

A Comparative Study Of Construction Project Delays In Plain Terrain And Hilly Region

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Abstract- A timely completion of construction project is a major criterion of project success. Failure to complete the project on time will ultimately results in delay. The need to control the causes of delays during the construction process comes out when the number of delay project has been increase from time to time. Hence, it is essential to identify the causes of this problem from the early stage of construction project. The objectives of this study are to study the causes of delay in term of frequency occurrence and severity effect, and finally to identify the methods available to minimize construction project delays. A questionnaire survey was conducted to identify the significant causes of delay in order to avoid or minimize their impact on construction project. The perspective of contractors, consultants and client has been analyzed and ranked based on Relative Important Index (RII). A comparison of frequency occurrence and severity effect on the delay causes was done between Plain Terrain and Hilly Region. The study established that there were unlike results on the pattern of significant delays causes in both regions. Respondents in believe that ‘contractor’s financial problem’, ‘poor subcontractor performance’ and ‘shortage of manpower’ are the major causes of delay in construction project. Meanwhile, ‘poor site management and supervision’, ‘slowness of client decision making’ and ‘slow payment of completed work’ are the major concern from the respondents’ point of view in Sabah. Finally, appropriate project management practices are thus identified to curb the significant causes of delays in construction projects.

I. INTRODUCTION

GENERAL

Many problems may arise during construction project implementation; one main concern is delay. Delay is the time overrun either beyond completion date specified in a contract, or beyond the date that the parties agreed upon for delivery of a project (Assaf and Al-Hejji, 2006). There are many reasons that cause delays. According to Ogunlana (2008), although the principle reasons for delays are comparable across developing countries, several factors pertaining to local industry, social-economic, cultural issues and project characteristics also contribute to delays. Delays may occur as a result of the actions or inaction on the part of owner, contractor, subcontractors, consultants or the government. In addition,

delays are always interrelated which led to the more complicated situation. Delays in construction projects are considered one of the most common problems causing a multitude of negative effects on the project and its participating parties. Along with delay, the frequently faced consequences are project failure, reduction of profit margin, and loss of belief of citizen in government funded projects, etc. When delays do occur, they are either accelerated or have their duration extended beyond the scheduled completion date. These are not without some cost consequences. Delays also give rise to disruption of work and loss of productivity, late completion of project increased time related costs, third party claims, abandonment and termination of contract

In conventional approach, this extra cost is included a percentage of the project cost as contingency in the pre-contract budget (Aibinu and Jagboro, 2002). Akinsola (1996) cited common practice allow a percentage of project cost as a contingency allowance in the contract price and this allowance is generally based on judgment. There is a room for improvement in present practices for keeping track of delays. This research is carried out to study the causes and the severity effects on the delay causes arising during construction phase of projects. In addition, the result of this research would lead to recommendations aimed at reducing the impact of delay. If construction delays can be avoided or mitigated, there could be substantial financial savings on projects.

Other main driver of its economy was the construction sector particularly in both commercial and residential properties (Sabah Budget Speech, 2009). In year 2008, Malaysian Federal Government have allocated about RM2.37 billion to the state for Sabah Development Corridor (SDC) projects. SDC is believed as a commitment from the government to boost up the development and economy of Sabah to a renowned level (Utusan Malaysia, Aug 2008). Regarding these problems, Malaysia government has acknowledged the construction delays and cost overruns problems as the big headache, especially with government-related funded projects. Minister of Public Work Department, Datuk Shaziman Abu Mansor, cited about RM200 million have been provide for the construction industry to revive most of abandoned government projects under Economic Stimulus Package (Utusan Malaysia, May 2009). Based on the findings, researcher can generate the appropriate recommendations

aimed at reducing the impact of delays. It also believed that the study would clarify and thus create an awareness of the extent to which delays can adversely affect project delivery.

II. METHODOLOGY

In achieving these objectives, a research methodology is required. Figure 1.1 highlights the critical stages of conducting this study. This figure comprises four essential stages of conducting the study which includes the following:

- Literature review
- Main survey
- Analysis Data
- Conclusion

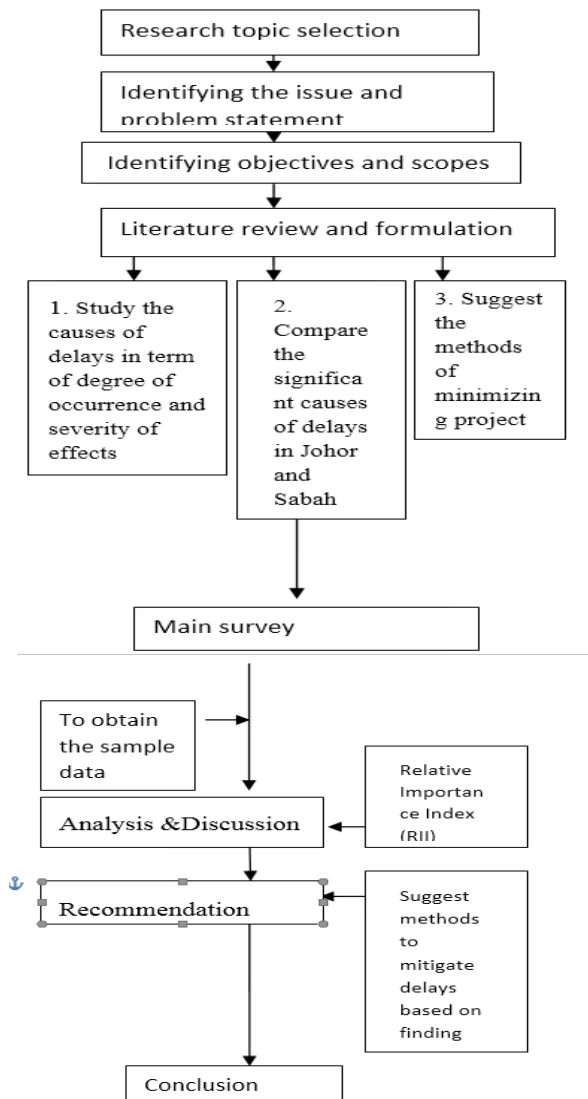


Figure 1. Research Methodology

This research will be adopted field survey methodology to uncover factors influencing on delay arising during construction stage. To identify the delay factors in construction market, a comprehensive literature review was conducted as to identify the essential information such as the main causes and effects of delay to the projects. This useful information will be included in the preparation of the main survey questionnaire. The technical materials researched include: technical papers, articles, conference proceedings, the internet, and leading construction management and engineering journals.

After that, main survey questionnaires are prepared. The designed questionnaire will be distributed to three principal construction parties namely; owner, consultant and contractor. Upon the completion of the data analysis, discussion of these findings, conclusions and recommendations will be presented.

Traditional contractual approach is still dominant in Malaysia construction sector and this may likely continue to be a trend. Malaysia construction sector comprises the clients or project owners, contractors, subcontractors, suppliers, and others key professional actors responsible for design and supervision of projects. These professionals include architects, engineers and quantity surveyors. Due to this mixed variety of parties involves in projects, they often encounter difficult situations and some degree of pressures. Many of these problematic conditions are beyond control and often lead to delays or project time overrun (Odeh and Battaineh, 2002). There are many factors that contributed to causes of delays in construction projects. Previous researches have classified factors of delays under various categories (group) of causes. The benefit of grouping was to determine the factors which are related through a common characteristic. It was not only revealed the common factor but also helped to focus attention in generating the possible factors for a particular group. Moreover, it is essential to determine the correct factors that cause the problem in order to establish appropriate permanent corrective actions (Abd. Majid, 1997). Therefore, the groups of causes by previous researchers are used as to provide a basis in establishing the groups of delays causes with parallel to these research objectives.

III. ANALYSIS AND DISCUSSIONS

Frequency and Severity Effects on the Causes of Delays

The objective of this section is to study the causes of delays by frequency of occurrence and its severity effect to construction project. A total fifty six causes that contribute to construction project delays have been identified from the

literature review. The fifty six causes were categorized into eight major groups: contractor-related, client-related, consultant-related, material-related, contract-relationship related, plant/equipment-related, labour-related and external factors.

There must be disparities in the ranking order of frequency occurrence and severity effect by overall. It means that not necessarily the more the causes frequently happens, the more it contribute severe impacts to the project. Therefore, it is essential to consider both frequency of occurrence and the severity effect of the causes into construction project. Derivation of importance index (IMP.I.) is important as they can point out the significant causes that contribute to project time overrun. Thus, the suggestion of corrective action in minimizing project delays can be established based on these significant causes. The following is the brief description and discussion of these causes according to their groups.

Causes of Contractor Related Delays

There are eight delay causes related to contractor were identified and ranked from the viewpoint of respondents in Plain Terrain and Hilly Region. Table 6.1 shows the results of survey analysis on the causes of contractors’ related delays. These causes were ranked based on frequency and severity index between group of client, contractor and consultant. ‘financial difficulties’ was ranked as the most frequent factor in Johor. This is followed by ‘poor site management and supervision’ and ‘poor subcontractor performance’. In term of its severity of effect to the project, ‘financialdifficulties’ and ‘poor site management and supervision’ remain the first and second causes among the category of contractor-related delay. However, ‘improper planning’ which is at the sixth rank in frequency, has been ranked 3 in severity index. Contrarily in Sabah, the top frequent causes of delay are ‘poor site management’, ‘financial difficulties’ and ‘improper planning’. Meanwhile, the top severity indexes are ‘financial difficulties’, ‘poor site management and supervision’ and ‘improper planning’.

Causes of Client Related Delays

‘Slow payment of completed work’ is the factor that always happens in Johor, followed by ‘financial difficulties of client’ and ‘client interferences’. However, the severity effects of these causes were ranked at first, second and fifth respectively. Differently in Sabah, ‘slow decision making’ is the most frequent factor of delay with the highest frequency index of 0.6929. This factor is underlying at rank 2 in term of its severity effect to the project. The most severe cause is ‘slow payment of completed work’.

Table 1. The result of client related delays

Causes	J				S			
	F.I	R a n k	S.I	R a n k	F.I	R a n k	S.I	R a n k
Client interference	0.6214	3	0.6071	5	0.5357	5	0.6000	5
Slow decision making	0.5929	5	0.5786	7	0.6929	1	0.6857	2
Contract modification	0.5357	8	0.5786	8	0.5357	4	0.5929	7
Change order	0.6143	4	0.6643	2	0.5929	3	0.6000	4
Financial difficulties of client	0.6357	2	0.6429	4	0.4929	6	0.6429	3
Uncooperative client	0.5643	6	0.6000	6	0.4857	7	0.5929	6
Slow payment of completed work	0.6643	1	0.6714	1	0.6071	2	0.7786	1
Unrealistic contract duration	0.5429	7	0.6429	3	0.4357	8	0.5357	8

Causes of Consultant Related Delays

There are ten causes of consultant related delays that been ranked by respondents in Plain Terrain and Hilly Region as shown in Table 6.3. Among the causes in this group, ‘late issue of instruction’ is the frequent delay factor in Johor. However, this factor brings less severe impact to project (rank 6). Similarly for the ‘changes in drawings/specification’, whereby its severity is at the rank 7.

In Sabah, ‘changes in drawings/specification’ are ranked as the first factor for both frequency and severity index. Frequent changes in drawings or specifications can result severe impact to the progress of work. Construction industry in Sabah should put a major concern for this factor. Apart from that, the frequency index and severity index for ‘inadequate supervision to contractor’ were slightly similar. However, they were different in rank.

Causes of Material Related Delays

In Table 6.4, shows the results on causes of materials-related delays. In Johor, the ranking of frequency index was lead by ‘material shortage’, followed by ‘material fabrication problem’ and ‘slowness of delivery materials’. ‘Shortage of materials’ and ‘material procurement problem’ had been ranked as the factors which give the most severe

impact to the project. Similarly in Sabah, ‘shortage of materials’ ranked as the top 1 for both frequency and severity index. Subsequently, ‘material procurement problem’ was ranked at 2 with its severity index is higher than frequency index.

Table 6.5 highlights the responses of survey expressed in frequency and the severity indices for the plant/equipment related delays. Both respondents in Johor and Sabah agreed that ‘equipment breakdown and maintenance problem’ is the frequent factors in their project. In term of severity, the similar factor shows the highest ranking for both regions.

Table 2. The result of consultant related delays

Causes	Johor				Sabah			
	F.I	Rank	S.I	Rank	F.I	Rank	S.I	Rank
Mistake in Design	0.5357	9	0.6286	4	0.4357	9	0.5643	6
Changes in drawings /specifications	0.6071	2	0.6071	7	0.6286	1	0.6500	1
Incomplete documents/drawing	0.5500	7	0.6286	3	0.5714	3	0.6071	5
Defects in design	0.5500	5	0.6071	5	0.4143	10	0.5500	7
Inadequate supervision to contractor	0.6071	3	0.6643	1	0.5000	6	0.5500	8
Delay of work approval	0.5000	8	0.6429	2	0.5500	4	0.6429	3
Late issue of instruction	0.6143	1	0.6071	6	0.5929	2	0.6500	2
Slow correction of design problem	0.5714	4	0.6000	8	0.4714	7	0.5214	9
Late valuation work	0.5500	6	0.5786	9	0.5429	5	0.6286	4
Slow inspection of completed works	0.4929	10	0.5143	10	0.4500	8	0.5071	10

Table 3. The result of material related delays

Causes	Johor				Sabah			
	F.I	Rank	S.I	Rank	F.I	Rank	S.I	Rank
Shortage of material	0.6357	1	0.6929	2	0.4929	1	0.6286	1
Material procurement problem	0.5500	2	0.6929	1	0.4857	2	0.5643	6
Material fabrication delay	0.5857	4	0.5857	6	0.4714	5	0.5786	5
Unforeseen material damages	0.5071	6	0.5929	5	0.4786	4	0.5857	4
Slow delivery of ordered materials	0.5857	3	0.6000	4	0.4857	3	0.6143	2
Noncompliance of material to specification	0.5714	5	0.6214	3	0.4571	6	0.6071	3

Causes of Plant/Equipment Related Delays

Table 4. The result of plant/equipment related delays

Causes	Johor				Sabah			
	F.I	Rank	S.I	Rank	F.I	Rank	S.I	Rank
Equipment shortage	0.5500	2	0.6214	1	0.4214	3	0.5214	5
Wrong selection	0.5214	3	0.5286	5	0.3857	6	0.5000	6
Low efficiency	0.5000	5	0.5143	6	0.4000	5	0.5214	4
Equipment delivery problem	0.5143	4	0.5786	3	0.4071	4	0.5357	3
Inadequate skill of operators	0.4929	6	0.5571	4	0.4357	2	0.5429	2
Equipment breakdown and maintenance problem	0.6143	1	0.6143	2	0.4714	1	0.5500	1

Group causes of delays

Classification of the above groups of causes may not be limited to those mentioned. The classification of groups of causes however, is depends on how the researchers derive the research’s result to meet the objective. The following section presents the factors of delays for each group of causes that review earlier. A set of factors that belong to a group of causes are cited from literature review.

Identify Causes of Delay

For the purpose of this research, the causes of delay that been established by Chan and Kumarasamy (1997); Odeh and Battaineh (2002); Sambasivam and Soon (2006); Long et al. (2008) are used. Following are the classification, the sources of delays that arise from each of these factor categories were identified from literature. All of these will be used in designing the questionnaire as to achieve the objectives of this research.

Client-related factors

Several studies identified the factors of client related delays. Chan and Kumarasamy (1997) in their study have listed the client characteristic, project financing, client variation and interim payment to contractor. Sambasivam and Soon (2006) identified the factor of interference, slow decision making and unrealistic contract duration. Aibinu and Odeyinka (2006) have added the factors of late contract award by client. Based on the literature review, there are eight factors of client related delays were identified as shown in Figure 2.2.

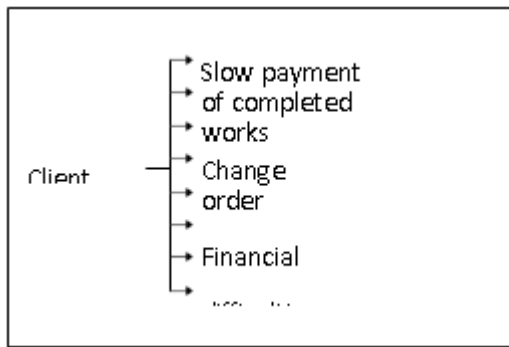


Figure 2.

Effects of Delay in Construction Project

Delays in construction project completion seem to be a perennial problem. When projects are delayed, they are either accelerated or have their duration extended beyond the scheduled completion date. Delays are usually accompanied by cost increases. The subject of delay has been addressed by several researchers and they found that delay always led to the negative effects. Abd. Majid (1997) state that delay may lead to disputes, low productivity and increases in cost. Alkass et al. (1994) addressed that delay are costly and often result in prolonged litigation by the parties. Additionally, associated delay problems can also result in total abandonment of project (Aibinu and Jagboro, 2001).

Several Aibinu and Jagboro (2002) conducted a study on the effect of delays on project delivery in Nigeria. They identified two methods to minimize or if possible eliminate time overrun. There were acceleration of site activities and contingency allowance.

Odeh and Battaineh (2002) recommended the following to improve the delays situation in Jordan: enforcing liquidated damage clauses; offering incentives for early completion; developing human resources through proper training and classifying of craftsmen; adopting a new approach to contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors; and adopting new approaches to contracting, such as design-build and construction management types of contracts..

Competent project manager; Ensure adequate and available source of finance; Multidisciplinary/competent project team; Availability of resources; Commitment to projects; Adopting a new approach to contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors; Adopting new approaches to contracting such as Design-Build (D/B) and Construction Manager (CM) type of contract; Complete

and accurate project feasibility study and site investigation; Acceleration of site clearance; Comprehensive contract documentation; Frequent progress meeting; Site management and supervision; Use of proper and modern construction equipment; Proper project planning and scheduling; Accurate initial cost estimates; Use of appropriate construction methods; Community involvement; Proper emphasis on past experience; Frequent coordination between the parties involved; Absence of bureaucracy; Clear information and communication channels; Accurate initial time estimates; Proper material procurement; Developing human resources in the construction industry through proper training; Allocation of sufficient time and money at the design phase; Awarding bids to the right/experience consultant and contractor; Perform a preconstruction planning of project tasks and resources needs; Systematic control mechanism; and Effective strategic planning.

IV. CONCLUSION AND RECOMMENDATION

From the literature review, about fifty six causes of delay in local construction market have been identified. The delay causes were grouped into eight; Contractor related, Client related, Consultant related, Material related, Plant/equipment related, Labour related, contract-relationship related and External factors..

In Johor, the results for the frequency of occurrence based on priority are: 'Contractor's financial difficulties', 'Poor site management/supervision', 'Poor subcontractor performance', 'Slow payment of completed work' and 'Shortage of manpower'. Subsequently, the causes with highest severity effect to construction project are: 'Contractor's financial difficulties', 'Poor subcontractor performance', 'Improper planning', 'Shortage of manpower' and 'Shortage of material.

Meanwhile, the most frequent in occurrence for delay causes in Sabah are: 'Slow decision making', 'Poor site management/supervision', 'Changes in drawings/specifications', 'Contractor's financial difficulties' and 'Improper planning'. Causes of delay that bring severely impact to project are: 'Slow payment of completed work', 'Contractor's financial difficulties', 'Poor site management/supervision', 'Shortage of manpower' and 'Unforeseen site condition'. To compare the significant causes of delays in Plain Terrain and Hilly Region. To acquire the most significant causes among the fifty six delay causes, the Importance index are computed based on both frequency and severity indices. Comparison results between Plain Terrain and Hilly Region were made into two ways; comparing the overall causes and comparing according to the group of causes.