







14.	Argument on the prolongation costs		✓	1
15.	Lowest price mentality in engagement of contractors and designers	✓		1
16.	No trust between the parties and felt no trust on mediator		✓	1
17.	Too many issues brought to table		✓	1
18.	Delay works due to utility services organization		✓	1
19.	People interruptions	✓	✓	2
20.	Negotiators lacked experience		✓	1

Reference

1-Hohns (1979), 2-Kumaraswamy (1997), 3-Kumaraswamy and Yogeswaram (1998), 4-Sambasivan and Soon (2007), 5-Acharya, Lee and Kim (2006a), 6-Fenn, Lowe and Speck (1997), 7-Hall (2000, as cited in Jafar et al., 2011), 8-Carmicheal (2002), 9-Cheung and Yiu (2007), 10- Jafar et al. (2011)

Table 1 presents the identified 50 causes that create conflict in construction stage. These causes are categorized under main four categories such as, client related causes, consultant related causes, and contractor related causes and common causes. The causes which arises generally are categories under the common causes. Amongst, delay interim payment from client has been identified as critical cause of client with higher frequency of 4. The frequency denotes the number of times the same causes are sighted in the literature. Late information delivery / cumbersome approach to request for information and design and specification oversights and errors or omissions resulting from uncoordinated civil, structural, architectural, mechanical and electrical designs are identified as critical causes created by consultant. Meanwhile, inadequate contractor’s management, failure to plan and execute the changes of work and failure to understand and correctly bid or price of the work has been identified as critical causes related to contractor. However, causes such as poor communication amongst the members of the team was highly sighted and considered most important cause araised under the common issue. Following this RIBA plan of work has been discussed.

**2.2 RIBA Plan of Work**

“The RIBA Plan of Work describes the way a construction process should be organized” (Hughes, 2003). It provides a shared framework for design and construction that offers both a process map and a management tool and developed through its history to reflect the increasing complexity of project, to incorporate increasing and changing regulatory requirements and to reflect the demands of industry (RIBA, 2013). The latest versions of RIBA plan of work are RIBA plan of work 2007 and RIBA plan of work 2013. RIBA plan of work 2007 consist of eleven stages from appraisal to post practical completion. The latest version of RIBA plan of work; RIBA plan of work 2013 has undergone a radical over haul (RIBA, 2013). This plan has eight stages and eight task bars.

Pre contract stage of the RIBA plan of work 2007 would be laid from appraisal to mobilization because signing of the contract would do at the mobilization stage (Cooke & Williams, 2008). In RIBA plan of work 2013 pre contract stage can be identified from strategic definition stage to technical design stage (RIBA, 2013). When considering above two outline plans it obviously shows that the pre contract stage in RIBA plan of work 2007 is more descriptive than the RIBA plan of work 2013 as it has more stages. Therefore this research would propose a pre contract practice which is based on RIBA plan of work 2007.

**3.0 Research Methodology**

A proper literature review was carried out in identifying the causes for conflicts in construction industry. This was followed with a preliminary interview among 3 experts who possessed

experience above 10 years in construction industry each from client, consultant and contractor organizations to investigate the activities in pre contract practices to eliminate the causes. Data was analyzed through a content analysis and a conceptual pre contract practice was developed.

Further a questionnaire survey was employed amongst 38 industry practitioners consisting of 10 practitioners from client organizations, 16 consultant practitioners and 16 contractor practitioners to identify the appropriateness of each practices amongst the four categories i.e. client, consultant, contractor and common related causes. Further, the questionnaire intend to identify the significant activities in the pre contract practices to eliminate the causes for conflicts. Thus, T test was used to analysis the data gathered through the questionnaire survey.

$$t = \frac{\bar{X} - \mu_0}{s / \sqrt{N}} \quad \text{Equation 01}$$

Where  $\bar{X}$  mean importance level given by the respondents for particular perspective or indicator;  $\mu_0$  Mean of the hypothesized population, (2 in this case); **S** Standard Deviation (SD) of the sample; **N** Sample size; **df** Degree of freedom (N-1);  $\alpha$  Level of significance.

Through the t value the significant activities were selected. Then using those activities proposing pre contract practice was refined and proposed to the industry as a conflict avoidance pre contract practice.

#### 4.0 Findings and Discussion

The Table 2 presents the activities of pre contract practice's Mean values, T values and P values to identify the significant activities.

**Table. 2**

<b>Pre contract practices to avoid causes</b>	<b>N</b>	<b>Mean</b>	<b>T</b>	<b>P</b>
<b>Practices to avoid client related causes</b>				
Provide a performance/ payment guarantee of the client to the contractor	38	4.3420	10.6	0.000
Selection of well qualified, competent and people who had done a similar nature project as the design team	38	4.4470	13.83	0.000
Appointing one person to coordinate all the parties of the project	38	4.2630	10.25	0.000
Client has to asses project options in terms of nature of his 'need' and the consequences of satisfying it using project appraisal techniques.	38	4.0260	8.83	0.000
Client has to identify what costs are affordable	38	4.5789	19.45	0.000
<b>Practices to avoid consultant related causes</b>				
Properly identification and clearly understanding of client's requirements and objectives	38	4.6316	20.57	0.000
In the Design Brief include user requirements	38	4.8684	27.82	0.000
In the Design Brief include schedules of accommodation ,	38	2.5000	-2.78	0.996
In the Design Brief include site information,	38	4.6053	16.64	0.000
In the Design Brief include design and material quality,	38	3.7110	3.85	0.000
In the Design Brief include facilities management,	38	3.5000	2.98	0.003
In the Design Brief include environmental services,	38	3.9740	7.03	0.000
In the Design Brief include sustainable development policy,	38	3.3950	2.74	0.005
In the Design Brief include whole life costing ,	38	3.8160	7.72	0.000
In the Design Brief include time table of critical events,	38	3.9470	6.29	0.000
In the Design Brief include target cost/cash flow constraints,	38	4.0530	8.44	0.000

In the Design Brief include procedures, time and cost controls ,	38	4.2630	10.76	0.000
In the Design Brief include professional appointments,	38	3.7370	4.4	0.000
In the Design Brief include partnering,	38	3.9740	5.85	0.000
In the Design Brief include construction procurement,	38	4.4740	14.05	0.000
In the Design Brief include risk, value and quality management policy	38	4.1320	8.98	0.000
Prepare soil investigation report	38	4.3160	10.97	0.000
Send the soil investigation report to the experts and get recommendations for the foundation	38	4.3680	12.5	0.000
Provide sufficient details to the architect to prepare drawings	38	4.7632	25.23	0.000
Prepare specifications according to the drawings of the project	38	4.6579	21.26	0.000
Prepare specifications for each particular project	38	4.5263	15.59	0.000
Prepare the preliminary estimate by a professionally expert and give a realistic figure to the client	38	4.3680	10.29	0.000
Update the preliminary estimate as design develops	38	4.4210	12.14	0.000
Prepare a comprehensive and error free design of structural and building services systems	38	4.5260	13.69	0.000
Have regular face to face interviews with the Architect, MEP engineer and structural engineer	38	4.5000	14.29	0.000
Prepare a 3D model of the design	38	2.9740	-0.18	0.572
Visualize the project using visualization techniques	38	2.9740	-0.21	0.581
Develop specifications according to the client's requirements	38	4.7105	22.94	0.000
Prepare a realistic cash flow forecast which shows cash in and out	38	4.6580	16.3	0.000
Complete the client brief; it should be very clear and in written	38	4.3680	9.55	0.000
Use prefabricated elements in the design	38	2.4210	-4.16	1.000
Clearly specify which material should use	38	4.5263	18.59	0.000
Review and check all the specifications as a whole after preparation	38	4.6842	19.76	0.000
Organize design workshop with architect, structural engineer and services engineer to get together and review the design	38	4.4210	12.14	0.000
Finalize the design	38	4.3420	13.19	0.000
Finalize the specifications	38	4.6579	21.26	0.000
Prepare Quality Manual	38	4.1320	8.98	0.000
Prepare Health and safety policy	38	4.3680	11.82	0.000
Find out all the information regarding the project	38	4.5526	15.91	0.000
Preparation of BOQ using quantities which are taken off from the 3D model	38	2.9740	-0.18	0.572
Use standard method of measurement to take off quantities	38	4.6316	20.57	0.000
Avoid words which have general meanings in the BOQ descriptions	38	3.7630	5.33	0.000
Write BOQ descriptions in a specific manner	38	4.4470	12.32	0.000
If there are any neighboring which has to give special attention and get disturbance avoidance precautions mention them in the BOQ	38	4.5263	16.9	0.000
Engineer goes to the site and get a proper a site investigation before preparing the engineer's estimate	38	4.1840	9.53	0.000
Application for statutory approvals and approvals and get those approvals before handing over the site to the contractor	38	4.7368	23.99	0.000
Prepare tender document with technical works related documents (drawings and specifications) and contract details	38	4.6053	19.98	0.000
Use exact description of the contract. (Which edition, does sectional completion apply, are there any supplements or amendments, etc.)	38	4.6316	20.57	0.000

Insert precise and correct details in the appendices, not just the completion date, but also the insurance provision and other vital data	38	4.4737	15.05	0.000
Include the full text of auxiliary documentation, such as bonds, guarantees, collateral warranties, etc. in the contract	38	4.5263	16.9	0.000
Mention the qualifications and ask for CV's of contractor's management staff which going to appoint in that project	38	3.7370	5.49	0.000
Review and check the tender document as a whole	38	4.8421	30.73	0.000
Evaluate Pre Qualifications of the tenderers	38	4.5530	14.84	0.000
Issue tender document to the selected contractor's through E- tendering	38	2.1580	-5.49	1.000
Give sufficient time to tenderers to bid	38	4.5789	17.64	0.000
Arrange pre bid meetings and let tenderers to send tender questionnaires for further clarifications	38	4.7895	26.7	0.000
Arrange pre tender site visits to tenderers	38	4.7105	20.47	0.000
Set an evaluation criteria specifically to the particular project	38	4.0790	6.67	0.000
Do a comprehensive technical evaluation while doing the bid evaluation	38	4.1320	7.97	0.000
When evaluating check whether the bidder had reached the depth which was expected	38	4.0000	10.82	0.000
Evaluate the resources of the bidder; whether he has sufficient plant and equipment	38	4.3680	13.32	0.000
Check past records, client reference letters and qualifications of the selected bidders before submitting the recommendations to the client	38	4.0530	8.85	0.000
Include full and complete descriptions of the works information; Avoid General statements within the contract; Instead of that set out a complete list of specifications, drawings, questions and answers, etc. that apply	38	4.5789	19.45	0.000
Complete the appendices should be fully and carefully	38	4.3950	12.65	0.000
Attach exact description of the ancillary documents to be referred	38	4.4474	14.83	0.000
All the documents in the contract document should be in line without any laps of information or ambiguities	38	4.7632	25.23	0.000
Use reasonable payment terms in the conditions of contract	38	4.5530	13.96	0.000
The clauses on client's and contractor's responsibilities to control the quality should be very strong and incorporated to the documentation	38	4.6842	22.04	0.000
Clearly state Engineer's responsibilities in the documentation (Eg: No. of test cubes, how many inspections, how to control the quality of the site, etc.)	38	4.6053	18.08	0.000
Mention the evaluation procedure of liquidated damages in the contract document	38	4.8158	28.49	0.000
Mention the evaluation procedure of prolongation cost in the contract document	38	4.6316	20.57	0.000
Give time bar in the contract document to respond for the requests for information (RFI), confirmation of verbal instructions(CVI) and other information requesting forms	38	4.6579	21.26	0.000
Elaborate the clause in the conditions of the contract what are the parameters which would measure the cost of a time extension	38	4.6842	22.04	0.000
Specify the dispute resolution methods in the contract document	38	4.5526	15.91	0.000
Mention the experience of the negotiator and the procedure of negotiations in the contract document	38	3.6050	4.94	0.000
Mention the Adjudicator/s in the contract document with the fee	38	2.8680	-0.87	0.804
Define the completion date	38	4.9474	53.05	0.000
Review and check the contract document as a whole by one person	38	4.6579	21.26	0.000
Provide the sequence and procedure of engineer's inspections and testing	38	4.4737	16.31	0.000

Set a date to give the possession of the site to the contractor after getting all statutory approvals and all authority connections of utility services.	38	4.6053	19.98	0.000
Keep a full copy of the contract for record purposes	38	4.5260	14.55	0.000
<b>Practices to avoid contractor related causes</b>				
Contractor should refer all the drawings, specifications and pricing preambles when pricing the bid	38	4.8684	27.82	0.000
Contractor should identify the work correctly when pricing; send tender questionnaires for clarifications in the tender document	38	4.9211	43.33	0.000
Contractor should attend in pre bid meeting and ask the things need to be clarified	38	4.9737	75	0.000
Contractor should attend in a pre-tender site visit and have a site investigation before pricing	38	4.9211	43.33	0.000
Contractor should refer quality manual and health & safety manual when pricing the bid	38	4.3947	17.36	0.000
Contractor should prepare a realistic program	38	4.9211	43.33	0.000
After client has decided to appoint a contractor the contract should be prepared and as soon as possible	38	4.4210	13.64	0.000
Identify Access restrictions, public disturbances and possibility of night working should at the site	38	3.5790	3.09	0.002
Prepare a program for the pre contract stage; pre contract activities should be properly identified and a reasonable time period should be allocated	38	4.3160	11.56	0.000
Contractor should properly schedule work and material to the project	38	4.6053	19.98	0.000
Contractor should prepare a realistic cash flow which shows cash in and out throughout the project	38	4.6316	20.57	0.000
<b>Practices to avoid common causes</b>				
Enter all the information of the project to Building Information Modelling to eliminate communication errors	38	4.8684	33.62	0.000
Any purpose written amendments should be attached to the contract as they are expressly incorporated.	38	3.5000	4.04	0.000
Identify the sequence of the project according the scope of the project	38	4.5789	19.45	0.000
Preparation of the project program	38	4.7105	22.94	0.000
Identify scope of each task and allocate reasonable duration for each task	38	4.6316	20.57	0.000
Find out the alternative materials which can be used	38	4.1840	9.53	0.000
Do Value Engineering to select elements and materials among the alternatives	38	3.9740	8.38	0.000
Do a crack survey and find out the details about neighboring buildings	38	3.2370	1.18	0.123

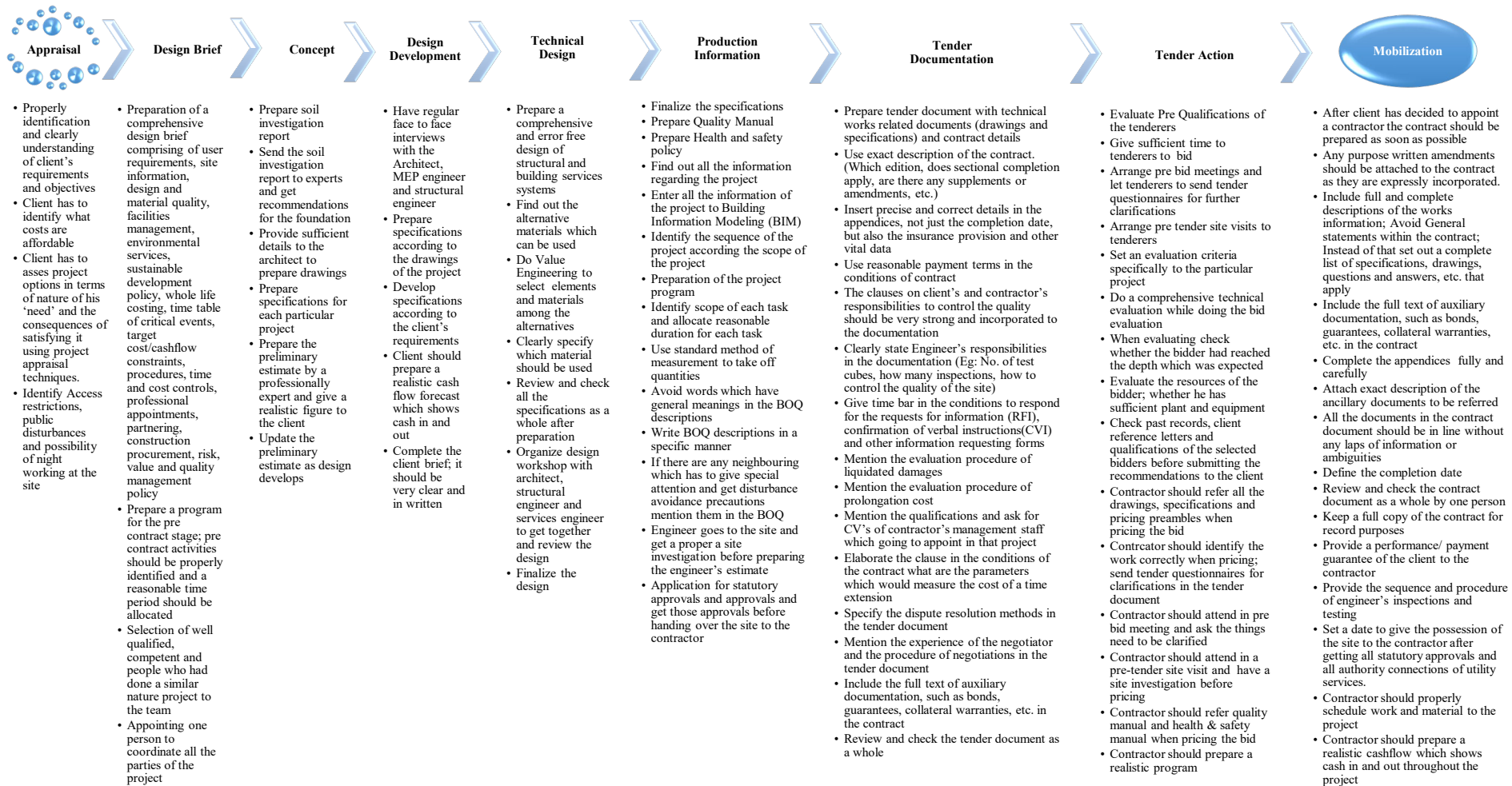
Throughout literature 50 causes were identified which create conflict in construction process. Pre contract stage activities were identified through expert survey. Then, conceptual pre contract practice were proposed and surveyed through questionnaire in order to identify the significant of activities and correct placement in the RIBA plan of work. There were only 18 proposed activities were found as not in the appropriate stage in RIBA plan of work. Then when selecting the appropriate work stage for those activities, the majority's opinion given by respondents in questionnaire survey was considered.

Subsequently, above identified 105 activities in pre contract practice to eliminate conflicts in construction stage has been assessed through questionnaire survey in order to identify significant activities in pre contract practice and verify the order assigned for each task in RIBA plan of work 2007. According to above test result 97 activities were selected which were having lesser p values than 0.025 and eight activities having higher p values than 0.025 were eliminated such as, In the Design Brief include schedules of accommodation, Do a crack survey and find out the details about neighboring buildings, Prepare a 3D model of the design, Visualize the project using visualization techniques, Use prefabricated elements in the



design, Preparation of BOQ using quantities which are taken off from the 3D model , Issue tender document to the selected contractor's through E- tendering, Mention the Adjudicator/s in the contract document with the fee. Remaining other all pre contract activities reject null hypothesis by accepting the alternative hypothesis. Hence those eight pre contract activities were removed and others were selected to propose the pre contract practice which avoids conflicts at the construction stage.

Further, literature identified 50 causes which are created by client, consultant, contractor and common factors. Amongst, the higher number of causes are identified in common factors. Which could be created by either parties or third party. However, among these 20 common causes "Poor communication amongst the members of the team" was identified significant and rest 19 common causes were rarely cited in the literature. Nonetheless, to eliminate common causes 8 practices were suggested in which enter all the information of the project to Building Information Modelling to eliminate communication errors was identified significant with a mean value of 4.8684. Next high number of causes were identified in terms of consultant in which to eliminate 82 number of practices were identified in which define the completion date was significant. Similarly for the rest of the two client and contractor causes, appropriate practices were suggested to eliminate such causes. Further the Figure 1 categories the practices among the RIBA stages and proposes a framework to integrate the practices to eliminate the causes in construction.



## 5. Conclusions

The construction industry is a place where conflicts are inevitable because multi-disciplinary parties are involved. Thus this study identified 50 causes which creates conflicts in the construction projects through a literature review. Accordingly 105 activities in the pre-construction stage which would eliminate the above identified causes were identified and carried forward to a questionnaire survey. Thus, 97 activities was identified as significant and refined pre contract practice was proposed through RIBA plan of work to avoid conflicts in construction stage. Contractor should attend in pre bid meeting and ask the things need to be clarified, Contractor should prepare a realistic program, Contractor should identify the work correctly when pricing; send tender questionnaires for clarifications in the tender document, define the completion date are identified as important practice among all identified practices through survey. Anyhow, all of these practices need to follow in each stage of RIBA plan of work throughout the pre contract stage to avoid the conflicts in project construction stage.

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