Causes of delays in construction project for developing Southeast Asia countries

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Abstract. Delay in construction industry impact the time and cost of project and mostly being the basis of dispute between stakeholders of the project. To reduce the impact, knowing the causal factors and lesson learned from past projects and studies is essential. Through this study, a literature review on the subject of construction delay factors studied in Indonesia, Malaysia, Thailand and Vietnam was undertaken to identify top factors and to determine whether there are special causes referring to this region. A comparison was made to a similar study on developed economies in Europe and North America. The result of the study revealed that the most significant factors causing delays in the Southeast Asia developing countries were related to contractor (material shortages, improper/ineffective planning, poor site management and supervision, and equipment shortage and failure), and owner-related causes (financial/payment issue and design change/variation order). The results of the study support the view that contractors handling projects in developing countries are dealing with the shortages problems, inefficiency/incompetence of the contractor, and problems caused by clients.

1. Introduction
Delay is a common problem in construction industry and had been observed globally both in developed and developing countries [1-3, 4, 5-6]. Delays problem have been described very serious and chronic by Kazaz and Ulubeyli [4], and major problems [1].

Delay or schedule overrun 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” [2], or simplify as “basically a project slipping over its planned schedule” [3]. Delay bring about time overrun, cost overrun, disputes, arbitration, litigation or even total abandonment [7] and affect the potential income of the owner [4], therefore knowing factors that causing delay in construction project is necessary in order to reduce the impacts.

This study is done by reviewing literatures on the subject of construction delays factors in Indonesia, Malaysia, Thailand, and Vietnam, four major developing countries in Southeast Asia (SEA) region. The result was then compared to the result of same study in developed countries in North America and Europe (UK, US and Portugal). The purpose is to identify the main construction project delay causes that have been revealed by these literatures, both in Indonesia and in the South East Asia (SEA) region. The study also intended to find out whether there are special delays generating problems in these SEA developing countries and are there any significant differences to developed regions.
### Table 1. Summary of major delay factors from existing literatures for Indonesia, Malaysia, Thailand, and Vietnam.

| Country   | Indonesia | Malaysia | Thailand | Vietnam |
|-----------|-----------|----------|----------|---------|
| Reference | [1]       | [14]     | [11]     | [24]    |
| Year      | 1997      | 2003     | 2011     | 2018    |
| Methodology | S        | I       | P        | B       |
| Construction type | B   | G       | G       | G       |
| Owner-related factors: |         |          |          |         |
| A1        | -        | -        | -        | -       |
| A2        | X        | X        | X        | X       |
| A3        | -        | -        | -        | -       |
| A4        | -        | -        | -        | -       |
| A5        | -        | -        | -        | -       |
| A6        | -        | -        | -        | -       |
| A7        | -        | -        | -        | -       |
| Contractor-related factors: |         |          |          |         |
| B1        | -        | -        | -        | -       |
| B2        | -        | -        | -        | -       |
| B3        | X        | X        | X        | X       |
| B4        | -        | -        | -        | -       |
| B5        | -        | -        | -        | -       |
| B6        | X        | X        | X        | X       |
| B7        | X        | X        | X        | X       |
| B8        | X        | X        | X        | X       |
| B9        | -        | -        | -        | -       |
| B10       | -        | -        | -        | -       |
| B11       | -        | -        | -        | -       |
| B12       | -        | -        | -        | -       |
| B13       | X        | -        | -        | -       |
| B14       | -        | -        | -        | -       |
| B15       | -        | -        | -        | -       |
| Consultant-related factors: |         |          |          |         |
| C1        | -        | -        | -        | -       |
| C2        | -        | -        | -        | -       |
| C3        | -        | -        | -        | -       |
| C4        | -        | -        | -        | -       |
| C5        | -        | -        | -        | -       |
| C6        | -        | -        | -        | -       |
| C7        | -        | -        | -        | -       |
| C8        | -        | -        | -        | -       |
| C9        | -        | -        | -        | -       |
| Common-related factors: |         |          |          |         |
| D1        | -        | -        | -        | -       |
| External factors: |         |          |          |         |
| E1        | -        | -        | -        | -       |
| E2        | -        | -        | -        | -       |
| E3        | -        | -        | -        | -       |
| E4        | -        | -        | -        | -       |

Note: S= Survey; I= interview; P= project case study; B= Building; G= General; Inf= Infrastructure, a= large, and b= small to medium company

A1= Financial difficulties and payment by owner
A2= Design change/ variation order/ change of scope by owner
A3= Slow decision making
A4= Unrealistic deadline set by owner
A5= Contractor selection methods (negotiation, lowest bidder)
A6= Late release of site/ compensation to community problem
A7= Lack of capable representatives
B1= Cash flow and financial difficulties
B2= Poor site management and supervision
B3= Material shortages on site/ late of delivery
B4= Inappropriate design/ impractical design
B5= Improper/ ineffective planning and scheduling
B6= Inadequate site investigation/ unforeseen subsurface condition
B7= Inadequate contractor experience
B8= Equipment availability and failure/ late of delivery
B9= Improper construction method
B10= Poor qualification of contractor technical staff/ lack of technical pe
B11= Labour shortage
B12= Low skill/ unqualified labour
B13= Low labor/craftsmen productivity
B14= Low equipment production rate
B15= Inaccuracy of material estimate
C1= Inadequate contractor experience/ incompetent consultant
C2= Slowness in making decision/ response/ instruction
C3= Inappropriate design/ impractical design
C4= Incomplete documents/ drawings/ lack of clarity of project scope
C5= Design changes by consultant
C6= Design changes by consultant
C7= Delay preparation or revision and approval of drawings
C8= Inadequate site investigation/ unforeseen subsurface condition
C9= Lack of consultant experience/ incompetent consultant
C10= Unpredictable weather condition (Rain effect)
C11= Strikes
C12= Inadequate contractor experience/ incompetent consultant
C13= Lack of consultant experience/ incompetent consultant
C14= Inappropriate design/ impractical design
C15= Incomplete documents/ drawings/ lack of clarity of project scope
C16= Inadequate site investigation/ unforeseen subsurface condition
C17= Incomplete documents/ drawings/ lack of clarity of project scope
C18= Inadequate site investigation/ unforeseen subsurface condition
C19= Inadequate site investigation/ unforeseen subsurface condition
C20= Inadequate site investigation/ unforeseen subsurface condition
C21= Inadequate site investigation/ unforeseen subsurface condition
C22= Inadequate site investigation/ unforeseen subsurface condition
C23= Inadequate site investigation/ unforeseen subsurface condition
C24= Inadequate site investigation/ unforeseen subsurface condition
C25= Inadequate site investigation/ unforeseen subsurface condition
2. Method

Literature review method is adopted in this study. The literatures were extracted from scientific database such as Scopus-Elsevier and search engine (e.g. Google Scholar). The keyword used include “delay factors”, “delay causal factors”, “schedule overrun factors”, and “construction project”. All of the extracted literatures then filtered based on the intended country the study was taken. There are 19 final studies identified in this study to pinpoint the top construction delay factors in four developing SEA countries: 4 studies for Indonesia, 8 studies for Malaysia, 4 studies for Thailand, and 3 studies for Vietnam. These four countries were chosen among others emerging economies in the region based on the availability of studies.

The methodology used in this study has been adopted by Kog [6]. The summary of the method are: (1) the number of times each construction delay factor was identified by the respective studies for Indonesia, Malaysia, Thailand, and Vietnam was calculated, (2) the top construction delay factor must be identified by more than one study, and (3) the top delay factors ranking are based on the frequency of those factors identified by the respective studies.

3. Results and discussion

There are 36 delay factors identified as major construction delays for Indonesia, Malaysia, Thailand, and Vietnam out of 19 studies. The factors classified into five categories based on project’s participant, which are: (1) owner-related factors, (2) contractor-related factors, (3) consultant-related factors, (4) common responsibility-related factors, and (5) external factors. Table 1 shows the factors along with references, country of the study, research methodology, and the type of construction project studied.

| Table 2. Top construction delay factors for Indonesia, Malaysia, Thailand, and Vietnam. |
| --- |
| Country | Construction delay factors | Indonesia | Malaysia | Thailand | Vietnam | ALL |
| Owner-related factors | | | | | | |
| A1 | Financial difficulties and payment by owner | 4 | 2 | 40% | 2 | 6 | 75% | 1 | 25% | 2 | 2 | 67% | 4 | 11 | 55% |
| A2 | Design change/ variation order/ change of scope by owner | 1 | 5 | 100% | - | 2 | 25% | 3 | 2 | 50% | 2 | 2 | 67% | 4 | 11 | 55% |
| A3 | Slow decision making | 4 | 2 | 40% | - | 2 | 25% | - | 1 | 25% | - | 5 | 25% |
| A6 | Late release of site/ compensation to community problem | 1 | 25% | - | 2 | 2 | 67% | - | 3 | 15% |
| Contractor-related factors | | | | | | |
| B1 | Cash flow and financial difficulties | 3 | 4 | 50% | 3 | 2 | 50% | 3 | 2 | 50% | 1 | 3 | 100% | 6 | 9 | 45% |
| B2 | Poor site management and supervision | 4 | 2 | 40% | 1 | 7 | 88% | 2 | 3 | 75% | - | 1 | 33% | 3 | 13 | 65% |
| B3 | Material shortages on site/ late of delivery | 2 | 4 | 80% | 1 | 7 | 88% | 2 | 3 | 75% | 2 | 2 | 67% | 1 | 16 | 80% |
| B5 | Under perform subcontractors | - | - | - | - | - | - | - | - | - | - | 3 | 15 | - | - | - |
| B6 | Improper/ ineffective planning and scheduling | 2 | 4 | 80% | 2 | 6 | 75% | 2 | 3 | 75% | 2 | 2 | 67% | 2 | 15 | 75% |
| B7 | Inadequate contractor experience | - | 1 | 20% | - | 2 | 25% | - | 2 | 2 | 67% | - | 5 | 25% |
| B8 | Equipment availability and failure/ late of delivery | 2 | 4 | 80% | 3 | 4 | 50% | 3 | 2 | 50% | - | 5 | 10 | 50% |
| B9 | Improper construction method | 4 | 2 | 40% | - | 1 | 13% | - | - | - | 3 | 15% |
| B10 | Poor qualification of contractor technical staff/ lack of technical personnel | - | 1 | 20% | - | 2 | 25% | 3 | 2 | 75% | 2 | 2 | 67% | 7 | 8 | 40% |
| B11 | Labour shortage | 3 | 3 | 60% | 4 | 3 | 38% | 3 | 2 | 50% | - | 7 | 8 | 40% |
| B12 | Low skill/ unqualified labour | 4 | 2 | 40% | 4 | 3 | 38% | - | - | - | 5 | 25% |
| Consultant-related factors | | | | | | |
| C2 | Slowness in making decision/ slow to give instruction | - | 1 | 20% | - | 2 | 25% | 3 | 2 | 50% | - | 5 | 25% |
| C3 | Lack of consultant experience/ incompetent consultant | - | - | - | - | 1 | 13% | - | 2 | 2 | 67% | - | 3 | 15% |
| C5 | Incomplete documents/ drawings/ lack of clarity of project scope | - | 1 | 20% | - | 2 | 25% | 1 | 4 | 100% | - | 8 | 7 | 55% |
| C7 | Delay preparation or revision and approval of drawings | 3 | 3 | 60% | - | 1 | 13% | - | 1 | 25% | - | 5 | 25% |
| Common responsibility-related factors | | | | | | |
| D1 | Lack of communication/ coordination between parties | - | 1 | 20% | 3 | 4 | 50% | 1 | 1 | 25% | - | 6 | 30% |

Note: F= frequency; P= proportion of studies that identified the factor to be one of top delay factors; R= rank.

Table 2 shows the top delay factors for Indonesia, Malaysia, Thailand and Vietnam, which are factors that were identified by most studies in the region. The top 10 rank delay factors for the four countries combined are: B3-material shortages on site/late of delivery (80%), B6-improper/ineffective planning and scheduling (75%), B2-poor site management and supervision (65%), B1-financial difficulties and payment by owner (55%), A2-design change/variation order/change of scope by owner (55%).
equipment availability and failure/late of delivery (50% ), B1-contractor’s cash flow and financial difficulties (45%), B10-poor qualification of contractor technical staff/lack of technical personnel (40%), B11-labour shortage (40%), and C5-incomplete documents/drawings/lack of clarity of project scope (35%).

Through these literatures, the most dominant contributor of delay factors identified in the four countries combined is contractor-related group with 61% identification. There are 7 factors in the top 10 identified as top delay causal factors under contractor responsibility compare to 2 factors under owner’s and 1 factor under consultant responsibility. The number 1, 2, and 3 rank factors also identified in the contractor factors group out of seven factors identified in this group show it extent proportion based on the number of identifications as delays major factors in the region.

Figure 1 shows that the delay factors for Indonesia, Malaysia, Thailand, and Vietnam are basically similar. Out of 21 factors identified as top rank delay factors, there are 14 factors identified in all of four countries. There are two factors identified in this study as top rank factors in all country combined, which are: B3-material shortages on site/late of delivery (rank 1), and B6-improper/ineffective planning and scheduling (rank 2). It is obvious based on the revelation that shortage and contractor’s incompetence problems are major factors causing delays in this region, while problems caused by client and consultant such as A1, A2, and C5 are relatively moderate to low importance based on the frequency of identification. This finding supports the view in [8] that shortage and incompetence of contractor are special problems of developing countries. They also remarked that the three class of problems revealed in this study, namely (1) shortage problems (mainly supply of resources); (2) clients and consultants related problems and (3) incompetence of contractor, are common problems facing by contractors in the developing economies. The contractors running project in SEA developing region must be well aware and prepared for the self-inflicted delay factors especially shortages and self-inefficiency or self-incompetence problems.

Figure 1. Comparison of top rank delay factors for Indonesia, Malaysia, Thailand, and Vietnam.
The most identified delays factor was differed in each country (Table 2). These differences may reflect the variations and differences in many aspects of construction industry in each country. Indonesia perceived the A2-design change/ variation order/ change of scope by owner as the most importance delay factors based on the frequency of identification, in comparison to B2-poor site management and supervision and B3-material shortages on site/ late of delivery factors for Malaysia, C5-incomplete documents/ drawings/ lack of clarity of project scope factor for Thailand, and B1-contractor’s cash flow and financial difficulties factor for Vietnam. The A2-design change/ variation order/ change of scope by owner, the most identified factor for Indonesia (100%) were perceived as low importance for Malaysia (25%) and moderate in Thailand (50%) and Vietnam (67%). The most important factor for Thailand, C5-incomplete documents/ drawings/ lack of clarity of project (100%) were not identified in Vietnam and perceived as low importance in Malaysia (25%) and Indonesia (20%). The B1-contractor’s cash flow and financial difficulties factor, while not identified by a single study in Indonesia, is perceived as the most important factor in Vietnam (100%) and moderately important in Malaysia (50%) and Thailand (50%). The A6-slow site clearance factor identified by 67% studies in Vietnam was not identified in Malaysia and Indonesia.

To gain a broader understanding, comparison was made to developed region. Figure 1 shows the comparison of this study to major construction delay factors in UK, Portugal, and USA [6]. The result revealed the contrast between the two economies. While contractor-related delay factors were very significant based on the number of identifications in the SEA developing region (63%), were identified by only 25% of studies in the develop region. The top 3 factors identified in develop region: A2-design change/ variation order/ change of scope with 92% identification, E3-government regulation and permit approval with 69% identification, and C5-incomplete documents/ drawings/ lack of clarity of project with 65% identification were owner, consultant, and external related factors, in contrast to SEA developing regions with all three were contractor’s issues. This finding farther supports the view of problems causing delays in construction industry in developing economies, as it is revealed that shortage and contractor incompetence problem were far less identified in developed economies.

4. Conclusion

The result of this study revealed that the most identified factors causing delays in SEA developing region were mostly due to contractor’s problems: material shortages on site/late of delivery, improper/ineffective planning and scheduling, and poor site management and supervision. The second most identified factors group was owner-related problems: financial difficulties and payment by owner, and design change/variation order/change of scope by owner. The self-inflicted delay factors, especially shortages and self-inefficiency or self-incompetence problems as well as financial and design change problems by owner are the top factors that contractors running project in the region must be well aware of and mitigate properly in order to reduce the impact.

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