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Identification of Critical Challenges for Adoption of Integrated Project Delivery

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Abstract

Question: Which are the predominant barriers responsible for the reluctance of Architecture, Engineering, and Construction (AEC) industry for IPD adoption?

Purpose: The purpose of this paper is to identify the critical challenges faced by stakeholders belonging to the AEC industry for the adoption of IPD to deliver construction projects successfully.

Research Method: Through the literature review, various challenges for IPD adoption were enlisted under various categories. The authors undertook a focus group discussion exercise involving seven professionals representing the various stakeholders of the AEC industry. The comments made by the members were further analyzed to identify the critical challenges in the Indian context.

Findings: Through the focus group's structured discussion, fourteen critical challenges were identified under the broad categories such as cultural, technological, financial, legal, and others.

Limitations: The research work is limited to finding out the IPD adoption specific barriers and does not provide a solution to the identified barriers.

Implications/Value for practitioners: This paper will help AEC industry stakeholders to understand the critical factors responsible for the reluctance in the adoption of IPD. They can use this information while developing a policy framework to make it more effective.

Keywords: project delivery models, Integrated Project Delivery (IPD), procedural challenges, collaborative decision-making, multi-party agreement.

Paper type: Main Paper

Introduction

For the successful execution of building projects, various project delivery types are used in the AEC industry globally like 1) Design Bid Build 2) Design-Build 3) Design Build Operate 4) Construction Management at Risk. A project delivery type primarily represents

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the relationship dynamics of the various stakeholders involved. (Malsane et al. 2016; Kensek 2014).

Various studies and published literature suggest that despite the availability and use of such delivery types, traditionally construction industry lags behind when it comes to timely and effective completion of projects (Ghassemi and Becerik-Gerber 2011). Further building construction delivery process is becoming more complex due to increase in project scale, use of building services, firm construction schedule, a large number of stakeholders involved at various stages, compliance to various norms, etc. The existing delivery contracts at times have adverse impacts or inherent problems like 1) Formation of multiple cultures within the AEC industry 2) High degree of fragmentation 3) High cost of inadequate interoperability 4) Fragmented information management and exchange 5) Intense friction among stakeholders due to fragmentation.6) Inability to fully coordinate the project 7) Owner is at risk for design error (Kent and Becerik-Gerber 2010).

Historically AEC industry has been on a lookout for ways to improve its project delivery. Design Bid Build (DBB) was accepted extensively by public procurement policies since the 1940s thus making it the most popular methods of delivery of projects. Design-Build (DB), another option of project delivery popularized in 1990's showed improvement in terms of cost, schedule & quality metrics over traditional delivery types (Ghassemi and Becerik-Gerber 2011). To tackle the problems caused due to the fragmentation of project teams as well as project information, the concept of Construction management (CM) was introduced in the 1960s as a solution and has been useful to owners since (Ghassemi and Becerik-Gerber 2011). As mentioned earlier, the traditional methods do not encourage collaboration amongst the stakeholders to work innovatively and towards the customers' objectives. It was primarily due to the use of bilateral contracts and the selection of the lowest bid. The problems associated with the traditional methods have forced the industry to seek other methods for better collaboration, such as project partnerships (PP), project alliance (PA) and integrated project delivery (IPD) (Lahdenpera 2012). The earliest use of IPD for delivering a project can be traced back to 2005 in the construction of healthcare facilities and hospitals in the United States (US). In fact, the project launched by Sutter Health in 2005 has often been said to have started the IPD era. (Cohen 2010;Lahdenpera 2012). Traditional delivery methods have been based on transactional contracting; however, IPD was based on relational contracting. IPD contracts are known as "relational" contracts because consideration is given to the process, not just to the end product (Pelberg 2009; Velan and Senthilkumar 2017). IPD aligns project objectives with the interests of key participants, through a team-based approach and advocates the use of multi-party agreement among key participants. (Aapaoja et al. 2013; Ghassemi and Becerik-Gerber 2011)

The Indian construction industry is optimistic about its growth due to the planned major infrastructure developments and smart cities across India by the Government of India. Further large-scale projects are planned by the private sector hence it is imperative to choose the right project delivery method for the successful completion of projects with respect to time and cost. The Indian AEC industry relies heavily on the use of traditional contract types for its execution of projects. Significant unawareness has been found when it comes to the use of IPD holistically. However, the use of project alliance contractual method, which has a certain similarity to IPD, was observed in one of the recently completed residential projects in India (Velan and Senthilkumar 2017).

In the Indian context, the alliance method was used for a project the Ramanujan IT City in Chennai. It was decided to select the alliance method over the traditional delivery model to address challenges such as1) completing the entire project within a short

duration, 2) complying the SEZ and other statutory norms, 3) maintaining the quality and safety, 4) mobilizing material and skilled resources on time. With the selection of traditional model, it could have led to huge delays, contractual issues, cost overrun, safety and quality related issues, hence alliance was preferred. The project started quickly after the Alliance finalization without waiting for the design completion. The entire work was completed within the budgeted cost and on time. There were no delays in the Alliance, as the problems faced by the involved parties were envisaged before, which made it easier to solve them (Velan and Senthilkumar 2017). Some of the key features of alliance method adopted in Ramanujan IT City project were

- The legal and commercial contractual relationship between the owner/client and the other participants such as contractor, architect and consultants, was established using the Alliance Method.
- All participants or the firms were aligned to achieve the common objective of project completion on time and within the pre-set budget.
- The project risk was collectively shared by all the participants and the process was administered effectively.
- Using the open book accounting system among the participants, transparency was maintained and it proved very helpful for any cross verification.
- The pain and gain share principle was utilized as part of the commercial framework of alliance method.
    - In case of the outstanding performance or the underperformance by the non-owner participants, it was decided to share the profit or the loss by all including the owner.
    - However the pain and gain share was capped at a certain percentage, and if the loss or profit exceeds beyond that limit, the owner had to take the onus.
- No blame policy was adopted as part of the alliance method. Participants can blame others only in case somebody was intentionally underperforming.
- The legal framework of Alliance method was used to constitute the Project Alliance Board for the overall administration.

The use of alliance method shows Indian stakeholders or clients are looking for innovative ways or methods to improve its delivery of the project which is a positive sign for the growth of IPD adoption. Even though the concept of IPD has been hailed by a number of researchers of construction management over the last couple of decades (Ghassemi and Becerik-Gerber2011; Cohen 2010), there have been very few success stories of implementation of IPD in actual projects globally. Through this piece of research, challenges related to IPD adoption were identified through the available literature. These challenges were later presented to a panel of experts and on a consensus-based approach, critical challenges have been found out in the Indian context.

Literature Review

Professional organizations like AIA and the Associated General Contractors of America (AGC) are at the forefront of IPD initiative or awareness. They are contributing in terms of establishing standards, publishing IPD principles and techniques, facilitating discussions among their members on IPD related topics. The AIA defines IPD as “a project delivery approach that integrates people, systems, business structures, and practices into a process that collaboratively harness the talents and insights of all project participants to optimize

project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication and construction" (AIA CA Council 2007; American Institute of Architects 2007). Currently, there is no standard definition of IPD that has been accepted by the industry as a whole and hence many different definitions or interpretations of IPD concept exist from various authors and sources. However, throughout the IPD related literature, it was found that three common principles have been associated with IPD for its explanation by most of the authors, those are 1) multi-party agreement 2) early involvement of all parties, and 3) shared risk and reward (Kent and Becerik-Gerber 2010). To execute IPD holistically all the above principles must be incorporated into a project (Sive 2009).

In this section, we have reviewed the literature on IPD, to identify the challenges in the implementation of this seemingly promising concept in projects. There has been a substantial consensus among researchers (Kent and Becerik-Gerber 2010; Cohen 2010 &Ghassemi and Becerik-Gerber 2011) that the challenges can be broadly grouped into four categories: 1) technological challenges 2) legal challenges, 3) financial challenges, and 4) cultural challenges. However, during the literature review, the authors felt that some of the challenges could not be categorized in any single box, and hence a new category was introduced, titled 'Others', which included challenges which can fit into more than one of these categories. Since multiple studies reviewed have identified similar challenges, the authors have presented the literature review for this paper in tabular form. Tables 1, 2, 3, 4, 5 summarize respectively the technological, legal, financial, cultural, and other challenges, and also indicates the studies which have identified them.

Table1: Technological Challenges

Number	Issues	Authors
01	Integration of information and knowledge management systems	Owen et al. 2010;Ghassemi and Becerik-Gerber 2011; Hellmund et al. 2008; Lichtig 2006;Kent and Becerik-Gerber2010; Succar 2009.
02	Intensified planning - overlapping roles of client, architect and contractor	Owen et al. 2010; Lichtig 2006.
03	Inexperience with Appropriate technology	Owen et al. 2010; Hellmund et al. 2008;Kent and Becerik-Gerber 2010.
04	Ineffective feedback system leading to slow decision making	Hellmund et al. 2008;Kent and Becerik-Gerber 2010.
05	Timing of key participant involvement	Cohen 2010; Ghassemi and Becerik-Gerber2011; Owen et al. 2010; Hellmund et al. 2008; Ashcraft 2012; Cohen 2010.
06	Un-established/unclear BIM standards and practices	Hellmund et al. 2008;Kent and Becerik-Gerber 2010; Succar 2009.
07	Early definition of target goals without fully developed design	Ghassemi and Becerik-Gerber 2011; Owen et al. 2010; Lichtig 2006;Ashcraft 2010.
08	Loss of focus on the aesthetic components of design due to earlier participation of other stakeholders	Hellmund et al. 2008;Ashcraft 2012; Sive 2009.

Table2: Legal Challenges

Number	Issues	Authors
01	Need for new legal framework	Becerik-Gerber& Kent 2010;Kent and Becerik-Gerber 2010; Sive 2009.
02	Contracts for IPD not tested or understood	Becerik-Gerber & Kent 2010;Kent and Becerik-Gerber 2010; Sive 2009.
03	Criteria for selection of agencies value based vs. cost based	Hellmund et al. 2008; Lichtig 2006.
04	Multiparty agreement for entire project lifecycle	Ghassemi and Becerik-Gerber 2011; Lichtig 2006.
05	Insurance industry does not have coverage for IPD	Ghassemi and Becerik-Gerber 2011;Becerik-Gerber & Kent 2010; Sive 2009.
06	How to handle third party claims	Ashcraft 2010.
07	Legal risk of moving from 2D-3D	Kent and Becerik-Gerber 2010; Succar 2009.
08	Aspirational language in contract	Ashcraft 2012; Aki 2013.
09	Public institutions and agencies lack authority to restructure their procurement process	Ghassemi and Becerik-Gerber 2011;Becerik-Gerber & Kent 2010;Ashcraft 2012;Ashcraft 2010; Sive 2009.

Table3: Financial Challenges

Number	Issues	Authors
01	Compensation structure	Ghassemi and Becerik-Gerber 2011; Lichtig 2006;Ashcraft2010; Cohen 2010.
02	Equitable distribution of opportunities for gain and potential for loss among stakeholders.	Ghassemi and Becerik-Gerber 2011;Ashcraft 2012.
03	Profit pooling	Ghassemi and Becerik-Gerber 2011.
04	Reconciling project goals	Ghassemi and Becerik-Gerber 2011.
05	High bids due to inexperience	Hellmund et al. 2008.
06	Absolute financial limitation of owner	Ashcraft 2012.
07	Confusion & Misunderstandings regarding accounting of contingency	Lichtig 2006;Ashcraft 2010;Kent and Becerik-Gerber 2010.
08	Difference in accounting of costs and profit among client, consulting and contracting firms	Ashcraft 2010.
09	Concerns regarding risk sharing and open-book accounting	Becerik-Gerber & Kent 2010;Kent and Becerik-Gerber 2010; Aki 2013.
10	In larger duration projects, parties may not agree to defer profit	Ashcraft 2012;Ashcraft 2010.
11	Lenders may demand ‘hard pricing’ precluding IPD	Ashcraft 2010.

Table4: Cultural Challenges

Number	Issues	Authors
01	Training & Skill enhancement	Ghassemi and Becerik-Gerber 2011; Owen et al. 2010.
02	Mutual respect & trust	AIA CA Council 2007;Ghassemi and Becerik-Gerber2011; Owen et al. 2010; Lichtig 2006;Kent and Becerik-Gerber 2010.
03	Accommodate differing values and objectives	Becerik-Gerber & Kent 2010;Ashcraft 2012; Sive 2009.
04	Inexperience with each other & IPD	Hellmund et al. 2008;Ashcraft 2010; Sive 2009.
05	Fear of change	Hellmund et al. 2008;Becerik-Gerber & Kent 2010;Ashcraft 2012; Kent and Becerik-Gerber 2010.
06	IPD is meeting intensive	Ashcraft 2012.
07	Awareness and willingness about IPD among owners	Kent and Becerik-Gerber 2010; Sive 2009; Aki 2013.
08	Parties need to openly discuss goals and trust the information provided by prospective teammates	Ghassemi and Becerik-Gerber 2011;Ashcraft 2012.
09	Concurrent communication between and within group	Aki (2013).
10	Providing collaborative and fully integrated project environments	Ghassemi and Becerik-Gerber 2011; Owen et al. 2010.
11	who will take tough decisions in case of disputes	Owen et al. 2010; Sive (2009).
12	Contract language reflecting scars of prior battle	Ashcraft 2010.

Table5: Other Issues

Number	Issues	Authors
01	Setting procedures for problem solving and resolution	Ghassemi and Becerik-Gerber2011; Lichtig 2006.
02	Early involvement of subcontractors	Ashcraft 2010.
03	Third party commissioning	Hellmund et al. 2008.
04	Requirement of competent and risk tolerant client	Ashcraft 2010;Kent and Becerik-Gerber 2010; Sive 2009; Cohen 2010.
05	Joint ownership of documents	Ashcraft 2010.
06	Who owns BIM? Who will pay for it?	Ashcraft 2010.
07	Selecting the right team early and based on quality/values	Owen et al. 2010; Lichtig 2006.
08	Subjectivity in measuring quality	Ashcraft 2010.
09	Shorter projects cannot spend time on organizational efforts for IPD	Ashcraft 2010; Cohen 2010.

Research Methodology

To identify the critical challenges for implementing IPD in the Indian context, the authors conducted a focus group exercise. Focus group exercise has been accepted as an effective method to obtain "detailed information about attitudes, opinions, and preferences of a selected group of participants" (Trochim et al. 2016). Seven professionals with experience ranging from five to 15 years in the AEC industry were brought together for this study, to discuss the issues under various categories. The focus group was formed with an aim to have representation from all stakeholders in the construction industry, with members from a diverse background and form a comprehensive understanding of the barriers to IPD adoption. To form the focus group, overall 38 professionals from five organizations and four freelancing consultants were considered, out of whom seven were finally selected based on accessibility and convenience of the professionals, their exposure to IPD concepts, and similarity in the level of experience. Two members had more than seven years' experience each in India's largest construction company, one member is a chartered accountant with more than seven years work experience in the banking sector, two members were architects, one member worked in projects department of a major auto-component manufacturer in India, and one member worked in a leading real estate development company in India. Thus the group consisted of two members each representing client, consultant, and contractor, and one member representing the lender. Although none of the members had worked in any IPD projects in the past, all the members had prior knowledge of the concepts of IPD and BIM, and three had hands-on experience in BIM. The objective was to constitute the focus group with representation from stakeholders who can influence the decision regarding adoption of IPD as a project delivery model. An important stakeholder who could not be represented in the focus group was the subcontractor. This is because, as mentioned above, a primary criterion for selection of focus group member was prior knowledge about IPD and BIM, whereas, the authors could not find any subcontractor possessing such knowledge. Further the authors aimed to bring

in representation from only those stakeholders who are involved in the project throughout its lifecycle. The point of view of the subcontractors was represented to some extent by the contractors' personnel.

The members were assembled for a roundtable discussion, and they were asked to share their opinion about IPD, and the barriers to collaborative project management based on their experience. The comments made by the members were noted by one of the authors, and also recorded electronically, for further analysis. After the first round of discussion, the members of the focus group were handed out the list of challenges under each category, identified in the literature review (Tables 1, 2, 3, 4, and 5). One by one each category was taken up and the members were asked to give their opinion on which of the challenges enlisted were most critical in the context of Indian construction projects. For each category, the initial comments by the members were followed by a reiterative discussion, till a consensus was reached.

Result and Discussion

The recordings and notes taken during the focus group discussion were manually coded by the authors. Through qualitative analysis, the authors identified the critical challenges in each of the five categories defined in literature review. Table 6 summarizes the critical challenges in implementing IPD in Indian construction projects.

Table 6: Summary of the critical challenges

Number	Category	Barriers/Challenges
01	Technological	• Integration of information, and knowledge management systems. • Early definition of target goals without fully developed design • Un-established/unclear BIM standards and practices
02	Legal	• Need for new legal framework • Criteria for selection of agencies value based vs. cost based
03	Financial	• Equitable distribution of opportunities for gain and potential for loss among stakeholders. • Difference in the accounting of costs and profit among the client, consulting and contracting firms.
04	Cultural	• Mutual respect & trust • Inexperience with each other & IPD, • Contract language reflecting scars of prior battle and • Awareness and willingness about IPD among owners.
05	Others	• Early involvement of subcontractors, • Requirement of competent and risk tolerant client • Subjectivity in measuring quality.

The challenges in each category summarized in Table 6 have been explained here under, with justification of their criticality in context of Indian construction industry.

Technological Barriers

Out of the several technical issues identified from the literature (Table 1), some of the most critical issues identified were 1) Integration of information, and knowledge management systems, 2) Early definition of target goals without fully developed design, and 3) Un-established/unclear BIM standards and practices. In an IPD framework, it is necessary to define targets at a very early stage as a team since the incentives are tied to the achievements of these targets. The focus group opined that various stakeholders may find it very difficult to define clear targets of cost, time and quality without developing the design. Further, with the lack of well-established information and knowledge management systems in AEC industry in India, collaborative decision making becomes a challenge. IPD model advocates use of BIM as a common data repository but AEC industry is in transition with respect to use of BIM to its fullest capability. Limited competency among stakeholders in using BIM tools results in confusion and conflicts. One of the focus group members recounted an experience where collaborative decision making failed as the client and the contractor could not decide on how to share the information without infringing copyright.

Legal Barriers

In extant literature, several barriers to IPD implementation have been classified under legal issues. The focus group also felt that for successful implementation of IPD, an essential prerequisite is a new legal framework. In India the largest clients for construction projects is the Government of India through its various departments, statutory authorities and public sector undertakings. Current tendering rules are stringent for all projects financed through public money; the award of contract should be to the lowest responsive and responsible bidder. Since criteria of selection of agencies in IPD is supposed to be value-based rather than cost-based, it is not compliant to the current rules. The focus group was unanimous in their opinion that for IPD to succeed in India, the first step should be the introduction of a new legal framework allowing for value-based selection of agencies. The members felt that all the other legal challenges shall be taken care with such development.

Even though earlier researchers globally have put a lot of importance on the unavailability of IPD specific insurance products/policies, the focus group felt that insurance is the least significant among all the barriers identified. This is because the contentious issues in IPD insurance like professional liability insurance is not being given importance by the Indian AEC industry. In India, the main insurance obtained for construction projects is Contractors All Risk Insurance (CAR). In the case of IPD, the same product can be modified so as to cover all the parties.

Financial Barriers

Among the financial barriers, two issues were identified as critical, viz. 1) Equitable distribution of opportunities for gain and potential for loss among stakeholders and 2) Difference in the accounting of costs and profit among the client, consulting and contracting firms. Though there has been extensive research on the models to share the risks and rewards among stakeholders in an IPD, there is still no universally accepted formula. This is especially important as the incentive for the project needs to be based on multiple criteria like cost, time, quality and safety. The major issue with regard to this is the varying risk appetite among the client, consultant and contractor. There may be a tendency of each stakeholder to push their individual business risk to the shared pool while

maximizing their share of the reward. A number of thoroughly researched formats for sharing of risk are available such as the 'Target Criteria Amendment and Target Cost' in AIA document C191 (2009), and Cost benchmarking, Price estimation, and Risk pool mechanism in Consensus300 (2007).However to accept these established formats, a general consensus is required among all stakeholders for sharing of risks and rewards, based on the extent of involvement.

The other financial issue highlighted by the group was the difference in accounting practices of costs and profit among designers and contractors. Designers include profit in their hourly rates, whereas contractors consider profit as a percent of the cost. Hence, integrating these two types of accounting practices into one common method of accounting for calculation of cost and profit is a major challenge. It was felt that all the other financial challenges in IPD implementation found in literature can be resolved with the development of new legal framework.

Cultural Barriers

It was observed by the authors that a maximum number of challenges identified in the literature fall under the category of cultural. A similar pattern was also observed during the opening comments of focus group members where they mostly spoke about cultural barriers as the critical challenge in collaborative decision-making. Out of the 12 challenges identified by the authors in this category, the focus group selected four as most critical. 1) Mutual respect & trust 2) Inexperience with each other & IPD, 3) Contract language reflecting scars of prior battle and 4) Awareness and willingness about IPD among owners.

During the discussion, it was observed that there is a lot of mistrust among the parties in Indian construction industry because of prior experience of opportunistic behavior. Hence, the parties are used to contract language clogged by the accumulation of provisions designed to prevent rare failures. Such risk averseness prohibits early collaboration among stakeholders. Further, inexperience with each other's work culture, decision-making practices results in apprehensions about collaboration for early target setting. Finally, the group members highlighted a lack of awareness and willingness among the owners about IPD. It was felt that for IPD to succeed, all stakeholders starting from owner to subcontractor should be enthusiastic about this model but finally, it is the owner's prerogative to decide the type of project delivery model to be used. The owners will be motivated to implement IPD only when they have come across some success stories. In the Indian context, for successful implementation of IPD, it is essential for the Government to take the lead, being the client for maximum projects.

Other Barriers

During the literature review, the authors identified nine challenges which could fit into more than one of the above-defined categories. For example; the question of ownership and payment for BIM can be identified under either of financial, legal and technical. Hence, these challenges have been grouped under the fifth category 'Others'. Out of these challenges, the focus group has identified three as most critical: 1)Early involvement of subcontractors, 2) Requirement of competent and risk tolerant client, 3) Subjectivity in measuring quality.

Early involvement of subcontractors was found to be the most contentious issue which needed the maximum time for the focus group to arrive at a consensus. While some members felt, that the objectives of IPD can never be successful without involving major subcontractors in the core group, others opined that in Indian construction sector the

subcontractors are not reliable or competent enough to make any worthwhile contribution to the IPD process. Rather the subcontractors would try to misuse the IPD system of collaborative decision making and free flow of information, to engage in opportunistic behavior. It was noticed in the focus group discussion that there is substantial trust deficit towards the subcontractors from client and contractors. This is because historically most subcontractors in India are engaged in projects based on considerations other than technical expertise, and hence lack professionalism. Only exceptions are subcontractors involved in specialized services like formwork, ready-mix concrete, etc. Hence, it was finally agreed that specialized subcontractors have to be included in the IPD process however their involvement may be staggered. Also, it is noted that Indian construction industry needs to nurture trustworthy subcontractors not only for implementation of IPD but also for the betterment of the industry as a whole.

Risk averseness of Indian clients has already been discussed under cultural and financial barriers. It was again stressed by the focus group that a risk tolerant and competent client is a necessary condition for IPD. Another issue raised by the group was the problem of measuring quality. Traditionally, quality management systems in construction projects aim to comply with the specification. IPD advocates setting of target goals in terms of cost, time and quality and rewards are linked to the performance against these set targets. While performance with respect to cost and time can be measured objectively in terms of cost saving and early completion, there is no standard matrix for objective measurement of quality. The subjectivity in the quality measurement thus raises concern regarding the fairness of sharing the reward.

Conclusions

While substantial research literature is available internationally on procedural challenges in the implementation of IPD, this study has assessed which of these challenges are most critical in the Indian context. Early settings of target goals without fully developed design and lack of clarity about information system especially use of BIM are the most important technological barriers. A new legal framework allowing for value-based selection of agencies for projects as against the prevalent method of awarding the contract to the lowest responsive and responsible bidder was identified as a necessary prerequisite for the implementation of IPD. Among financial barriers, the most critical issues were developing a universal formula for equitable distribution of risk and reward and resolving the difference in accounting system for treatment of cost and profit among the stakeholder firms. Culturally, developing mutual respect and trust among stakeholders has been found to be difficult, because of their lack of experience with each other, unfamiliarity with IPD, and prior experience of confrontational contract language. Another important issue is risk averseness and lack of knowledge among owners inhibiting them from adopting IPD. Early involvement of all stakeholders, including subcontractors, is a basic principle of IPD but was felt to be very difficult to achieve in Indian construction industry. Lastly, subjectivity in measuring quality for the purpose of reward sharing may result in concerns regarding fairness.

It is beyond doubt that Indian construction industry is passing through challenging times and change is required in the project delivery models presently in use for the betterment of the industry. IPD has been internationally commended for improving the deliverables in construction projects, but there have been no major success stories of IPD adoption in India and very few internationally. To implement IPD in India, a strong policy push is required from the Government (as the predominant client for construction

projects). The barriers identified in this study shall be useful for policymakers and researchers to develop strategies for wider adoption of IPD in India. Once the legal framework is suitably modified to adopt IPD and a few success stories are observed, the authors are hopeful that the industry will overcome the cultural, technological and financial barriers to effective use IPD for construction projects.

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