 2-Disagree, 3-Neutral, 4-Agree, 5-Strongly agree). These barriers are broadly divided into five categories: Technological, Cultural, Financial, Legal, and other barriers. Then, using the Relative Importance Index (RII) all the barriers were ranked based on the responses given by the stakeholders. 'Fear of change' barrier from the cultural category got the first rank among the 29 barriers which indicates that even today in the Indian construction industry, stakeholders have hesitation to change into IPD, they prefer traditional project delivery methods over IPD for their ease of operation. Since IPD is a new concept and it encourages complete teamwork from the initial stages of the project, stakeholders felt that 'Inexperience with each other in the project team and also with the IPD' will impact the overall progress of the project. It got the second rank and 'Lack of trust & open discussions among parties' got the third rank. It was observed that the first 3 ranks are acquired by the cultural barriers since IPD is a collaborative process and it's fully dependent on communication between the stakeholders involved in the project. 'key participants involvement timing', 'Aspirational language in contract' & 'Providing collaborative project environments' got the 27<sup>th</sup>, 28<sup>th</sup> & 29<sup>th</sup> rank respectively. Respondents felt that these barriers have less impact compared with all other barriers. When analysing the overall barriers from all the categories, Cultural barriers have a huge impact on the selection of IPD as a project delivery system for a project, next to it Financial, Legal, technological barriers are there. From the analysis, it is clear that respondents are aware of the barriers of the IPD in the Indian construction industry in which many high-ranked barriers are based on the teamwork and collaboration of the stakeholders. All the barriers, its RII value & Rank are clearly mentioned in Table- III.

## VI. CONCLUSION

The objective of this research is to study the IPD, Identification & assessment of barriers for the adoption of IPD in the Indian construction industry, which are achieved by the detailed literature review, questionnaire survey, and Relative Importance Index (RII) method. According to the study's findings, IPD is less technical and more cultural in nature.

IPD pushes for a shift in stakeholders' mind-sets so that they can collaborate for the project's benefit. Implementing an integrated project necessitates the involvement of all key stakeholders, as well as ongoing collaboration and considerable owner involvement. It

demands a large amount of upfront effort from all stakeholders when compared to traditional systems. In order to adopt IPD, a cultural and behavioural shift is required. It is undeniable that the Indian construction sector is facing difficult circumstances, and reform in the current project delivery methods is essential for the industry's improvement. Although IPD has been praised internationally for boosting project deliverables, there have been no big success stories of IPD adoption in India and just a few internationally. In order to implement IPD in India, the government must make a strong policy push. Proper frameworks and legal standards are also required for the successful implementation of the IPD in the Indian construction industry. Policymakers and researchers will be able to use the barriers identified in this study to develop strategies for the greater adoption of IPD in India.

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