PARTNERING TO BRIDGE THE GAP BETWEEN CONVENTIONAL AND BIM BASED PROJECT PROCUREMENT

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ABSTRACT

Building Information Modelling (BIM), has not yet been used in the Sri Lankan context. It has not yet become a clearly identified and proven standard method in building procurement. As a procurement method, Integrated Project Delivery (IPD) is key contender in BIM implementation process worldwide. But due to the lack of integrated projects in Sri Lanka and the reluctance of professional, changing their methods for the sake of BIM would be impractical. Therefore it is vital to identify the minimum requirement needed, to implement BIM. Partnering is a concept that is also alien to the Sri Lankan context; but is more of the intangible procurement method laid on top of the existing procurement system. This method creates the environment that dissolves the contractual boundaries, enabling working together to achieve mutual as well as individual goals. Therefore it could be used to create the collaborative environment needed for BIM, rather than changing the whole system. Through an extensive literature survey, the characteristics of partnering, including its benefits, barriers were identified. Thereafter the applicability of BIM to the current context was recognized. Then it was discovered of CIC BIM protocol to bridge the contractual gap, that would give out the smallest change required for BIM. Thereafter, the applicability of the BIM protocol and barriers that prevents BIM from implementation in the Sri Lankan context was analysed based on interview responses of the professionals. It was also identified that CIC BIM protocol is not covering all the barriers in concern. With the addition of partnering to the equation it was identified that partnering together with the BIM protocol creates the most suitable environment for BIM implementation in the Sri Lankan context.

Keywords: *Barriers; Building Information Modelling (BIM); BIM Protocol; CIC; Construction; Partnering; Sri Lanka.*

1. INTRODUCTION

Building Information Modelling (BIM) and partnering are two new concepts that are yet to enter to the realm of construction. United States Army Corps of Engineers (USACE) (2010) declares, partnering is there to inspire parties to alter from their traditional confrontational interactions to a more supportive, team-based attitude, and to avoid problems from progressing into disputes. While Kassem *et al.* (2013) explains that Building Information Modelling (BIM) is a developing scientific and procedural change within the Architecture, Engineering, and Construction and Operations (AECO) industry. But the Sri Lankan industry is yet reaping its benefit due to the fact that it had not yet been implemented it. There are number contracts that are used internationally to implement BIM. However the usual resistance to change in Construction Industry, challenges the adoption of these contracts in Sri Lanka. This research was aimed to identify how to bridge the gap between conventional and BIM based project procurement with a minimum change to existing contractual arrangements, so that the resistance to change would become minimum.

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2. BACKGROUND

BIM is one of the methods that can be used for integration of information. Jin and Levitt (1996, cited Coates *et al.*, 2010) said that BIM signify the new basis that is being adopted to make possible Information and Communication Technology (ICT) in the business of architecture design, which is an aggregation of many information interactions between parties.

Jayasena and Weddikkara (2012) added that BIM technology is not yet in Sri Lankan construction industry and since the country has relatively high IT literacy which was also within Architecture, Engineering and Construction (AEC) professionals, it would not be a dare to adopt BIM technologies. However, they alarmed that there would be resistance to change due to overlapping professional boundaries perceived.

Associated General Contractors of America (2005), in 2005 declared that at the time "there was no clear accord, as how to implement or use BIM. Unlike many other construction practices, there was no single document or treatise on BIM that instructs on its application or usage". Six years later, Singh *et al.* (2011) held that, "In the current practice, a customized project instruction document is generally developed to serve as a guide for the project operation." More recently Porwal and Hewage (2013) wrote that "no such methodology, framework, or analysis in public procurement with BIM is available in the published literature". However, the rapid developments occurred in the field has developed several solutions, and the time is needed to validate their suitability and to find challenges within them.

Consideration should be given to the resistance, due to perceived overlapping boundaries of professionals in Sri Lanka by providing a pragmatic solution and also to the need for effective collaboration among parties. No standard form of contract currently being used in Sri Lanka is focused on collaborative approach; and neither the project participants will readily embrace such new contract. A partnering charter would enable them to use the existing contract as a standard, while creating the collaborative environment. Hence, it is timely to find the possibility and methods to bridge the gap between conventional and BIM based project procurement with the help of partnering.

2.1. PARTNERING

USACE in 1991, which, was later updated and reintroduced by Edelman *et al.* (2010) in November 1, 2006, states: "Partnering is a voluntary organized process by which multiple stakeholders having shared interests perform as a team to achieve mutually beneficial goals. It is based on establishing these goals early in the project lifecycle, building trusting relationships, and engaging in collaborative problem solving" . Table 1 depicts those characteristics expressed by Ng *et al.* (2002), Li, Cheng and Love (2000) Edelman *et al.* (2010) and Meng *et al.* (2011).

Table 1: Characteristics of Partnering

Characteristics	Justification
Mutual Goals	The parties to the partnering set goals that both parties agree on.
Shared Interests	The partners agree to mutual targets of the project and shared principles of the partnering relationship.
Commitment	Though the contract is not legally binding, the stake holder must be working together, willingly and making a realistic effort to make the charter become reality
Teamwork	The partnering effort is not a singular participation. It is working together to achieve the mutual goals set forth. Hence the pre-set organisation boundaries are dissolved
Problem Solving	It uses the bottom up method to resolve problems to prevent development of the conflict
Trust	The stakeholder do not hide any details from one another where, the communication between them is open and honest
Synergistic Relationship	Without working as separated entities, the stakeholders pool together their resources in a joint effort. This is very strong, due to the fact that, it can minimize resource wastage,

Characteristics	Justification
	use expertise knowledge.
Continuous Evaluation	The method needs to be continuously evaluated. Thus, adaptation of the method for any dynamic situation is possible
Shared Risk	Partners share the risk of the goals achievement and create collaborative atmosphere to face risk, yet, the responsibilities a kept within the said party.
Equity	The parities of the arrangement are considered equal and their goals, considerations and requirements are mutually addressed
Win/win Approach	It is considered that none of the parties partnering arrangement wins, if, a one party fails to reach their objectives
Freedom and Openness	All the member of each organisation are encouraged to create an open relationship with other organisations. They are to predict, identify problems and resolve them if possible
Innovation	The exchange of new and cooperate ideas to resolve daily problems

2.2. PROBLEMS IN PARTNERING

Problems in Partnering as identified by Ng *et al.* (2002), Bresnen and Marshall (2000), Imrie and Morris (1992), Eisenstat and Spector (1990, cited Bresnen and Marshall, 2000) presented in Table 2 below.

Table 2: Problems in Partnering

Problems
▪ Problem in open and honest communication
▪ Stakeholders development of a win loose approach
▪ Reduced intimacy between partners
▪ Issue not addressed at the beginning
▪ Partners not willing to comprimize their goals and attitudes
▪ Less empowerment of the representatives
▪ Large and traditionally bureaucratic organisation
▪ Lack of technical knowhow of the Employer or controlling party
▪ Financial pressures
▪ Lack of training and guidance in the project partnering arrangement
▪ Use of a competitive tendering arrangement inhibits flexibility
▪ Not involving all the vital stake holders
▪ Partnering is not suitable for a particular project
▪ Reducing the broader view
▪ Different commitment in the organisation

2.3. RESOLVING THE PROBLEMS IN PARTNERING

Ng *et al.* (2002) identified methods to resolve problems in partnering as:

1. Total commitment to partnering arrangement by building required attitudes because it is the main requirement of the arrangement
2. Provide knowledge so that the parties must have total understanding of the partnering arrangement and ensure that other needed qualities achieved through the process of training. The partnering training must mainly target inexperienced parties.
3. Develop non-contractual personnel relationship with the main parties so that it would ensure that all the stakeholder realize the importance of them self and their need in the project.

4. Commitment is key in partnering therefore, encourage every stakeholder to accept the implementation of agreement
5. Encouragement and utilization of flexibility for the stakeholders' organisations and its regulations to benefit the partnering
6. Selection of contractor not only forcing on price but mainly on past performance. Therefore the mutual understanding of the organisations are already in place facilitate better results.
7. Encouragement and empower the representatives of the parties to identify potential problems make decisions at lowest level.
8. Establish independent initiator to the entire project to compensate for lack of experiences of the parties and representatives.
9. Create and establish joint problem solving method to which all the parties agree.

2.4. BIM PROTOCOLS

Many institutes are in production of protocol to incorporate BIM for the existing procurement systems. Construction industrial council have produced a protocol on 2013 February. Which incorporates all the legal boundaries needed for BIM implementation. Construction Industrial Council (CIC) have produced this document to be incorporated into the contracts, between all parties including sub-contractor document. The protocol overlays on existing contracts: both main contract and sub-contracts.

2.5. PARTNERING AS A STRATEGY FOR BIM IMPLEMENTATION

Since partnering is tool that creates a collaborative relationship, it could be the answer to the key BIM challenge that exists. Effectiveness of partnering could be theoretically emphasized using the considering following areas.

Partnering is a collaborative approach that has no legal emphasis; thus, it would not be used as another contract. Therefore, the parties would not reject such an approach. Moreover, partnering sets mutual goals that every party would benefit. Hence, commitment of the parties would be more. On the other hand, setting up of strict rules and conditions to parties who had not used advance a digital setup like BIM would find it hard to swallow. This could lead to rejection of BIM.

Partnering also helps the parties to collaborate resources in creating the singular Federate Model and other Models. This could be extremely helpful for small sub-contractors, suppliers as well as contractor and consultants who are not aware of BIM and could pool resources like experts, software, knowledge and hardware. Partnering draw backs discussed earlier, could be minimized by careful implementation and its success depends on practice than more than the theory.

There should still be certain legal provisions needed for BIM, especially those associated with data sharing and data specifications in the needed phases as stated earlier. Such provisions are not met in common contracts used in Sri Lanka such as, ICTAD Standard bidding document (SBD) and FIDIC Standard biding documents. According to Richard and Jason (2010, cited Porwal and Hewage, 2013), BIM introduces new risks which must be distributed among parties. These include assumption of contribution from a party is accurate, software malfunction and data corruption. Additionally, they describe that intellectual right are there to parties that have produced the documents and transfer of sub licenses to other parties. Finally, Legal provisions should be changed to remove the Information Manager role and divided the responsibility to other parties. Thus, change the BIM protocols' legal provisions could be used suit the partnering approach.

3. RESEARCH METHODOLOGY

The qualitative method was used in this research due to its nature. This involved a desk study of the current document involved in the construction to establish the conceptual premise. The ideology was that, those documents produced by panels of experts, represented the opinion of industry experts. The main

review was conducted on the CIC BIM protocol. Since the areas of the research, BIM and partnering, were not present in the current context, only a few number of local professional were knowing about such systems and only a handful had encountered the capabilities of the systems. Using the desk study findings, a questionnaire was developed to interview the professionals on practical application of BIM and BIM protocol followed by the applicability of partnering in local industry. Transcribed interviews were analysed using content analysis method with the aid of computer software (Nvivo).

4. FINDINGS OF THE RESEARCH

Findings of the research can be presented under four key areas viz. problems in BIM contracts, barriers for BIM implementation, applicability of Partnering, and Partnering and BIM Protocol.

4.1. PROBLEMS IN THE BIM CONTRACT

This BIM contract was produced before the professional and the interview guide had been prepared to address the effects of its salient clauses on the current practice. The problematic areas identified are divided into following sections (shown in Table 3).

Table 3: Problems in BIM Contracts

Section		Explanation
Contractual changes	-	Problems raised due to the new contractual changes
Drawing goals	-	Setting exact drawing goals, with specific details
Information manager	-	New role, duties responsibilities not defined and specified according to project
Subcontractors using BIM	-	Ability of the sub-contractor in Sri Lanka to handle
Sub licences	-	Giving sub licences to others to use drawing models
Transferring problems	-	Problems due to the transfer of the data from one platform to another

4.2. BARRIERS FOR BIM IMPLEMENTATION

In connection with BIM, the respondents were questioned in relation to other factors that would affect the implementation in Sri Lanka. The main factors discussed, and responses are given in Table 4.

Table 4: Barriers for Implementation

Factor		Explanation
Cost	-	The unknown whole life cycle cost has not yet been calculated. Thus it remains a problem
Change for the professionals	-	The professional are not willing to change and the barrier preventing them from change
Age gap and the use copy type	-	The different age group are comfortable with different type of format like hard copies, 2D format 3D format like wise
Incompatibility with the current system	-	There are IT systems that are used construction like BMS systems that would need to change to coordinate integrate with BIM
Uncertainty of the IT system	-	People are have no confidence on the IT system relating to construction
Unavailability of perfect example	-	There is no perfect examples that has implemented BIM
Transparency of the system	-	The increased transparency would create problems
Working in a collective model	-	The collective model would create problems because the need go beyond the strict boundaries

4.3. APPLICABILITY OF PARTNERING

Contracts do not solve all the problems, according as these barriers identified by the professionals. It's therefore referred to partnering to see what are barriers or problems that can mitigated or removed by it. Hence each barrier is discussed separately as follows.

4.3.1. COST

Partnering does not create direct cost reduction to the implementation such as equipment, or transition or maintenance. But since the contracts are dissolved a bit, the total of these cost could be indirectly reduced. For example if the contractor, sub-contractors or consultants are needed to be trained for BIM, there are practical things to learn, which could be learned only by experience. Partnering could be used to reduce cost spent for third party expertise.

Furthermore, they could share resources, same as drawings and information as per BIM, thus change from per entity BIM unit at site to one per site. Therefore we could pool resources to reduce cost per project.

4.3.2. CHANGE FOR THE PROFESSIONALS

Since every professional is somewhat reluctant to change to BIM, it is main barrier holding back BIM in Sri Lankan. When it comes partnering, it is all about working together, to achieve individual as well as project goals, with transparency. This is the platform that is created by BIM, but with less transparency and individual goals achieved.

As forwarded by the professionals, some are running chaotic system to achieve construction goals. Thus applying strict set of rule would not be method to achieve time, cost, quality targets, which are the main reasons for construction, whether it's chaotic or not. Thus partnering in its ambiguous nature could be gel to which the BIM could be stuck. It could be used to ensure trust in the professional, to go ahead with BIM. The consultants and contractors could be flexible towards each other in achieving targets. Furthermore they could help each other in BIM related matters like knowledge, problems, built families. Since they are helping, with the knowledge of the client disclosure is there. Furthermore, it is for the betterment of the project as well as increase in individual entity efficiency and effectiveness.

But this is would only work to the extent partnering is allowed into the system. This could not change the consultants or contractors that are unwilling to change since it is not enforced on each other. It will work as much as they are willing.

4.3.3. AGE GAP AND THE USED COPY TYPE

The age gap would be very much useful if partnering is in play. For example if the professional is young, he would have more IT based knowledge and would probably good in the modelling side. On the other hand more mature professional would have much more experience and better practical error detection that could not be detected by BIM. Thus, they could help each other by pooling this knowledge, experience and skill, whether it's in the same entity of cross entities.

Furthermore, when referring to the above advantages, it could be said that BIM supports, both hard copies and soft 2D and 3D with section from any place. Thus the younger could go ahead with model and do the work, detect problems. The matured could use the hard copies to detect practical problems, not detected by BIM, as well use it for his work. Thus, the mature professional could use the young professionals to insert it to the model, thus mixing the young with matured, like grandparents and grandchildren together.

4.3.4. INCOMPATIBILITY WITH THE CURRENT SYSTEM

Partnering will not solve this problem as it cannot directly change the current practices that local government uses or the current systems like BMS. But, it could easy ease the clash with such professionals, due to partnering. They could come to comprise with other systems or help them to change to BIM. But, the system has to be change to be compatible with public systems when connecting with them.

4.3.5. UNCERTAINTY OF THE IT SYSTEM

Since the IT systems reliability, is not related to construction sector professionals, this could be ensured by a system or the producer and its operators. But for the safety of the project, the professional could keep server copies individual, at interim levels, with each other's agreement. Thus if a system fails, you can go ahead.

4.3.6. UNAVAILABILITY OF PERFECT EXAMPLE

This problem would when it comes to partnering in the construction practice in Sri Lanka as of now. Therefore this could be issue, but there is some kind of practice in Sri Lanka due to the chaotic nature of the system. Thus, this could, theoretically be said it can be done, but practical example creation is a priority.

4.3.7. TRANSPARENCY OF THE SYSTEM

Partnering truly works, if they system is transparent and open. Thus if the parties are not comfortable in transparency then partnering could be problematic to extent. However if the partnering is established, parties are confident and trust the other parties. If partnering is established transparency would not be a problem.

4.3.8. WORKING IN A COLLECTIVE MODEL

As explained in literature and analysed as per the interviews above, BIM a cross cultural collaboration in information storage and working platform. But partnering is more extensive cross collaboration of professional targeted on project goals as well as individuals. Thus if partnering is implemented BIM collaborative model would be supported throughout the project. This would enable client, consultant and contractor excel in BIM, as all want to make it work.

4.4. PARTNERING AND BIM PROTOCOL

As identified before sector, CIC BIM protocol has some issues that are not agreeable to the current construction sector practice in Sri Lanka. Hence forth, impact of partnering should be discussed

Contractual changes would create problematic situation. This is due to the fact it is not used by professional elsewhere and all the problems are detected. But it is imperative that we have contractual changes in practice, because partnering would not create any definite obligations thus, if it fails there must be a backup. Thus the contract must be there.

When discussing about the drawing goals, it is explained that work would be done on time if partnering is there. It is said also work would be effective and efficient as per the literature. Thus it is could be analytically said that practical drawing goals could be achieved if partnering is set, furthermore the buffer needed as per the culture of Sri Lanka could be through partnering.

Information manager would mostly benefit from the partnering agreement as collaboration would at its peak as per BIM. Therefore information manager role would be easier to manage the information as well as the system.

Sub-contractors using the system would get more help from the other professional and would need less costs to bear on BIM as well as would create a sound footing in BIM due to chare of knowledge, experience and skill with the consultants and main contractors.

Sub licensing should be there as is create the footing for contractual authorization to use other model and would most certainly, necessary. This would not come in to contact with partnering.

In the case of transferring of the data, and the issues it create would be mitigated, as per theory of partnering, because without blaming someone or wiping their hands from the problem, the professional would pool resources to find compatibility or transfer data loss. There if an error occur they would mitigate it, at that stage, thus reduces the problems from data transfer error.

5. CONCLUSIONS

According to the findings of the study BIM cannot be implemented with only partnering or a protocol like CIC BIM protocol. It can be concluded that CIC BIM protocol will give out the contractual needs for BIM and partnering will create the collaborative environment needed for BIM. Thus, the gap between traditional contract and BIM based project procurement would be bridged with the help of partnering and CIC BIM protocol.

6. RECOMMENDATIONS

In relation to the finding realised and concluded, following recommendations could be given in order to bridge the gap between traditional contracts and BIM contracts with help of partnering.

6.1. STANDARDS TO LOCAL PRACTICE

In Sri Lanka, the construction industry adopts Standard Bidding Documents published by ICTAD. These documents are based on international standards like JCT and FIDIC. However, there is no standard document yet for BIM, partnering or sub-contracting. The need that local standard document to enable effective BIM implementation could be fulfilled by utilize CIC BIM protocol to develop standards to the local practise. Furthermore, it is recommended that partnering also is introduced to the local scenario, with a standard partnering charter.

6.2. APPLICATION TO THE CURRENT PRACTICE

Since there is no project using BIM in Sri Lankan, it is recommended to implement one project with proper planning and BIM protocol, if possible, to create a practical situation. It is also suggested by the professional to use it for a project, but with proper methods. If not, it could back fire creating fear for BIM.

6.3. INCREASE SKILL, KNOWLEDGE IN THE BIM RELATED ENVIRONMENT

Use of software like Revit or Bentley is not fully understood by the professionals. It is imperative that professionals possess such skill in order to grasp BIM. Therefore it is advised that workshops and training programmes to be conducted by professional bodies to create awareness and the need of BIM to Sri Lanka environment.

7. LIMITATIONS

New concepts are always bound to change with time and expertise in order to refine them. In the process of such development, early identification of limitations becomes a cornerstone. Due to the fact that BIM is a newly developing field in Sri Lankan context the research process encountered the following limitations. Addressing these limitations can help in building a better platform for implementing BIM and partnering in the future.

7.1. NO PRACTICAL EXAMPLES

Setting up an example is always difficult and for that to be a perfect example even more so. The construction industry participants in Sri Lankan are not that much aware of BIM, therefore the responses from professional seems to be more hypothetical. Examples relating to our context are still at their infant age. Furthermore there is no project using partnering in Sri Lanka to identify the practical extent that partnering could achieve in terms of our context.

7.2. UNAWARENESS OF BIM

It was also seen that the professionals were not much aware of BIM. Therefore it could be seen that some professional were reluctant to express their true views due to less knowledge and uncertainty of the situation. Therefore they were introduced as 3D modelling and then explained on the collaborative nature of BIM. Thus the response would depend on the understanding ability of the professionals and their pre-existing knowledge of the issues raised in interviewing.

7.3. UNAVAILABILITY OF COST ANALYSIS FOR BIM

Since the initial cost of BIM is higher, it was key limitation to the research on whether BIM is cost effective. This was needed to create the mind-set need to implement BIM. The cost analysis should be done as Whole Life Cycle Cost with relation to the Sri Lankan context.

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