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Common Contractual Behaviour of Key Participants in Civil Engineering Projects

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Abstract: The delivery of civil engineering projects in Malaysia largely has been beset by cost overrun, schedule delays, shoddy workmanship. Previous studies have replete that most of the problems which hinder the project success is related to the unfavourable contractual behaviour of the project key participants who do not adhere to and comply with the terms of the contract in project implementation. Hence, the purpose of this paper is to investigate the factors that hindered the success of civil engineering projects focusing on the aspect of contractual behavior of key participants. The objective of this study is to determine the common contractual behavior of key participants in civil engineering projects in Malaysia. The data of this study was obtained from professional civil engineer registered with Board of Engineers Malaysia (BEM) and Grade G7 contractors registered with the Construction Industry Development Board (CIDB) via a questionnaire survey. Based on the result from 288 questionnaire survey, this study highlighted five (5) contractual behaviour of key participants which all this while hindered the civil engineering project success. They were the delay of interim payment, delay of contractor's work progress, delay of issuing project information, ineffective communication between engineer and contractor and unauthorised instructions. The severity of contractual behaviors' occurrence is important to be empirically researched to understand the contractual root causes that largely affect project performance and eventually can comprehensively be placed more concerned for improvement for future projects.

Keywords: Civil engineering, contractual behavior, delay, key participants

1. Introduction

Civil engineering structures are very important to a country for social and economic development support. Therefore, the performance of civil engineering projects has always become a concern of the government. Unfortunately, there have been many critics in the delivery of civil engineering projects in Malaysia where many civil engineering projects have been beset by cost overrun, schedule delays, shoddy workmanship and conflict among key participants (National Audit Department Malaysia 2012, 2016; Ismail, 2015; Utusan Online, 2014; Sinar Harian, 2012; Adnan et al., 2012; Quay & Ting, 2009; Deborah & Kamini, 2008). Since civil engineering structures traditionally are the responsibility of government, the unsatisfactory performance of delivered projects has tarnished the public's trust towards the accountability of the government and failed to deliver facilities as promised to the citizenry.

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2. Literature Review

Due to many key participants and their respective organisations involved in a construction project, the need for a contract is paramount to ensure good integration and cooperation among themselves in implementing the project. Thus, each of all the key participants must adhere to what is stipulated in the contract during project implementation. The compliance of the contract not only smoothen the project implementation but can avoid conflict among them. Hence, inthe context of this study, the term 'contractual behaviour of key participants' is referring to an action or conduct of a key participant towards other key participants of the project based on what is stipulated in the agreed contract. In other words, the contractual behaviour of project key participants can be referred to what extent the contract has been implemented by the people who make the decision by the contract (Abdul Aziz, 2012).

2.1 The Common Contractual Behaviour of Key Participants in Civil Engineering Projects

In the construction performance-related studies, it is found that many scholars used contractual behaviour of key participants' variables such as delay of payment (Zhang et al., 2016; Lee & Azizan, 2012; Ye & Abdul Rahman, 2010; Mohd Danuri et al., 2006), poor communication among consultant and contractor (Jaffar et al., 2011; Ahmed & Othman, 2013; Ling et al., 2013; Zhang & Fan, 2013; Sambasivan & Soon, 2007), client's direct instruction towards contractor (Abdul Aziz, 2012; Rahmat, 2008), delay of contractor's work progress (Jaffar et al., 2011; Cheung et al., 2008; Sambasivan & Soon, 2007; Alaghbari et al., 2007) and delay of giving instruction and information (Zhang et al., 2016; Cheung et al., 2008) as among the factors influencing construction project performance. This shows that the research on contractual behaviour has long been explored in the construction management field where most of them associated the contractual behaviour with construction project performance. Unfortunately, all the contractual behaviour variables are isolated, and all of the aforementioned scholars do not refer or group those variables as contractual behaviour of key participants. Hence this study attempts to fulfil this gap by grouping all the aforementioned variables as contractual behaviour of key participants that affect civil engineering project performance.

2.1.1 The Communication Effectiveness of Contractor and Engineer

The skill of communication among project participants is among contributing factors to the performance of project positively or negatively (Jaffar et al., 2011; Ahmed & Othman, 2013; Ling et al., 2013; Zhang & Fan, 2013; Sambasivan & Soon, 2007). Communication skills are the ability to conduct effective communication among the project participants in order to smoothen the project implementation (Zhang & Fan, 2013). The skill of communication of the engineer is paramount as the engineer acts as the leader in the project implementation team. In the Traditional procurement method, the engineer represents the client and is the leader and coordinator of the design team. According to Yu & Shen (2013), the communication skill of the engineer is very critical for good integration of the participants in implementing the construction projects. In addition, he is responsible for making sure that the planning phase of a project contains complete task definition, resources, time schedule, and a list of requirements, which the engineer must conduct through clear and effective communications. On the other hand, good communication skills by the contractor isalso critical in this type of procurement method since the designs are prepared by the design team. In ensuring the smoothness of the construction process, a good understanding of the design is paramount. Therefore, it requires the good skills of the contractor in communicating with the design team. Subsequently, the main contractor must ensure theinformation flows efficiently to the numerous subcontractors' organizations. In addition, it is vital in civil engineering projects because of the involvement of large numbers of subcontractors compared to general building projects.

2.1.2 Delay of Interim Payment

The purpose of the interim payment is to ensure that the contractor is regularly paid throughout the progress of construction works, thus helping to maintain the contractor's cash flow and minimising the contractor's cash deficit which may affect the smoothness of project implementation (Judi & Abdul Rashid, 2010). Hence, a smooth and timely interim payment is among the critical factors emphasize by many researchers in achieving project success such as El-adaway et al. (2016), Nurul et al. (2016) and Adnan et al. (2012). Unfortunately, literature is replete with payment issues which eventually causes conflict among contractor and client such as in Jaffar et al. (2011), Cheung et al. (2008) and Cheung & Yiu (2006). Similarly, Barough et al. (2013) highlighted that late interim payment is a substantial factor that could lead to disputes in the Malaysian construction industry. As cited in Hamzah et al. (2011), Harris and McCaffer defined delay in interim payment as a failure of a client to make payment to the contractor within the period of honouring of certificates as stated in the contract. Likewise, Judi & Abdul Rashid (2010) stated that the client is considered to have delayed or failed to pay the contractor when the contractor does not receive payment after 3 to 5 consecutive periods of the interim certificate. Thus, delay in the interim payment issue occurs when the client takes a

longer time than the time frame stipulated in the contract to issue the payment to the contractor. From the perspectives of contractors in Malaysia, Abidin (2007) found that delay in paying interim payment was the main factors of payment disputes. This is supported by Sambasivan & Soon (2007) who stated that inadequate client's finance and delay in payments for completed work will cause total construction delay due to the slow in construction progress. Similarly, thecivil engineering project also faced a payment problem. For instance, the Rawang Bypass Project experienced 2132 days' delay and with an additional budget of RM390m as reported by the National Audit Department Malaysia (2016). The delay in making interim payment to the contractor was among the contributing factors to the project problem that requires attention by the industry.

2.1.3 Delay of Providing Project Information

Delay of issuing project information such as drawings and instructions is one example of unfavourable contractual behaviour of engineer in project implementation and has been reported by many scholars as one of the factors causing disputes and unsatisfactory construction project performance as reported by Zhang et al. (2016) and Cheung et al. (2008). Zhang et al. (2016) and Krima et al. (2007) argued that late approval of drawings and late in giving instructions are the common factors that caused disruption to the regular progress of the construction project. Atout (2016) had the same opinion by stating that the delay in providing necessary drawings due to changes of the contract document, late approval and supervision as well as the late agreement with the contractor highly cause a delay in handing over the project to the client. According to Bakhary (2019), the delay in providing necessary drawings, instructions and approval are within the responsibility of the client/engineer and therefore, the contractor becomes entitled to time extension as well as monetary compensation for the direct loss/expense incurred by him because of such delays. Unfortunately, the responsibility of proving the delay in the approval of drawings, designs or part work completed by the employer is cast on the contractor. This is not an easy task because for claiming an extension of time (EOT) as well as damages the contractor has to provide documentary evidence supporting his claim (Bakhary, 2019). The failure to provide sufficient proof or evidence that the critical path method has suffered irrecoverable delays due to the delay in issuing project information from the engineer may cause rejection of the EOT application. This highly causes dissatisfaction and conflict between contractor and engineer/client which eventually affect project performance. Thus, the failure of providing timely project information by the engineer/client is an unfavourable contractual behaviour in the project implementation that leads to dissatisfaction and conflict due to the unfair deal where the delay is made by the engineer but the responsibility to prove the delay is cast on the contractor. Thus, indirectly affects the project performance.

2.1.4 Delay of Contractor's Work Progress

In reviewing the literature on the aspects of time overruns in construction projects, prevalently can be found that most of the factors that mainly lead to the construction project time overruns are the delay in the contractor's work progress (Jaffar et al., 2011; Sambasivan & Soon, 2007; Alaghbari et al., 2007; Lo et al., 2006). Indeed, the progress of the contractor's works on site whether ahead or delay is determined by comparing with the work program prepared by the contractors before the commencement of work on site with the actual work progress on site. Othman (2009) stated that, in the construction process, a program is usually produced to record the sequence of work which is called a work program with the purpose to assist the contracting parties as well as the project key participants to plan and manage the construction process. For any types of construction projects, the progress of the construction process on site is very critical to be closely followed according to the approved work program to avoid the occurrence of any delay. This requires the contractor to proceed regularly and diligently with the performance of his obligations under the contract. Hence, the construction activities that duly obey the sequence and time allocated in the approved work program is very critical and lead to the success of a construction project. Therefore, the frequency of delay of contractor's work progress on civil engineering project is important to be researched and to what extent it will create dispute among the key participants and impacts the project success.

2.1.5 Unauthorised Instruction

Contractually, the contractor must obey all authorised instructions by the S.O or engineer and in the event that the contractor fails to obey them, the contractor can be charged as a breach of contract (Rajoo et al., 2010). However, due to the complexity and uncertainty that characterised the civil engineering projects, this may cause the S.O or engineer to issue an instruction that beyond his empowerment under contract in reacting to any issue needed in the project implementation. In fact, Clause 2.1 which refers to the authority of the engineer stipulated under FIDIC give more power and authority to the engineer in resolving many issues that may arise during implementation. In order to ensure the smoothness of civil engineering project implementation, Lina (1997) stated that the engineer has the authority to eject any unruly workers from the construction site, to carry out the initial protective measure on archaeological discoveries on site and to secure any remedial works necessary for the safety of the works. Unfortunately, this broad- spectrum authority given to the engineer will lead to dispute because of conflict in

determining the 'tiny line' between authorised and unauthorised instruction. This is because, contractually, the contractor does not have the obligation to obeying the unauthorised instruction by the engineer. In fact, if the contractor continues doing so, he will be considered a breach of contract (Chappel et al., 2005). This is a critical issue commonly disputed among the contractor and the client.

3. Methodology

According to Rajoo (2010) the contract in a construction is entered into between the client and contractor to carry out types and quantities of work or supply materials involving building, refurbishing, repair, maintenance or demolition of building and other structures. This shows that regardless whether building or civil engineering projects, the contracting parties of the projects are the client and contractor. Therefore, the views of both contracting parties must be taken into consideration. However, even though the civil engineering project contract is entered into by client and contractor, in practice all the management of its implementation is carried out by the consultant civil engineer. Therefore, despite the client suitability, engineer was found to be more suitable as respondent than the client due to the role as contract administrator and presenting the client in public and private work projects.

Once the total population of respondents in this study was identified, next, the sample size for the data collection process must be determined. According to the Peck et al. (2008), sample size is an important feature of any empirical study in which the goal is to make inferences about a population from a sample. Since the total population of this study was large, it would be time consuming and not economical to conduct this research involving a total of 4151 numbers of respondents. Therefore, this research adopting a questionnaire survey as one of the data gathering method was carried out only on the sample from the total population. Once the data collected and statistics were calculated from the samples, then inferences and extrapolation can be made and generalized to represent the total population. Hence, the size of the sample was important. This study estimated sample size was 255 out of the 4151 eligible target population with a confidence level of 90% and a 10% margin of error. This was calculated using an automated software program named Raosoft sample size calculator which can be accessed via http://www.raosoft.com/samplesize.html. This sample size calculator has been used by many researchers in various field of studies to calculate the sample size of their research such as Alpak et al. (2015), Al-Bitar et al. (2013) and Al-Qazaz et al. (2011). It was also used in a similar field of study as this research for example Desa et al. (2012) and Araujo et al. (2019), hence showing that the sample size calculation is rationale and reliable for this study.

Next, the pilot questionnaires were distributed with 30 questionnaires to contractor's firms and 30 questionnaires to consultant engineer's firms to confirm the content of the questionnaire and to ensure it reflected the real scenario of the industry. Then the reliability test was carried out on the 38 returned questionnaire by calculating the Cronbach's coefficient alpha value. The overall Cronbach alpha value was 0.802. This means that all questions in the questionnaire received coefficient alpha values more than 0.70, which indicates acceptable reliability. Therefore, the result of the reliability test verifies that all variables in the study demonstrate internal consistency and the questionnaire survey could be carried out to all targeted respondents.

Subsequently, the process of gathering data proceeded by administering 1000 questionnaire survey to Grade G7 of CIDB's listed contractors and certified professional civil engineers registered under The Boards of Engineers Malaysia (BEM). A five-point Likert scale was used to determine the common contractual behaviour of key participants in civil engineering projects with values on the scale as follows: 1 as "very low", 2 as "low", 3 as "moderate", 4 as "high" and 5 as "very high".

In order to determine the ranking of each variable, the Mean Score (MS) was computed using the following formula:

$$\mathrm{MS}ii = \sum(ff \text{ x } SS)/NN$$

where, S was the score given to each variable by the respondents, ranging from 1= never to 5 = very frequent; f was the frequency of the responses to each score for each variable; N was the total number of responses for that particular variable; and i was for the respective variables.

Hence, factors with mean scores between 4.00 and 5.00 are considered as having high frequent occurrence contractual behaviour of key participants in civil engineering projects (Shehu et al., 2014, Adedokun et al., 2013 and Nguyen et.al., 2004). Meanwhile, the factors with mean values from 3.00 to 3.99 are considered as having moderate occurrence. While for the factors with mean values less than 3.00 are considered as low occurrence.

4. Result and Discussion

4.1.1. Respondents' background

The response rate of this survey was 29% consisting of 137 engineers and 151 contractors representing 48% and 52% of total respondents respectively (Table 1). 88% of engineer respondents were civil engineers and the remaining 12% were managers. Meanwhile, the majority of respondents representing contractor organisation was quantity surveyors (74%), followed by civil engineers (13%) and managers (13%). Based on the result, all respondents' posts

were at the executive level suggesting that the data gathered in this study came from reliable sources because the respondents were at the forefront of project execution. In addition, as indicated in Table 2, the majority of respondents have wide experience managing and constructing civil engineering projects where 51% of engineer respondents and 46% of contractor respondents have experience of more than 10 years. While 49% of engineer respondents and 46% of contractor respondents have experience between 6 to 10 years. Only 12% of contractor respondents have experience between 2 to 5 years.

Table 1 - Types of respondents

Types of Respondents	Frequency	(%)
Engineer	137	48
Contractor	151	52
Total	288	100

Table 2. The background of respondents

Respondents position in their organisation		Manager	Civil Engineer	QS	Total	
Engineer	Frequency	17	120	0	137	
	(%)	12	88	0	100	
Contractor	Frequency	19	20	112	151	
	(%)	13	13	74	100	
Year of experience in CE projects		**< 2 years**	**2 to 5 years**	**6 to 10 years**	**>10 years**	**Total**
Engineer	Frequency	0	0	67	70	137
	(%)	0	0	49	51	100
Contractor	Frequency	0	12	69	70	151
	(%)	0	8	46	46	100

4.1.2 The Common Contractual Behaviour of Key Participants in Civil Engineering Projects

Following the interpretation of the five-point Likert scale, the analysis of the survey data as shown in Table 3 indicated that out of the mean scores for the five (5) contractual behaviour of key participants rated by overall respondents, only delay of interim payment seen to have high occurrence in civil engineering projects with the mean value of 4.04. Delay of contractor's work progress (M = 3.78) was ranked as the second common contractual behaviour of key participants with moderate-to-high occurrence in civil engineering projects. The third, fourth and fifth were the delay in issuing project information (M = 3.42), ineffective communication between engineer and contractor (M = 3.37) and unauthorised instructions (M = 3.27) respectively with moderate occurrence.

Table 3 - Contractual behavior of key participants in civil engineering projects

Common contractual behavior of key participants	Overall		Engineer		Contractor		Mann-Whitney U *Sig. p*
	Mean	Rank	Mean	Rank	Mean	Rank	
Delay of interim payment	4.04	1	4.01	1	4.07	1	0.250
Delay of contracor's work progress	3.78	2	3.89	2	3.68	2	0.000*
Delay of issuing project information	3.42	3	3.34	3	3.5	3	0.006*
Ineffective communication	3.37	4	3.34	4	3.4	4	0.280
Unauthorised instruction	3.27	5	3.17	5	3.36	5	0.000*

Delay of Interim Payment

Delay of interim payment was the highest contractual behaviour of key participants that occurred in civil engineering projects. The result is expected because when payment is due under the contract is delayed or of lesser value than anticipated, the contractor's financial position suffers, and this may affect the overall project's implementation. The delay of payment will also subsequently affect the percentage of claims and regular progress of works, thus affecting the quality of the end product of civil engineering projects. According to Aziz & Abdel-Hakam (2016) and Yong & Mustaffa (2012), regardless of civil engineering or building projects, many construction projects experienced delays of interim payment by the client. Badroldin et al. (2016) and Safri (2009) added that this issue usually experiences in public projects.

In their study on the issues of late and non-payment in the construction industry in Malaysia, Mohd Danuri et al. (2006) found that local cultural or attitude and disagreement on the valuation of variation are at the first and second ranking of causes of a payment delay. Besides the local culture and attitude of the participants, the result of their study finds that when there is a higher percentage of variation order, it will increase a higher claim to be made by the contractor. If there is disagreement with the amount, it would cause a higher level of conflict and dissatisfaction of the contractor on the valuation of variation. In the end, it will risk the overall performance of the projects. Since civil engineering projects usually face uncertainty on site surroundings as well as unpredictable ground condition, the possibility of incurring variation works is high. Thus, the instruction to variation works, the impacts of variation, valuations of the variation works as well as the claims of the variation works must be properly conducted by adhering to that of what is stipulated in the Standard Form of Contract. This would be as a mitigation action to avoid problems of delay or non-payment on the contractor’s works.

Delay of Contractor’s Work Progress

The result of this study shows that the delay of a contractor’s work progress was the second-highest contractual behavior that occurred in civil engineering projects. Basically, the progress of the contractor’s works on site is determined by comparing with the approved work program prepared by the contractors before the commencement of work on site with the actual work progress on site. Once the work program has been approved by the S.O/Engineer, thatapproved work program will be referred to for monitoring and coordinating the construction work on site. For any type of construction project, the progress of the construction activities on site is very critical to be closely complied with the approved work program to avoid the occurrence of any delay. In reviewing the literature on the aspects of time overruns in construction projects, it can be found that most of the factor that mainly leads to the construction project time overruns is the delay in the contractor’s work progress (Jaffar et al., 2011; Cheung et al., 2008; Sambasivan & Soon, 2007; Alaghbari et al., 2007). This shows that the compliance of the contractor to proceed the work on site with the approved work programme is critical to ensure project success.

Delay of Issuing Project Information

Delay of issuing project information was the third-highest occurrence of contractual behavior of key participants incivil engineering projects that must be placed more concern by the industry player. This is due to many scholars who argued that delay of issuing project information such as drawings, specifications or instructions from the consultant is among the factors that contribute to unsatisfactory performance such as Emam et al. (2015), Alaghbari et al. (2007) andSambasivan & Soon (2007). Due to the uncertainty and complexity in civil engineering project ranging from the condition of ground and site area up to a variety of stakeholders involved as well as the level of urgency to start the civil engineering projects, the design of most civil engineering projects sometimes is not complete and have to undergo revision from time to time until the completion of the projects. Hence, the delay of issuing project information such as the revised drawings and specifications to some extent in civil engineering projects cannot be avoided. Indeed, this issue is real and dominant in civil engineering projects where a delay of design submittal from engineer usually due to inadequate design, design error as well as redesign due to variation works.

Ineffective Communication Between Engineer and Contractor

Ineffective communication between engineer and contractor was ranked as the fourth contractual behaviour that commonly occurred in civil engineering projects. Since the characteristics of civil engineering projects are complex andfull of uncertainties, communication of both engineer (as well as other consultants) and the contractor is crucial in translating the constructed design. It becomes more critical if the design for the projects is not fully complete when the project starts on site. Poor communication can and often mean a lack of cooperation in the interpretation of design documents. Moreover, most civil engineering projects involve large numbers of subcontractors where the projects are usually subcontracted into a number of work-packages. Therefore, good communication between the engineer and contractor is highly critical to avoid misinterpretation of design documents to smoothen the flow of information to the subcontractors. Thus, the communication barriers such as failing to communicate and physical walls between engineer

and contractor should be removed.

Unauthorised Instructions

The fifth contractual behaviour of key participants that commonly occur in civil engineering projects was unauthorised instructions. The result of this study found that the occurrence of giving and obeying unauthorised instructions by key participants was at a moderate frequency. Due to the complexity and uncertainty characterised by the civil engineering projects, this may cause the engineer to issue instructions beyond his empowerment under contractin reacting to any issue needed in the project implementation. Besides, due to the broad-spectrum authority given to the engineers in most Standard Form of Contract (Lina, 1997), it will, to some extent, lead to dispute because of conflict in determining the 'fine line' between authorised and unauthorised instruction. This is because, contractually, the contractor does not have any obligation to obey the unauthorised instruction by the engineer. If the contractor continuesdoing so, it will be considered as a breach of contract (Chappel et al., 2005). This is a critical issue that results in disputes mostly among the contractor and the other key participants.

5. Conclusion

This research embarked on the assumption that a successful civil engineering project would be possible if all key project participants duly comply with the conditions of contract in implementing the project. Unfortunately, based on the aforementioned finding and discussion, the delay of interim payment was the most common contractual behaviour of key participants occur in civil engineering projects in Malaysia. It was followed by the delay of contractor's work progress, delay of issuing project information, ineffective communication between engineer and contractor and unauthorised instructions. All of these undesirable contractual behaviours of key participants that empirically found commonly occur in civil engineering project have the possibility of hindering the project success. Hence, they must be put more concern by the industry player and solution must be provided to reduce their occurrence in order to ensure the delivery of a good performance of civil engineering projects in Malaysia.

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