

ADAPTABILITY OF INTEGRATED PROJECT DELIVERY IN A CONSTRUCTION INDUSTRY

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ABSTRACT

Within the traditional procurement system, level of achievement of client and contractor objectives may vary depending on the type of procurement used. This may further create a gap between the expected and actual performance of the project. Integrated Project Delivery (IPD) is the modern development of the procurement systems in the industry where collaborative innovation is the path used to achieve the goals of a project. Appreciable characteristics and benefits of this concept convert the construction industry towards it. It is observed that United States of America is the first to develop and implement this concept specially focusing on the public sector. Although, the concept is not yet popular around the world, it is likely that the clients will demand for it in future due to economic and managerial advantages it brings. Thus, it is important that an industry be prepared to adapt the system as and when the need arises. Identifying this need, a literature synthesis on requisites and barriers for successful implementation of IPD is presented in this paper. The findings shall become valuable source for any construction industry to assess their readiness and take necessary steps to be ready to implement IPD system successfully.

Keywords: Procurement, Integrated Project Delivery, IPD, Construction.

1. INTRODUCTION

Within the traditional procurement system, level of achievement of client and contractor objectives may vary depending on the type of procurement used. This may further create a gap between the expected and actual performance of the project. Integrated Project Delivery (IPD) is the modern development of the procurement system in the industry where collaborative innovation issued to achieve the project goals. Appreciable characteristics and measurable benefits of this concept have given high potential for it to become the industry standard internationally. A literature synthesis on requisites and barriers for successful implementation of IPD is presented in this paper. The findings are beneficial in identifying the preparedness of an industry for IPD integration.

2. BACKGROUND

The procurement of construction project is immense in scope because it involves the gathering and organising of myriads of separate individuals, firms and companies to design, manage and build construction products for specific clients or customers. Project procurement is very much concerned with the organised methods or process and procedure of obtaining or acquiring a construction product. It also involves arranging and coordinating people to achieve the prescribed goals or objectives (Rashid *et al.*, 2006). Procurement is the process which is used to realise construction project within the budget, time duration and required quality by deciding the overall framework of the project, structure of the responsibilities and authorities of the key parties of the project. It is a key factor, which ultimately decides the overall success of the project. From time to time numerous procurement methods were developed within the industry to overcome the drawbacks of the previous methods (Alhazmi and McCaffer, 2000).

The major weakness of common procurement methods is that they do not ensure the productivity level required to the project. The failure to inline with schedule and budget, insufficient details in construction

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drawings, wastage of materials are the main reasons for lower productivity. IPD was designed overcome those problems (Jackson, 2011).

It is observed that United States of America was the first to develop and implement IPD concept. The American institute of Architects and American Institute of Architects California Council (AIA and AIACC, 2007, p.01) define “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 optimise project results, increase value to the owner, reduce waste, and maximise efficiency through all phases of design, fabrication, and construction”. They have shown that IPD can reduce the total project cost by 10% (AIA, 2009).

Although, the IPD concept is not yet popular around the world, it is likely that the clients will demand for it in future due to economic and managerial advantages it brings. Thus it is important that an industry be prepared to adapt the system as and when the need arises. Thus, a study was initiated aiming to identify requisites and barriers for successful implementation of IPD in a construction industry. A synthesis of current knowledge from a review of literature is presented in this paper.

3. INTEGRATED PROJECT DELIVERY

IPD may have two different but related meanings when thought of it as philosophy or delivery method. IPD as a philosophy occurs when integrated practices or philosophies are applied to more traditional delivery approaches such as Construction Management (CM) at-Risk, Design-Build or Design and Build (where the owner is not party to a multi-party contract). IPD as a Delivery Method occurs when the owner has elected to sign a multi-party contract with the prime designer, contractor and/or other key members of the project team. In addition to the multi-party contract, IPD as a Delivery Method is characterised by a contract that incentivises collaborative behaviour, team risk-sharing and other IPD principles and practices (NASFA *et al.*, 2010; Sive, 2009). This study focuses on IPD as a method, because that is the new approach for the industry which future clients may demand.

3.1. CHARACTERISTICS OF IPD

IPD encourages early contribution of knowledge and experience and requires proactive involvement of key participants. Responsibility is placed on the most able person with decisions being made on a “best for project” basis. Although it is possible to implement IPD without Building Information Modelling (BIM: discussed hereinafter), it is essential to efficiently achieve the collaboration required for Integrated Project Delivery (AIA *et al.*, 2007).

IPD is built on collaboration. As a result, it can only be successful if the participants share and apply common values and goals. IPD is a method of project delivery distinguished by a contractual arrangement among a minimum of the owner, constructor and design professional that aligns business interests of all parties. IPD motivates collaboration throughout the design and construction process, tying stakeholder success to project success, and embodies the following contractual and behavioural principles (AIA and AGC of America, 2011),

Contractual Principles

- Key Participants Bound Together as Equals
- Shared Financial Risk and Reward Based on Project Outcome
- Liability Waivers between Key Participants
- Fiscal Transparency between Key Participants
- Early Involvement of Key Participants
- Jointly Developed Project Target Criteria
- Collaborative Decision Making

Behavioural Principles

- Mutual Respect and Trust
- Willingness to Collaborate
- Open Communication

3.2. DIFFERENCE BETWEEN IPD AND OTHER PROCUREMENT METHODS

Understanding of the differences of IPD from the other systems is imperative in understanding the preparedness of an industry for its integration. Table 1 presents a comparison between IPD and Traditional Procurement Methods.

Table 1: IPD and Traditional Project Delivery – A Comparison
 (Source: AIA and AIA California Council (2007); Mossman, *et al.* (2010))

Traditional Project Delivery		Integrated Project Delivery
Fragmented, assembled on just-as-needed” or “minimum necessary” basis, strongly hierarchical, controlled	Teams	An integrated team entity composed of key project stakeholders, assembled early in the process, open, collaborative
Linear, distinct, segregated; knowledge gathered “just-as-needed;” information hoarded; silos of knowledge and expertise	Process	Concurrent and multi-level; early contributions of knowledge and expertise; information openly shared; stakeholder trust and respect
Individually managed, transferred to the greatest extent possible	Risk	Collectively managed, appropriately shared
individually pursued; minimum effort for maximum return; (usually) first-cost based	Compensation/ Reward	Team success tied to project success; value-based
Paper-based, 2 dimensional; analog	Communications/ Technology	Digitally based, virtual; Building Information Modeling (3, 4 and 5 dimensional)
Encourage unilateral effort; allocate and transfer risk; no sharing	Agreements	Encourage, foster, promote and support multi-lateral open sharing and collaboration; risk sharing
Blame, finger pointing, exploiting loopholes, individual reward maximisation, risk averse	Culture	Learning, continual improvement, engaging with reality
Command a control; encourage unilateral effort; Break project into constituent parts; Optimise parts (especially “my bit”)	Thinking	Systems thinking; optimise the whole; encourage, foster & support multi-lateral open sharing & collaboration
Top - down: Manage the contract, manage the programme, manage budgets, manage people	Management ethos	Outside- in: act on the system to improve it for customers (helped by those working in it).
Separated from work	Decisions	Integrated with work; based on data
Budget output, activity, standards, productivity	Measures	Related to purpose, capability and variation
Functional specialisation; fragmented, silo based, strongly hierarchical, controlled; constructors not generally added until late in process	Organisation design	Based on demand, value & flow; open, collaborative & integrated team of key players formed at the outset & added to as t he stakeholder group grows
Gathered “just - as - needed”, hoarded in silos	Knowledge and expertise	Shared openly and early
Contractual	Attitude to customers	What matters to them? Understanding their human and technical concerns.

4. REQUISITES TO IMPLEMENT IPD

IPD is relatively a new concept that did not find enough time for maturity in different construction industries. Consequently, the current knowledge may not be comprehensive enough to answer the question “what are the requisites to implement IPD” coherently. There were few studies carried out in different parts of the world which would help. However, the best approach would be to logically build up the answer by synthesising the findings of those studies and the characteristics of IPD.

Whether it is legislative restrictions, policy limitations or cultural barriers, there are a number of reasons that affect to implement the IPD process. Three studies found to present a good knowledge base on requisites.

O’Connor (2009) highlights the most important aspect – the mutual trust – is to be something that can be created by contract but must exist independently of it. He also identifies many other items and shows that they are directly influenced by parties’ contracts. Cooper (2009) describes the key concepts that must be maintained when proceeding with the IPD procedure. Mossman (2009) presents a list of factors categorised into three groups as (a) IPD enablers, (b) requirements for IPD, and (c) supportive factors for IPD.

5. SYNTHESIS OF REQUISITES TO IMPLEMENT IPD

Thirty seven numbers of requisites to implement IPD were synthesised by reviewing the current knowledge and constructing arguments on it. For clarity and consistency, these requisites were categorised into four categories.

Requisites by IPD characteristics

1. Mutual trust among the parties
2. Open communication among parties
3. Mutual understanding with respect to each other’s objectives
4. Frequent formal and informal meetings for continual improvement
5. Language directing the parties to collaborate upon developing project goals.
6. Lean logistics
7. System thinking and lean thinking
8. Early involvement of key team members
9. Clarity of client’s understanding on purpose/end result
10. Early consideration of logistics and other buildability issues
11. Whole life value assessments that include organisational outcomes
12. Project bank account
13. Intensified Planning

Requisites from IPD agreement

14. Awareness of risks and rewards
15. Effective co-ordination
16. Collective responsibility instead of personal responsibility
17. Alignment of objectives
18. Agreed, clear and quick process for dispute resolution
19. Pioneering role of the owner/client
20. Legal implications
21. Risk allocation must be consistent with public law requirements
22. Project specific insurance may be required in order to achieve IPD risk shearing objective
23. Risk management team, include potential insurers should be engaged early in the process
24. Tolerance for risks retained must be evaluated for all stakeholders
25. Risk assessment, safety plan, project labour agreement, ADR for workers compensation should be part of the early collaboration

26. Good relational contract
27. Clarity of management decisions
28. Performance evaluations and payouts

Cultural requirements

29. Positive attitude of the project participants
30. Readiness to compromise on unclear issues
31. Professional ethics
32. Agreed mechanism for performance appraisal
33. Cost of implementing IPD
34. Willing to collaboration and flexibility
35. Compatible organisational cultures

Technological requirements

36. Appropriate Technology
37. Building Information Modelling (BIM), a single digital model to which all contribute

6. DISCUSSION

It is useful to review each of the requisite separately, but not be appropriate for a presentation of this nature. For simplicity, the discussion follows is based on four categories identified.

6.1. REQUISITES BY IPD CHARACTERISTICS

The significant characteristic of IPD is collaboration among the IPD team members. Collaboration requires freely soliciting and sharing information and ideas as equals, not as master and subordinate. A major shift is to engage the team in collaborating to define the problem, rather than critique a proposed solution (Mossman *et al.*, 2010). This requires all team members to approach collaboration as a process by which they have the opportunity to share with and learn from the talents, experiences and performance of others. Real collaboration cannot happen without trust amongst the team members and openness to the reality that each of us does not have the best idea for a solution (AIA and AIACC, 2007).

Trust must be a common thread running through the entire program and provides a foundation for collaboration. Trust is essentially a decision each person on the project makes every day to trust the other participants. To trust people is to count on their sense of responsibility, believing that they will choose to act in a trustworthy manner, while recognising the possibility that they may choose to betray the trust (Thomsen *et al.*, 2010). It is something that can be built intentionally and must be openly discussed. This requires the company to trust the participant to make important decisions in the project's interest and, simultaneously, the participant to trust that the company's long-term interests are best served by *project-first* thinking. Trust is realised through fulfilling commitments (Howard and Ashcraft, 2011).

In an integrated project, the key participants must get involved from the earliest practical moment. Decision making is improved by the influx of knowledge and expertise of all key participants (Thomsen *et al.*, 2010). Their combined knowledge and expertise is most powerful during the project's early stages where informed decisions have the greatest effect. Project goals are developed early, agreed upon and respected by all participants. Insight from each participant has to be valued in a culture that promotes and drives innovation and outstanding performance, holding project outcomes at the centre within a framework of individual participant objectives and values (AIA and AIACC, 2007).

The IPD approach recognises that increased effort in planning results in increased efficiency and savings during execution. Thus the thrust of the integrated approach is not to reduce design effort, but rather to greatly improve the design results, streamlining and shortening the much more expensive construction effort (Mossman *et al.*, 2010). IPD's focus on team performance is based on open, direct, and honest communication among all participants. Responsibilities are to be clearly defined in a no-blame culture leading to identification and resolution of problems, not on determination of liability. Disputes must be recognised as they occur and promptly resolved (Thomsen *et al.*, 2010).

Continuous improvement adds value to the owner as it affects every area of project development and implementation including site selection, design, procurement decisions, fiscal reporting, safety and quality issues, project delivery methods, material choices, vendor offerings, and operational efficiencies. Frequent formal and informal meetings must take place to measure continual improvement of the project team (Mossman *et al.*, 2010).

6.2. REQUISITES FROM IPD AGREEMENT

In IPD, the project team is an organisation in its own right and all team members are committed to the project team's goals and values. Leadership is taken by the team member most capable with regard to specific work and services. Often, design professionals and contractors lead in areas of their traditional competence with support from the entire team; however specific roles are necessarily determined on a project-by-project basis. Roles are clearly defined, without creating artificial barriers that chill open communication and risk taking (AIA *et al.*, 2007).

Using BIM and other tools to construct a building virtually in advance of actual construction substantially diminishes the risk of design errors and omissions. If the participants adopt “no suit” clauses, the risk of incurring internal first-party claims for economic loss can be eliminated (Bedrick and Rubel, 2009). It is now required that the insurance industry develops and offers alternative insurance products that align with the project goals and the specific risk allocation terms established among the IPD project participants (Howard and Ashcraft, 2011).

The Consensus DOCS (Design, Owner, Contractor, Subcontractor) and AIA A295IPD contract arrangements are standard IPD agreement published in the United States making them more manageable by insurance standards. Suitable contracts (standard forms) will be required by other countries integrating IPD (Ballobin, 2008).

Rather than simply shifting risk among each other, members of an IPD team have to agree in various ways to share risk and collectively manage it. By sharing risk, all project participants have a financial stake in effectively identifying and mitigating risks. Collective risk management brings less risk for the whole project (Mossman *et al.*, 2010). IPD projects use many creative ways of sharing risks and fostering collective risk management. Three common approaches involve sharing the cost-savings or cost overruns against an estimated cost of the work, pooling some portion of the team member's profit and placing it at risk, and/or pooling contingency funds and sharing any amount remaining after project completion (Thomsen *et al.*, 2010). The industry should be prepared for this and should have good awareness of risks and rewards to be motivated.

Periodic and timely performance evaluation is essential to reinforce good performance and address performance issues. Performance evaluations need to be done frequently in order for the project to be able to take advantage of lessons learned during the project (Howard and Ashcraft, 2011).

The IPD premise is that design and construction will improve if the designers and constructors align their interests and remove legal barriers to collaboration. When conflict surfaces within the team there must be someone to step in and align the team without the cost and delay of litigation. There should individuals among the parties to the contract who are skilful and with a charisma to do that. However, it is accepted that as long as multiple organisations have interests in the IPD Team and those organisations are doing at least some of the work independently, unaligned self-interest will exist.

6.3. CULTURAL REQUIREMENTS

A motivating culture is imperative for IPD success. Incentives are complex strategies. What “should” work may, or it may not work on the next project even if it did on the last. The owner and IPD team should be flexible regarding the incentive program so that they can adjust it mid-project to address changed project conditions; and they should be capable of detecting such requirement in order to make corrective adjustment (AIA and AIACC, 2007).

All members of the team should value reputation. Good people want repeat work and will work hard to build or uphold their reputation (Ballobin, 2008). IPD team has to be selected on qualifications, they should know they can be selected again if they deliver a great outcome or have a reputation for excellent client service (AIA *et al.*, 2007). Thus, IPD is for organisations which values professional ethics, who believes people are honest, and ready to compromise in unclear issues.

6.4 TECHNOLOGICAL REQUIREMENTS

Integrated projects often rely on cutting edge technologies. Technologies are specified at project initiation to maximise functionality, generality and interoperability. Open and interoperable data exchanges based on disciplined and transparent data structures are essential to support IPD. Because open standards best enable communications among all participants, technology that is compliant with open standards has to be used whenever available (Ashcraft, 2009).

BIM (Building Information Models) are to be used in design and construction to increase communication and team efficiencies. Indeed, BIM demands collaboration in order for the participants to obtain the benefits of this technology. The use of this technology has immediate and demonstrable benefits (Glick and Guggemos, 2009). Only BIM can facilitate to have more than one person working in a project model simultaneously and the ability to have the entire project team work on the same model. This helps the work get done faster and prevents against duplicating information and conflicts in the building design. BIM adds additional value when used to integrate project delivery processes, and BIM is catalyse for the IPD process (Gerber and Kent, 2010). In addition to the availability of technology, skill of the team members to use the technology is also a requisite.

7. CONCLUSIONS AND RECOMMENDATIONS

IPD holds the prospect of real productivity gains in the provision of design and construction services. Project delivery innovation is long overdue in the construction industry. The industries those have understood change is necessary are leading the way with the new method. The calculated benefits of IPD will yield demand for it in future; and thus it became necessary to identify the requisites for successful integration of IPD to a local construction industry.

By synthesising the current knowledge base from several perspectives, 37 requisites for successful integration of IPD to a construction industry were identified. It was emphasised that the mutual trust among the parties is critical. It was further identified that there were other requisites that yield the mutual trust such as culture, the contract, search for continuous improvement, and technological environment (especially BIM).

Scrutinising the list of requisites, one may realise that a particular construction industry lacks lot of them. This may be very much evident in an industry that does not practice collaborative methods like Partnering. However, it should be noted that previous studies in Sri Lankan context have shown that, some requisites for collaborative project delivery methods are not evident because of procurement methods in practice. The study showed that a change in the method and consequently contractual and functional relationships can surface some of the required features which would normally not found (Gunathilake and Jayasena, 2008). Thus the capacity of an industry to adapt IPD shall not be judged by simple observation. The status of the requisites is to be judged by simulating the IPD environment or by stimulating it features in conventional system. That is the way forward for this research.

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