THE RESHUFFLE OF CONTRACTUAL LIABILITIES BY IMPLEMENTING INTEGRATED PROJECT DELIVERY (IPD) IN BUILDING INFORMATION MODELLING (BIM) BASED CONSTRUCTION

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ABSTRACT

"Sustainability by building smarter", the vision of buildingSMART international clearly conveys what Building Information Modelling (BIM) was developed for. BIM has now been accepted as a primary tool for sustainable project procurement. Building information modelling (BIM) is the latest innovation of construction industry and it is increasingly becoming the design standard for architectural and construction engineering. Effective adoption of the BIM requires a change in the traditional work practices, where it needed a greater collaboration and communication among project participants and efficient flow of information. Conventional procurement methods are less efficient in delivering these requirements. The Integrated Project Delivery (IPD) approach is widely recognized as the most suitable project delivery approach to receive the full benefit of BIM adoption for construction project procurement. Basic concept of IPD is the collaboration among the owner, architect, and contractor to create the core team. The team focuses on trust, transparency, shared risk and reward, value-added decision making, and technology to complete a project as efficiently and effectively. Collaborative approaches to project procurement are very rare in Sri Lanka. A concept like IPD is totally a new paradigm for the local industry. Given the context that BIM is likely to become the standard in future and the widening global competition will force the local industry to adopt methods like IPD. This research is conducted to identify the reshuffle of contractual liabilities in IPD from those in traditional delivery method, where the findings will help the industry to get prepared to face future challenges.

Keywords: *Building Information Modelling, BIM, Contractual Liability, Integrated Project Delivery*

1. INTRODUCTION

Building Information Modelling (BIM) is one of main development technology that offers the potential increase of efficiency and effectiveness to construction projects. The collaborative environment needed for BIM procuring is offered from integrated project delivery (IPD) as an alliancing project delivery system. Although IPD is interpreted as beneficial to the design and construction industry, changing the industry into new relationships and methodologies could prove difficult. Implementing IPD create a reshuffle of contractual liabilities in traditional procurement. Knowledge on what and how liabilities are reshuffled is inevitable in achieving project success through these modern procurement options. Identifying whether reshuffle of contractual liabilities would occur by implementing IPD is the primary focus. If any significant reshuffle occurs, the study will further explore the extent of it. This is an ongoing research study conducted in Sri Lanka; and this paper presents the initial findings from its literature review.

2. BUILDING INFORMATION MODELLING

Society currently faces many challenges dealing with the current economic conditions and the pressing need to address climate change (and its effects) together with the wider sustainability agenda.

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Construction industry has found considerable practices to improve its efficiency and play a key role in addressing the environmental concerns. But construction has been widely recognized as an industry that exhibits many intractable problems. Information technology (IT) has been introducing new expectations to the industry as remedies and industry is currently making the transition to full digital model-based working, creating new opportunities and posing new challenges (Watson, 2011).

One of the latest technologies used in construction industry which has been introduced by IT sector is Building Information Model (BIM) (Qais Consulting [QC], 2010). A building information model is a digital representation of the physical and functional characteristics of a facility (Smith, 2007). In technical terms, BIM will be a transition from the traditional computer aided two-dimensional drawings to modelling representations of actual building parts and pieces used to build a structure. The use of three dimensional modelling will allow for the creation of a virtual model of an entire project (Udom, 2012).

The resulting model is a data-rich, object-oriented, intelligent and parametric digital representation of the facility. BIM helps to enable Architecture, Engineering and Construction (AEC) professionals and owners design, visualize, simulate, and analyze the key physical and functional characteristics of a project digitally before they build it. Using information within the model, everyone on the project team can make better, more-informed decisions across the entire project lifecycle of building and infrastructure projects (Hergunsel, 2011). Furthermore, in 2007, Stanford University's Center for Integrated Facilities Engineering showed that BIM provided a 40% reduction of unbudgeted changes; provided cost estimates within 3% of the traditional estimates; contract savings of up to 10% with the use of clash detection; and reduced project time by up to 7% (A buildingSMART alliance project, 2012).

The use of BIM by architects, engineers, contractors, owners, and others is rapidly becoming widespread within the design and construction industries (Wickersham, 2009). More recent experience indicates a trend in large clients and government agencies across the globe to mandate the use of BIM, not only for delivery of the building, but also as a tool to manage operationally. BIM adoption in the United States shows that almost 39% of the construction industry is now using BIM in major projects with separate design and construction procurement processes (Porwal and Hewage, 2012).

Although BIM can be used with all kinds of project delivery systems, including design / bid / build, many believe that its benefits are greatest when coupled with more collaborative approaches to project delivery (Wickersham, 2009).

3. INTEGRATED PROJECT DELIVERY

In the present, traditional procurement system has devolved into an adversarial process resulting in inefficiency, mistrust, and commoditization of services among owners, architects, contractors, subcontractors, and suppliers, each with their agendas, silos, and preferred outcomes built into the project delivery process (AIA and AGC of America, 2011). Relational contracts in construction procurement promote and facilitate construction activities through the principles of collaboration and lean project delivery to achieve project objectives in best way (Haynes *et al*., 2009). Therefore the industry has begun to look to more collaborative, non-traditional delivery systems to facilitate better communication, reduce/share risk, increase profits, and provide a positive experience for project participants. Integrated Project Delivery (IPD) is one of these collaborative systems (AIA and AGC of America, 2011).

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 (AIA California council and McGraw-Hill Construction, 2007). The parties intend that the project shall be delivered in a collaborative environment and shall endeavor to align individual interests with those of project. The parties agree to contribute their knowledge, skills and services during all phases of the project and to bring to bear their expertise for the benefit of project (AIA document C191^{TM} 2009). Furthermore, 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 (AIA California council and McGraw-Hill Construction, 2007).

AIA and AGC of America (2011) stated that, following contractual and behavioral principles of IPD;

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

3.1. TRADITIONAL PROJECT DELIVERY VS. INTEGRATED PROJECT DELIVERY

A comparison between the traditional project delivery method and IPD in terms of key features of a project delivery is presented in Table 1.

Table 1: Traditional vs. Integrated Project Delivery

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 key project stakeholders, assembled early in the process
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; analogue	communications/ technology	Digitally based, virtual; Building Information Modelling
Encourage unilateral effort; allocate and transfer risk; no sharing	agreements	Encourage and support multi-lateral open sharing and collaboration; risk sharing

(Source: AIA and AIA California Council, 2007)

4. SIGNIFICANCE OF IPD IN BIM BASED CONSTRUCTION

BIM can be viewed as a virtual process that encompasses all aspects, disciplines, and systems of a facility within a single, virtual model, allowing all team members to collaborate more accurately and efficiently than traditional processes (Azhar, 2012). The successful implementation of BIM requires

early involvement of all project stakeholders. It means that the traditional project delivery systems (e.g. design-bid-build) have very limited role in BIM-based projects. Recently the Integrated Project Delivery (IPD) concept emerges as a natural companion to BIM. IPD brings key construction management, trades, fabrication, supplier and product manufacturer expertise together with design professionals and the owner earlier in the process to produce a design that is optimized for quality, aesthetics, constructability, affordability, timeliness and seamless flow into lifecycle management (Azhar, 2012). In the United States, the IPD has become a preferred project delivery system for all major projects involving BIM (McGraw-Hill Construction, 2008).

5. CONTRACTUAL LIABILITIES IN TRADITIONAL PROJECT DELIVERY

There are several types of delivery methods in traditional project delivery Design-bid-build, Construction Manager at-Risk, and Design-Build are the three most commonly used traditional delivery methods. In each method, the roles of the design professional and contractor are clearly defined (Ballobin, 2008). Traditional contracting intends project participants operating within their own separate silos of responsibility (AIA National and AIACC, 2007). Generally, the architect or engineer is responsible for design, the contractor for construction means and methods (Ballobin, 2008).

6. CONTRACTUAL LIABILITIES IN BIM BASED IPD

Integrated Project Delivery (IPD) seeks to improve project outcomes through a collaborative approach of aligning the incentives and goals of the project team through shared risk and reward, early involvement of all parties, and a multi-party agreement (Gerber & Kent, 2010.). In its fullest version, IPD has given rise to new forms of contractual relations that dramatically change many of the current expectations of owners, architects, and construction managers (Wickersham, 2009). In a Project Alliance, the key participants collectively assume responsibility for agreed project performance. The shared opportunities and responsibilities align the parties' interests and provide an incentive for collaboration and blame-free performance (AIA National and AIA California Council, 2007). This is not to say, however, that IPD participants do not have separate work scopes for which they are primarily responsible. For the most part, the designers remain primarily responsible for design services and the constructors remain primarily responsible for construction services (Wickersham, 2009).

In a multi-party agreement (MPA), the primary project participants execute a single contract specifying their respective roles, rights, obligations, and liabilities. In effect, the multi-party agreement creates a temporary virtual, and in some instances formal, organization to realize a specific project. Because a single agreement is used, each party understands its role in relationship to the other participants. Multi-party agreements require trust, as compensation is tied to overall project success and individual success depends on the contributions of all team members. For a MPA to be successful, the participants must be committed to working as a team to achieve team goals (AIA National and AIA California Council, 2007).

7. POTENTIAL RESHUFFLE OF CONTRACTUAL LIABILITIES WITH INTRODUCTION OF IPD

In spite of the significant benefits associated with BIM, there are several legal issues and risks which the design and construction industry has not addressed properly (Simonian, 2013). Implement of all the functions available in a BIM system, presents a substantial set of legal issues (Sieminski, 2007). When implementing IPD, parties have to agree to a more innovative set of relationships and it raises important contractual issues that may not be addressed by standard industry contract forms (Wickersham, 2009).

One of issues IPD result of this approach is a blending of traditional roles. The blending of roles, while strengthening the creative process, can lead to the question of who is responsible for particular scopes

of work. For that reason, a well-drafted IPD agreement clearly spells out individual work scopes (AIA National and AIA California Council, 2007).

8. RESEARCH METHODOLOGY

Not only has the absence of the IPD method, but also the rare knowledge about it in the Sri Lankan construction industry has posed challenges on developing an appropriate research methodology. Since direct empirical verification is not possible, a positivist approach to the research is not become suitable. Thus the researchers selected the alternative approach. For this research, it is assumed that contract documents represent the intentions of industry on the allocation of contractual liabilities among parties at various alternative procurement options. This assumption is unlikely to be found false because standard forms go through a rigorous process of review and refinements. The research will employ content analysis techniques to compare and contrast the allocation of contractual liabilities among parties in conventional practice and IPD set up by analysing standard forms of contract from each group. The researchers will interpret these documents during the analysis, and unclear contexts will be taken to industry experts for clarification where necessary. Thus the research entails interpretivist approach.

9. CONCLUSIONS

IPD is enabled and encouraged by recent developments in technology. Building Information Modelling (BIM) is one of main development technology that offers project managers and firm owners the potential to increase efficiency and create new opportunities. The collaborative environment needed for BIM procuring is offered from IPD as an alliancing project delivery system.

Traditional procurement system dominates in Sri Lankan construction industry even there are different non-traditional procurement systems introduced. Collaborative approaches to project procurement are very rare in Sri Lanka. A concept like IPD is totally a new hypothesis for the local industry. BIM is likely to become the standard in future and the widening global competition will force the local industry to adopt methods like IPD. When introducing integrated project delivery system to the Sri Lankan design and construction industry, changing the industry into new relationships and methodologies could prove difficult. Various and unaccustomed contractual liabilities of participants is one of main challenge caused when implementing IPD since it create a shuffle of contractual liabilities.

The absence of IPD method in Sri Lanka poses practical difficulties in adopting common research methods. An interpretivist approach to the research has been chosen to overcome those.

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