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Factors Contributing to Delay of Interim Payment in Civil Engineering Projects

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Abstract. Delay of interim payment remains a chronic problem in the Malaysian construction industry and has relatively increased in number in recent years. Other than causing conflict among the contracting parties, the impacts it brings could shatter the entire delivery chain. Thus, the unfavorable contractual behavior of the client is a matter of great concern that should be addressed by all parties involved to ensure satisfactory project performance. However, research has revealed that the factor causing it is not solely because of the client's faults but also caused by other factors. Therefore, the purpose of this research is to determine the factors that lead to the occurrence of delay of interim payment in government-initiated civil engineering projects in Malaysia. The perceptions of civil engineer consultants and contractors were compared in relation to a list of factors derived from the literature review. The data were collected through an industry-wide questionnaire survey from 288 respondents. This research developed a list of 22 items that might influence the delay of interim payment based on four domains, namely project characteristics, quality of Standard Form of Contract (SFoC), external factors and participants and local attitude. The results found that the occurrence of delay of interim payment in civil engineering project is very high frequency. Correlation analysis performed revealed that the three major factors are positively correlated, namely project scope and design changes, ground uncertainty under the project characteristics domain, and bureaucracy in government agencies under the participants and local attitude domain. These results can help the project participants to better understand the relationship between the groups of factors and the delay of interim payment and encourage them to find solutions or implement mitigating actions to improve the outcomes of civil engineering project.

Keywords: Civil engineering; Construction; Delay; Payment; Standard form of contract

1. Introduction

Interim payment is among the critical factors emphasized by many researchers in achieving project success (Ismail and Adnan 2020; El-adaway *et al.,* 2016; Jatarona *et al.,* 2016; Adnan *et al.,* 2012). In fact, interim payment can be considered as the 'blood' of the contractor in the construction process. The purpose of the interim payment is to ensure that the contractor regularly paid throughout the progress of construction works, thus helping to maintain the contractor's cash flow and minimizing the contractor's cash deficit

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which may affect the smoothness of project implementation (Judi and Rashid, 2010). In addition, the interim payment is important to the contractor due to the high investment made by the contractor at the preliminary stage of the construction process. Besides, the received interim payments enable the contractor to finance his expenditures, such as payment to material suppliers, workers' wages, rental of plant and equipment, and other payments in relation to the implementation of the project.

Unfortunately, the literature is filled with examples of payment issues that often lead to conflicts between contractors and clients. Some notable studies highlighting this issue include (Ismail and Adnan, 2020; Jaffar *et al.,* 2011; Cheung *et al.,* 2008; Cheung and You, 2006); Kumaraswamy, 1997). In Malaysia, for instance, based on the study done by Abidin (2007) from the perspectives of contractors found that delay in paying interim payment was the main factor of payment disputes. Besides, Sambasivan and Soon (2007) argue that inadequate client finance and delay in payments for completed work will cause slowness in construction progress, which eventually leads to a total construction delay. Similarly, civil engineering projects also face payment problems. For instance, the Rawang Bypass project and the Upgrading of the road project from Batu to Pancur Hitam Project in Labuan were reported that the delay in making interim payments to the contractor was among the factors that contributed to the project problems (Auditor's General Report, 2016).

In Malaysia, PWD 203A SFoC is commonly used for government-initiated civil engineering projects, while FIDIC SFoC is generally used for projects involving international contracts. Both PWD 203A and FIDIC stipulate that when the Contractor completes or executes the works, interim payment should be made to the Contractor. However, Clause 28 of PWD 203A requires the S.O. to evaluate the works carried out by the Contractor and assess the value of unfixed materials and goods delivered to the site before issuing the interim certificate. Commonly, the contractor will participate in the valuation process. Within 14 days after the valuation date, the S.O. shall issue the Certificate of Interim Payment (CIP) stating the amount to be paid to the contractor by the client. Next, the payment will be made by the client within the stipulated date in the Appendix of the contract. If there is no date stated in the Appendix, the payment must be made within 30 days after the date of issuance of CIP to the contractor. Unfortunately, under PWD 203A, the contractor is not entitled to suspend work as a remedy for late payment by the client. In fact, PWD 203A does not include any specific grounds for the suspension of work by the contractor or for slowing down the progress of the works. Furthermore, the options available to the contractor in such situations are limited. The contractor can either choose to continue with the construction until completion and then proceed with arbitration after practical completion or terminate the employment under the contract based on common law principles. Consequently, this matter creates dissatisfaction among contractors in Malaysia who contracted under PWD 203A, where the delay in payment by the government as the client under this type of contract is prevalent in this industry.

The impacts of delay of interim payment by the client could be very severe to the overall project implementation. (Safri, 2009; Sambasivan and Soon, 2007) are certain that problems in paying regular interim payment are among the reason behind project delays. They highlight that most contractors really depend on regular interim payment throughout the progress of works to maintain the project cash flow. Hence, interruption in receiving regular interim payments causes the contractor to slow down construction activities by cutting out the number of workers and other resources. If this goes on without any means of overcoming it, it could lead to project abandonment. Besides, payment issue is a common nature of disputes in the construction industry. In his study on 72 numbers of Malaysian contractors, Abidin (2007) found that delay in interim payment was identified as one of the

main causes of payment disputes in the Malaysian construction industry. Recognizing the fact that delay of interim payment has the possibility to have severe impacts on overall project performance, hence, this study attempts to investigate the problems of delay of interim payment in the civil engineering project and the factors affecting it. It is hoped that if this issue is properly understood, it can make delay of interim payment problems less likely. After reviewing the literature on the subject matter, this study considers the project characteristics, external factors, Quality of Standard form of Contract (SFoC), and the attitude of the project participants as the influencing factors that could lead to the occurrence of delay of interim payment in civil engineering projects. Under the four aforementioned domains, there were twenty-two variables found as the possible factors affecting the delay of interim payment to contractors as shown in Table 1.

Table 1 Factors affecting delay of interim payment

Possible Factors Affecting the Delay of Interim Payment		Reference
Project Characteristics	Project scope and design changes, Ground uncertainty, Project complexity, Site Surrounding problems, Site access, Level of design completion before the project start, Scope definition before a bid is invited, project type, project size, procurement method, type of SFoC.	Ismail et al., (2022), Tereshko and Rudskaya (2021), Riazi and Nawi (2018), Alfakhri *et al.,* (2018), Guo *et al.,* (2016)
External Factors	Bureaucracy in government agencies, Weather conditions, Technological advancement, Resource availability.	Ismail and Adnan (2020), Riazi and Nawi (2018), Yong and Mustaffa (2012), Sambasivan and Soon (2007)
Quality of Standard Form of Contract	SFoC details the right and obligations, SFoC fairly shared risks and liabilities, Clarity of SFoC, Trust produced by SFoC.	Rameezdeen and Rodrigo (2010), Ali and Wilkinson (2010), Chong and Zin (2010)
Participants and the Local Attitude	Poor in understanding the content of SFoC by participants, Poor cooperation in solving problems by participants.	Ismail *et al.,* (2022), Alfakhri et al., (2018), Shehu *et al.,* (2014), Ahmed and Othman (2013), Alkhamali *et al.,* (2010)

2. Methods

Following a critical review of the literature on characteristics of projects, external factors, quality of SFoC, and participants and local attitudes, a list of 22 factors causing a delay of interim payment was developed, which forms the focal point of this study. The target population of this study was the contractor who carried out the construction process and the civil engineer who led the consultant team in managing civil engineering projects. This study conducted a questionnaire survey inviting respondents (Table 2) to determine factors that they deemed to be major causes of delay of interim payment from the perspective of G7 contractors and civil engineer consultants who have experience dealing with civil engineering projects in Malaysia. The list of respondents was obtained via the Board of Engineers Malaysia (BEM) and the CIDB Malaysia websites. The questionnaire was divided into two sections: the first section asked the characteristics of the respondents, as summarised in Table 1, and the second concentrated on the factors causing a delay of an interim payment. These factors were measured by using a series of five-point Likert scales where (5) denotes very high influence, (4) high influence, (3) moderate influence, (2) low influence, and (1) very low influence. The twenty-two factors were randomly arranged and presented for assessment in this way to determine which of them has a significant influence on the delay of interim payment. The frequency distribution method was used to present the profile of the respondents and the frequency of delay of interim payment occurrence in

civil engineering projects. Then, a Mann-whitney U analysis was conducted to ascertain if there exists any statistical variation between the mean values (between the Contractor and Engineer involved) computed for the level of occurrence of delay in interim payment. Next, the factors causing a delay of interim payment were determined using Spearman correlation coefficient analysis.

Prior to distributing the questionnaires, a pilot survey was carried out on a smaller scale of targeted respondents, which involved 10 civil engineer consultants, fifteen G7 contractors, and five academicians in verifying the completeness (Sambasivan and Soon, 2007), content, and face validity of the research instrument (Fan and Yan, 2010). The sampling method used in this research was non-probability convenience sampling using the convenient and snowball methods. This approach is similar to the methodology used by (Shehu *et al.,* 2014; Sambasivan and Soon, 2007), where the questionnaire was distributed to individuals who were friends or relatives working in civil engineer consulting firms and G7 contractor firms. They in turn distributed to their friends who are qualified to participate in the survey. This method was successful in obtaining a large number of completed questionnaires economically in a very fast way. In fact, Shehu *et al.* (2014) argue that this method is preferred when it is difficult to acquire responses from statistical sampling.

3. Results and Discussion

3.1 Demographic background

The estimated sample size of this study was 255 which was calculated using Raosoft sample size calculator for the 4151 eligible population. Out of 1000 questionnaires distributed, only 288 were received from the respondents (response rate 29%) and they were subsequently analyzed using SPSS 20. 137 responses were received from the Engineer, while 151 were from Contractors. All of respondents participated were at executive level. 49% of respondents have more than 10 years' experience dealing with civil engineering project, 47% of respondents with 6 to 10 years' experience while only 4% have 2 to 5 years' experience. Meanwhile, 90% of respondents have experience in road/highway, 14% on railway, 35% on bridge, 13% on drainage/canal, 9% on tunnel, 5% on port, 19% on airport and 6% on dam projects. As depicted in Table 2, most of the respondents have experience dealing with civil engineering projects with more than RM 50millions project size. 75% of respondents' project mostly used traditional procurement method while the rest 25% respondents used Design and Build method. Majority of respondents' project used PWD 203A type of SFoC while 21% and 4% respondents mostly used PWD DB and FIDIC with modification respectively in their most projects. The result of reliability test was 0.888 (Cronbach's coefficient value). This means that all questions in the questionnaire received coefficient alpha values more than 0.70, which indicates good reliability. Therefore, this verifies that all variables in the study demonstrated internal consistency.

Table 2 Response rate and demographic data

Types of organisation	Response received	(%)
Engineer	137	48
Contractor	151	52
Total	288	100
Respondents' position	Response received	(%)
Manager	36	12.5
Civil engineer	140	48.61
Quantity surveyor	112	38.89
Total	288	100
Years of experience in civil engineering projects	Response received	(%)
Less than 2 years	0	0
2-5 years	12	4
6-10 years	136	47
More than 10 years	140	49
Total	288	100
Project type	Frequency	(%)
Road/highway	259	90
Railway	39	14
Bridge	101	35
Drainage/canal	36	13
Tunnel	26	9
Port	14	5
Airport	56	19
Dam	17	6
Procurement method	Response received	(%)
Traditional	217	75
Design and Build	71	25
Total	288	100
Types of SFoC used	Response received	(%)
PWD203A	216	75
PWD DB	61	21
FIDIC with modification	11	4
Total	288	100

3.2. Delay of Interim Payment by Client

Table 3 depicts the overall frequency of delay in paying interim payments to contractors rated by all respondents. The results indicate that a majority of contractors in civil engineering projects face late payment from clients. Specifically, 33% of the respondents rayed a high frequency of late payments, while 65% rated frequent occurrences in their projects. Based on the Mann-U Whitney result in Table 4, there was a significant difference (p-value < 0.05) in the level of occurrence of delay in interim payment rated by both types of respondents. With an overall mean value of 4.04, this can be concluded that the delay of interim payment problems in civil engineering projects was quite severe. This finding was accorded with Mohd-Danuri *et al.* (2006), who compared the delay in payment problem faced by contractors between public and private projects from the contractor perspectives, where 80% of respondents face late payment in government projects. While only 60% of them face late payments in private projects. It is supported by Safri (2009), who states that the slow payment of completed works is among the common

complaint among contractors particularly in public work projects. Since the government-initiated civil engineering projects was the scope of this study, the finding was in line with the authors 'earlier finding that many governments project faced delay in payment based on both Engineer and Contractor perspectives. Based on 288 responses which exceed 255 required sample size, this finding could be generalized that government-initiated projects, regardless of whether they are building projects or civil engineering projects, mostly face delays in interim payment.

Table 3 Frequency of delay of interim payment by client

Delay of payment by client	Frequency (No)	Percentage (%)
High frequent	96	33.3
Frequent	187	64.9
Neutral	5	1.7
Low frequent	0	0
Never	0	0
Total	288	100

Table 4 Mean score of delay of interim payment occurrence

Delay of interim payment by client	Overall	Engineer	Contractor	Mann-U Whitney *Sig.P*
	Mean	Mean	Mean	
	4.04	4.01	4.07	0.025

3.3 Significant Factors Affecting Delay in Payment

Since the data collected in this study is nonparametric and ordinal variables, the powerful method of examining the relationship between pairs of variables is by using Spearman's correlation (Bryman and Cramer, 2005). Hence, Spearman correlation coefficient tests are carried in this study to determine the significant factors that influence the delay of interim payment based on correlation value coefficient (or "ρ") value. The closer ρ is to +1 or -1, the more closely the two variables are related, hence shows the strength on their relationship. The strong relationship indirectly means the factor has significant influence on delay of payment.

As tabulated in Table 5, out of 22 correlations, only 8 were significantly correlated. The other 14 factors had no correlation. However, based on the Correlation Coefficient (r) value, 5 of them (out of 8 significant correlation) were weak to be associated with affecting delay in payment. They were poor in understanding the content of SFoC by participants, poor cooperation in solving problems by participants, project complexity, SFoC details the right and obligations and SFoC fairly shared risks and liabilities.

The other three factors that significantly correlated to delay in payment were project scope and design changes (r = 0.547), ground uncertainty (r = 0.419) and bureaucracy in government agencies (r = 0.388) which the strength of relationship were between week to moderate. This could be concluded that the influence of all of the above factors towards delay of interim payment was limited where based on the correlation coefficient (r) value only project scope and design changes, ground uncertainty and bureaucracy in government agencies have significant influence on delay of interim payment.

Table 5 Factors affecting Delay in Payment

Factors Affecting Delay of Interim Payment	Correlation Coefficient	Sig. (2-tailed)
Project scope and design changes	.547**	0.000
Ground uncertainty	.419**	0.000
Bureaucracy in government agencies	.388**	0.000
Poor in understanding the content of SFoC by participants	.188**	0.001
Poor cooperation in solving problems by participants	.185**	0.001
Project complexity	.161**	0.06
SFoC details the right & obligations	.159**	0.001
SFoC fairly shared risks & liabilities	.147**	0.011
Site Surrounding problems	0.08	0.169
Site access	0.039	0.507
Level of design completion before project start	0.085	0.144
Scope definition before bid is invited	-0.032	0.584
Changes in government regulations and laws	0.21	0.724
Weather condition	0.037	0.527
Technological advancement	-0.022	0.705
Resource availability	0.038	0.513
Clarity of SFoC	0.064	0.274
Trust produced by SFoC	0.107	0.066
Project type	-0.39	0.47
Project size	0.012	0.823
Procurement method	-0.071	0.222
Type of SFoC	-0.058	0.311

**p<.001 (2-tailed)

3.3.1. The effects of project scope and design changes on delay in payment

Due to complexity and uncertainty that prevalently characterized civil engineering projects, the changes are difficult to be avoided. However, when there so many design changes or project scope changes, there would be more unforeseen problems resulting to, many interpretations which might not be covered in the Standard Forms of Contract. Undeniably this could introduce variation works (Guo *et al.,* 2016) whether involve additional works beyond the original scope or omission of parts of original scope. Most of the time, this make rework or redesign work cannot be avoided and this process involve a lot of negotiations between contracting parties to reach agreement. The worst is that the payment on the variation works done usually will not be released until the agreement has been reached. Besides, the other problems brought by the introduction of variation work also could be severe. As argued by Hao *et al.* (2008) changes in construction project could create conflict especially in terms of payment. They revealed that the client blamed for bid shopping and for playing tricks in payments in most of variation works. Likewise, contractor's attitude in claiming over billing, front-end loading and playing change-order games could create dissatisfaction. All of these, eventually prolong the payment claim resolution.

3.3.2. The effects of ground uncertainty on delay in payment

Payment on time concerns the timeliness of payments by the client and in fact, could create a good relationship between both contracting parties. However, in high-uncertainty projects like civil engineering projects, it is often challenging to fulfill on-time payment to the contractor to a certain extent. This is due to most civil engineering projects, for instance, roads, railways, tunnels, and bridges, involving large geographical areas; hence the ground condition could be unpredictable. The uncertainty in ground conditions significantly contributes to changes in the original design or, in some cases, even leads to alterations in

the original project scope. These changes, most of the time, introduce variation works (Ke *et al.,* 2015; Kumaraswamy, 1997). Oladapo (2007) outlines several impacts of variation works on contractors due to variation works such as adversely affecting labor productivity, material wastage due to changes in original design and planning, and marginalizes project quality. All of these matters need quite some time to be resolved and agreed upon by the contracting parties. Unfortunately, these unresolved problems hold up payments in most cases until agreement by all parties is achieved.

3.3.3. The effects of bureaucracy in government agencies on delay in payment

The bureaucracy of government agencies has long been a critique and dilemma by all industry players, not only complicating the process but, to some extent, could delay the construction projects. Similarly, the bureaucracy also found in this study significantly causes delays in payment. This might be due to multilevel approval needed to be acquired before the interim payment could be released into the contractor's bank. This might be true indeed when Ren *et al.* (2012), in their study of public projects in Ghana, complained that the bureaucracy in processing payments is outrageous. They added that the contractors were frustrated with the bureaucracy, which involves over 30 steps from invoicing to the release of the payment cheque. In the context of Malaysia, several scholars have also acknowledged that excessive bureaucracy within government agencies contributes to the delay of interim payment. This observation is supported by studies conducted by (Judi, Mustaffa, and Nayan, 2017; Ye and Rahman, 2010). In fact, not only the multilevel procedures must be undergone for the payment process, but the attitude of officers in the government agencies who delay the process makes the problems worst. This situation worries the local contractors as they need a timely payment to finance the project implementation.

4. Conclusions

Civil engineering projects require major investment outlays in most developing countries like Malaysia, yet most construction projects in this country are characterized with unsatisfactory performance in terms of quality, time and cost overruns as well as conflict among the project participants. One of the contributing factors to the unsatisfactory performance replete in literature is delay of interim payment and the finding of this study support this literature statement where the result shows that the level of occurrence of delay of interim payment was very high. This finding supports the previous studies finding that the government-initiated projects regardless whether building projects or civil engineering projects, mostly face delay of interim payment. Hence, this matter must be put more concern by all industry players. On top of that, a firm project definition and scope and a comprehensive design are very important to be well developed before the construction starts since the result shows that this factor contribute significant influence on delay of interim payment. Similarly, concerns must be put during site and soil investigation at the onset to reduce the impact of unpredictable ground condition. Likewise, the bureaucratic red tape must be reconsidered because the findings found that this significant as well in causing the delay. Besides, the quality of SFoC (in terms of fairness and completeness) and attitude of participants also must be put more concern to reduce the delay. These factors, if properly addressed, are likely to reduce or completely eliminate the delay of interim payment problems.

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