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Risk-based Contract Management on the Design and Build Construction to Minimize Disputes in Infrastructure Projects

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Abstract. A poor contract management is considered the main cause of disputes in construction contracts. While dispute in a project oftenly unavoidable, it is however can be minimized by applying a proper contract management which should be in line with the project's nature. A common understanding to the roles and intricacies of the contract will lead the involved parties in the project to be open to negotiate, hence produces a better construction contract in a balanced manner. This study aims to determine the management phases in the construction contracts in which incorporate the approach of input, process, output, risk and impact. All activities in every phases of the contract management will be identified for it influence to dispute. The findings will suggest a strategic management strategy that is manageble in minimizing dispute in construction industry.

1. Introduction

Infrastructure project is aimed to facilitate and cover community needs, government as its owner or sometimes private parties that is granted a concession from the government, thus requires specific attention in administer its phases especially in terms of social and regulatory aspects. Nevertheless the target of the massive-planned infrastructure development have been defined, some calls for innovation on current methods applied for effectivity in achieving its framed goals. One of the issues is to review the application of the methods in the contract agreement. Infrastructure projects often use a design and build contract that is an arrangement of contract in which the design and construction part are made as an unseparated contract of the project [1-[2]. The concept of the contract management is a process in construction industry in which the phases of the construction works are deemed for its appropriateness and detailed activities at each stages of construction are defined, that is the phase of input, process, and output of the construction project incorporated. Whereas poor contract management has been suggested as one of causes of dispute on the construction projects, previous studies also considered it as the main trigger of dispute in the construction industry over the years [3]. Nevertheless, to put some efforts thus to understand the nature of contract, the involved parties whether the project owners, contractors, and consultants may negotiate for better and balanced contract agreement, hence could minimize the dispute among them during the project implementation. The activities at each phases of the contract management should be identified in such ways, so that reflects possible strategies to minimize dispute on the design and build infrastructure projects [4].

Contract management defined as an activity to manage a contract agreement in a proper manner so that the document of agreement can be used as guidance of control of the project work. Design and build contract is the contractual arrangements in which the design and construction phase are presented on one document of contract, thus not separate the design phase of a project and its construction phase into different contracts. Contract management includes [5-6]:

1. Preparation for contracting;
2. Developing contract for project guidelines;
3. Contract as a means of project control;
4. Administering and recording as it is drafted, as guidelines, and as a controlling tool of the project.

Dispute determined as a non-conformities circumstances between parties that are going into or in an agreement for partnership and thus to cooperate. In the construction industry, it may occur between two or more parties; it generally takes a very long time to be resolved, and it has a high complexity. Eventhough the parties had mutually agreed to each other on a partnership agreement. In this regard, dispute between parties usually occurs at the project implementation phase of the construction contract [5]. There are three causes of dispute on the construction contract, which are (i) caused by behavior, (ii) caused by contractual term, and (iii) caused by technical.

2. Methodology

In order to justify study problems on the introduction chapter, an initial review on literature conducted that is to formulate study problems and thus to framed the research question. Furthermore, in-dept studies were run in order to find proper methods in achieving the research objectives that have been set previously. A set of questionnaire was also distributed to respective respondents at the initial phase of the research, and their responses have been collected. The questionnaire applied was closed questionnaire using Likert scale, and conducted in four stages as the following in Figure 1:

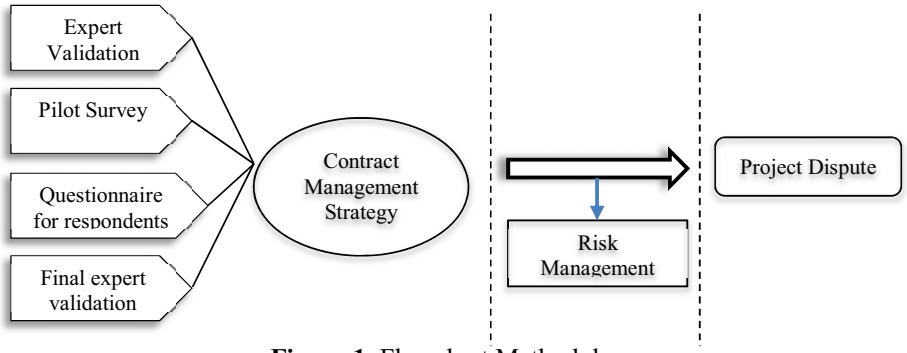

Figure 1. Flowchart Methodology

The variables in this research consist of sub-activity in design and build contract management in infrastructure projects considered affects the dispute and risk factors of the sub-activity. The suggested results were analized by performing Relative Importance Index (RII) in order to determine the ranking of the most influential sub-activities on the dispute. While, as for the results of risk factor variables, risk analysis was applied to justify the highest risk of the factors which influence to dispute on design and build contract management in infrastructure projects. For analysis purpose, validity and reliability tests were applied for the validity of the questionnaires responses. While, correlation and regression tests used to see the relation and effect of the independent variables to the dependent variables.

3. Result and Discussion

Based on the findings of the literature study, there were 118 variables of sub-activity with its risk factors on the design and build contract management on infrastructure projects that affects the dispute. Following the first stage of the Initial Expert Validation performed to five relevant experts, 103 variables were approved as the sub-activity with its risk factors. The 103 variables were applied for the Pilot

Survey and Respondents Questionnaire. Furthermore, those variables were tested by running the Validity and Reliability tests followed by the RII analysis to determine the ranking of the most influential sub-activity to the dispute. After Final Expert Validation as its last stages, there are nine top ranking thus suggested as the most influential sub-activity on dispute. Table below indicates those nine most influential sub-activity on the dispute based on the Final Experts Validation stage.

Table 1. The Most Influential Sub-activity to the Dispute

Rank	Sub Activity
1	Signing the contract
2	Detail Engineering Design (DED) arrangement
3	Obtaining initial information
4	Internal meeting to follow-up the initial information
5	Developing pre-design proposal/conceptual design
6	Preparing quotation
7	Issuing the first hand-over report
8	Ensuring the amendment order are officially in writing
9	Ensuring the return of warranties

Based on the results obtained from the above qualitative risk analysis, there are four sub-activities which then identified as high risk factors, which will be further analized for its causes, possible preventive actions, impact and its corrective action. These will be analized following the Final Expert Validation stage. From the identified preventive and corrective actions, there were actions that considered as the new sub-activities thus will be incorporated to the design and build construction contract management strategy in order to minimize dispute on the risk-based infrastructure projects. In addition, from 103 identified risk factors from all sub-activity on the design and build contract management that affect the dispute which analized by risk analysis, there were initially 11 high risk factors determined on the design and build contract management sub-activities on the infrastructure projects. These 11 sub-activity then also validated by the experts through the data collection of stage four; Final Experts Validation, that resulted ten high risk factors from the sub-activity on the design and build contract management that affect the dispute, as listed on the table below:

Tabel 2 . Rangking of High Risk Factors to the Dispute based on the Final Expert Validation

Rank	Risk Factors
1	Inaccuracy in Detail Engineering Design (DED) arrangement
2	Misintepretation or failure reviewing draft contract/agreement
3	Misunderstanding or misperception in signing the contract
4	Inaccuracy in proposing quotation
5	Inaccuracy, failure and incomplete data in reviewing the contractual aspects of claims or anti-claims
6	Inaccuracy, insufficient preparation of prerequirements, and incomplete data or evidence for claims or anti-claims documents, including its chronology duly signed by service users, engineer, and contractor
7	Uncooperative attitude from service users, or contractors negligence to obtain an official amendment order in writing
8	Failure to obtain initial information
9	Improper development of the proposed technical proposal
10	Disagreement in negotiation of the draft of contract

The results of design and build construction contract management strategies to minimize dispute on risk-based infrastructure projects were then validated by experts through the final interview. The following new sub-activities as the outputs are added to the contract management.

Table 3. Recapitulation Data as the Final Interview Result

No.	Sub-activity	Output
1	The acquisition of the land is entirely the service user's responsible	Prove of acquisition of the projects' sites, including its utility are fully under service user's responsibility.
2	Preparing work insurance	Professional Indemnity Insurance (PII) and Contractor's All Risk insurance (CAR).
3	Conducting a full review to tender documents comprising all related functions comprehensively	A thorough and comprehensive tender document report reviewed by related team with its relevant functions.
4	Provide detailed and thorough information to top level management regarding opportunity and risk of the contract when it signed	Detailed and complete information to the top management about the opportunity and risk of the contract and its follow-up action plan.
5	Referring to company database	To having reference for similar work which uses the design and build contract, as well as other types of work.

Based on the research findings, it was suggested four processes of construction design and build contract management that will minimize dispute on infrastructure project from contractor point of view: contract planning, contract formation, contract administration, and contract monitoring. It can be concluded that there is no significant difference in the phases of construction contract management, either on conventional construction project or on design and build. The differences were only on activities undertaken in each processes and kind of activities need to be considered in carrying out those activities.

3.1 Activities on the Process of Construction Contract Management on Design and Build that Affects Dispute on Infrastructure Projects

The results of the RII analysis which further finalized by the experts pointed that there are nine sub-activities o the design and build construction contract management which influence the dispute. Below are those nine sub-activities and discussions about the results of its validation:

a. Signing the contract

According to the experts, sub-activities of signing contracts can affect the dispute when the signed contract is not well understood by the contractor or involved parties. There also circumstances when contractors are forced to sign an unbalanced contract due to various considerations.

b. Detail Engineering Design (DED) arrangement

In the nature of design and build contract, contractors are requested to prepare the DED before the construction starts. According to the experts, this activity in its practice is very prone to cause dispute between parties. Problems that usually arise in this sub-activity are: lack of competence in DED where contractors have no experience on the design and build project; incomplete and inaccurate data of the project sites either provided by the service users at the time of tender or by the contractor after the commencement of work; contractor failed in interpreting employer's requirement; late of design approval from service user; different level of understanding about the design between involved parties. Incomplete and inaccurate data about the project sites is the most common problem on infrastructure project due to the nature of the infrastructure project that requires more adequate and sufficient field surveys. Hence, this sub-activity becomes very critical thus influential on the design and build contract

since it can lead to a dispute between contracting parties, and therefore has great potential to cause an enormous impact for the contractor, such as cost overrun, time overrun, rejected by the users, even design failure.

c. Obtaining initial information

According to the experts, the sub-activity of obtaining early information affects the dispute as at this stage the contractor has to consider the project feasibility, at the same time has to decide whether or not to continue the participation in the tender. In the event of failed in obtaining sufficient information, it can be ascertained that contractors will experience losses due to aspects that are not taken into account in their offer.

d. Internal meeting to follow-up the initial information

Conducting internal meetings in order to decide the follow-up action of the initial information is also suggested to have an effect on the dispute. This is due to at this stage the decision to go or no go have to be made. This stage must also involve all related functions within the organization with all its competence and responsible person to authorize and decide.

e. Developing pre-design proposal/conceptual design

Sub-activity of developing pre-design proposal/conceptual design is also an activity that affects the dispute. At this point, however is then determine the next phase, namely preparation of DED, on which will bring direct impact of DED quality, price and time. Failure at this stage will automatically cause errors on DED that will, however cause dispute with the service users and lead to contractor losses and even the design failures.

f. Preparing quotation

On the design and build contract, the most ideal price offer is made in the form of cost center. Whereas the bidder does not include the volume in their offer to service user than the costs for each work items or lumpsum for each work items. This is also, however indirectly affirmed in FIDIC in which grouping the design and build contracts by lumpsum payment. Nevertheless, the experts indicated this sub-activity as one of the most influential on the dispute since in general the design and build contract uses the lumpsum payment method. The price stated in the bid is suggested very important because it will be considered as the contract price without any re-measurement of volume proposed. Thus, it is strongly advised in the process of calculating price offer, the working methods of the service user's and contractor's rights, scope of work, project duration and the project funding must be clearly defined.

g. Issuing the first hand-over report

Still according to the experts, the sub-activities of issuing the first hand-over report (BAST I) has an effect on the dispute. In the matter of fact, however, at this stage the dispute between parties is often occurred. Problems that usually arise at this stage includes when the BAST I has been issued, but there are on-processes of the unfinished claims. This circumstance however will cause the contractor's claim be void due to the BAST I document has issued, while the service user may use the constructed facilities eventhough there still dispute with the contractor. Hence, before the BAST I is prepared for issued, the contractor must first make sure that all related matters resolved.

h. Ensure the amendment order is in official writing

To avoid any problems that end up as dispute with the service user, the contractor should also make sure that all work orders from the service user, including any of its amendment, are properly provided in official writing. Should there are any oral commands given by the service user, the contractor needs to confirm in writing to the service user. Thus, the amendment of order will be officially recorded.

i. Ensuring the return of warranties

Ensuring the return of warranties is an activity that the contractor needs to undertake in running the construction contract management.

3.2 Contract Management Strategy on Design and Build Construction to Minimize Dispute on Infrastructure Projects

The design and build construction contract management strategy to minimize dispute on infrastructure projects begins by identifying risk factors from all sub-activities to the follow-up of causes, preventive

actions, impacts and corrective actions on the high risk factors of the most influential sub-activities against dispute. From the identified preventive and corrective actions, it is determined which actions can be incorporated as the new sub-activities of a design and build construction on risk-based infrastructure projects. The new sub-activity in the construction contract design and build strategy to minimize dispute on the project presented below.

a. The acquisition of the land is entirely the service user's responsible

It is undoubtly that the total acquisition of the land as the project site is fully under the responsibility of the service users. This is nevertheless one of the most important on the construction contract management to minimize dispute, particularly on infrastructure projects. This sub-activity is carried out in the early stages of the tender and should be recorded in minutes of explanatory notification/Berita Acara Pemberian Penjelasan (BAPP), and duly signed by involved parties.

b. Preparing work insurance

Preparing work insurance is also an activity that needs to be considered and implemented as for the uncertainty and risks in construction projects, in particular on design and build projects. In this regard, eventhough the contractor's all risk insurance (CAR) commonly used on conventional contracts, however it is also necessary to insure the design work to mitigate the occurrence of design errors, i.e. with the Professional Indemnity Insurance (PII).

c. Conducting a full review to tender documents comprising all related functions comprehensively

In response to the risk of errors in reviewing tender documents, it is necessary to ensure that the review is conducted by all relevant teams in a comprehensive manner due to the broud aspects that need to be considered in preparing the offer. In this case, the management team needs to make policy and appoint appropriate person in charge, thus the review of this tender document can be conducted thoroughly, i.e. to coordinate among functions so the risk of missing work and in quantifying the contractor's offer can be avoided.

d. Provide detailed and thorough information to top level management regarding opportunity and risk of the contract when it signed

According to the expert, in the event of a policy or circumstance in which the contractor have to sign an unbalanced contract, team member is obligated to review the drafted contract and the tender team shall provide detailed and complete information to the top level management about the opportunity and risk of the contract; if it is signed.

e. Referring to company database

In minimizing the occurrence of failure in the design and construction work, it is necessary for the contractor to have reference by seeking the company database for similar work previously implemented uses the design and build contract, as well as other types of work. This is urged to avoid similar problems that may occur on the related projects. The Project Manager and the Management Team are expected to coordinate with the project team and other departments to find out what issues are faced in handling the design and build contract.

4. Conclusion

From all of design and build construction contract management process, there are thirteen variables of activity that affects to dispute. The RII analysis result which has been validated by the experts suggested nine sub-activity variables as the most influential on the design and build contract management. In addition, the study result indicated that there are four high risk factors from the most influential sub-activities to the dispute:

- Detail Engineering Design (DED) arrangement
- Signing the contract
- Preparing quotation
- Obtaining initial information on the project.

From this point, the follow-up on the causes, preventive action, impact and corrective action then defined. The identified preventive and corrective actions were then incorporated as the new sub-activity to the design and build construction contract management. While there are five new sub-activities for

the design and build construction contract management strategy based on follow-up results of risk analysis, the result can then be regarded as a risk-based contract management strategy on design and build construction to minimize disputes on infrastructure projects.

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