On the delay factors of the private construction projects in Medan city

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Abstract. The delay in construction projects undertaken by contractors is impeding the economic growth of a region. Medan city which is one of the big cities in Indonesia is suffering from it. This study aims to identify the dominant factors causing delays in construction projects conducted by private contractors. The interview method with questionnaires is used to involve 20 contractors, 10 consultants, and 10 owner representatives in the study. From the 45 identified factors causing delays, the highest ranking is the change of work demand by the project owners with 71.84% importance index.

1. Introduction

Economic growth in the construction services sector continues to increase every year based on the Central Bureau of Statistics (BPS) report. The percentage of Regional Gross Domestic Product of construction service sector for Medan City in 2011 was 10.52% and increased to 10.99% in 2013. But Medan City experienced problem of project delay.

Alifen (1999) [1] stated that the common thing that happens in the implementation of construction project work is the delay. The delay is not in accordance with the time contained in the planned schedule. Ariefasa (2012) [2] proposed a survey in the USA involving 193 owners of building projects, that 53% of respondents said poor scheduling would cause delays.

Every year it is reported that, districts or cities within the region of North Sumatra, there is a delay in the project (Medan Business, 2014) [3]. In this research, the factors causing the delay of construction project in Medan City are reviewed in detail and systematically. This study aims to identify the dominant factors causing project delays, as well as comparing the viewpoints of contractors, consultants and owners on the factors causing delays in construction projects.

Projects often experience problems, both technically and administratively, which ultimately can not be resolved according to the time set in the contract. One of the reasons for the difficulty in working on the project is due to the lack of proper understanding of the project, so it is not able to calculate all the required production factors. The delay is the time of project implementation that is not utilized in accordance with the activity plan causing some of the following activities to be delayed or can not be completed in accordance with the planned schedule and affect the financial problems (Ervianto, 2010) [4].

Researchers such as Proboyo (1999) [5] and Braimah, (2008) [6] classify delays when reviewed on the nature and compensation system to divided into excusable delays, because it could be caused by out-of-control events, other than non-excusable delays because it is caused by the negligence of either party, or it may be a compensable delay due to the negligence of one of the parties, but still acceptable by the other party by paying the indemnity, or it may be non-compensable delay, because of actions or mistakes that are beyond the control of the parties. Many things can cause activity time to increase, so the project...
completion time becomes retreat. Several causes can be identified by previous researchers, both locally and internationally.

International research conducted by Assaf (2006) [7] in Saudi Arabia outlines 72 factors causing delays from research on large-scale construction projects. Dayi (2010) [8] research in Turkey, analyzed the delays in construction projects and obtained 63 factors. In contrast to Dinakar (2014) [9] which analyzed project delays in India, successfully acquired 61 factors causing delays. Similar research is also conducted by academics from the national level. Like Astina, et. Al. (2011) [10] who conducted research with the main focus is Tabanan regency managed to get 55 cause factors. While Azhari, et. Al. (2014) [11] research on the implementation of infrastructure projects in Aceh Jaya Regency has revealed 49 factors. Desyllia, et. Al. (2013) [12] examines factors causing project delays in Surabaya and outlines 38 contributing factors. The research of Messah, et. Al. (2013) [13] about the project delays in Kupang City outlines 21 factors causing and Suyatno's research (2010) [14] in Semarang, about the building project managed to obtain 21 factors causing delays. Overall total 120 factors causing the delay ever uncovered. In this study, weighing the location and characteristics of the project, the causal factors are compressed into only 45 variables that have represented 8 categories.

2. Research Methodology
Data collected through survey, analyzed by using frequency index, severe index and importance index. The research flow is presented in Figure 1.

Figure 1. Flow of Research Methods

Then the questionnaire was distributed to 60 project managers as well as field managers, from contractor companies, consultants and owners, with one company being represented by one person directly related
to the project.

3. Design Questionnaire
Data then collected from the questionnaire. The questionnaire is divided into 3 sections. The first section deals with general information about companies and respondents. Contractors, consultants and owners, are asked to answer questions relating to their experience in the construction industry and their opinions about the project delays that they undertake.

While in the second section lists the causes of delays in construction projects identified. Factors relating to contracts and projects, owners, contractors, consultants, materials, equipment, labor and other external factors. Each causal factor is asked two questions: What is the frequency level of the cause factor of delay? And what level of influence can be generated to give effect to the project?

The questions are categorized on a 7 point scale upon recommendation (Budiaji, 2013) [15]. The occurrence frequency category starts from never, very rarely, rarely, sometimes, often, almost and always happens (point scale 1 to 7), as per Table 1 (Vaulzan, 2012) [16].

| Scale Point | Frequency of Events | Explanation |
|-------------|---------------------|-------------|
| 1           | Never Happened      | Percentage occurrence 0% |
| 2           | Very Rarely Happen  | Percentage occurrence 0% - 20% |
| 3           | Rarely Happen       | Percentage of occurrences 20% - 40% |
| 4           | Sometimes Happen    | Percentage of occurrences 40% - 60% |
| 5           | Often Happens       | Percentage incidence 60% - 80% |
| 6           | Almost Happens      | Percentage of occurrences 80% - 100% |
| 7           | Always Happened     | Percentage occurrence 100% |

Similarly, the category of influence that begins from no effect, rarely influence, lack of influence, influence, enough influence, very influential and too influential (point scale 1 to 7) in accordance with Table 2 (Vaulzan, 2012) [16].

| Scale Point | Influence on Project | Explanation |
|-------------|----------------------|-------------|
| 1           | No Effect            | Trivial delays |
| 2           | Rarely Influence     | A small delay of < 3% |
| 3           | Lack of influence    | The delay means 3% - 7% |
| 4           | Influence            | Medium delay of 7% - 10% |
| 5           | Enough Influence     | Serious delays 10% - 15% |
| 6           | Very Influential     | Big delay 15% - 20% |
| 7           | Too Influential      | Severe delay > 20% |

Then the data is processed statistically to get the rank of cause of delay.

4. Data Analysis Technique
Research data has a quantitative level difference. This data is ordinal scale and is used to measure respondent's perception of the factors causing the delay of construction project in Medan City. The method of analysis used is as follows:

4.1 Frequency and Severe Index
Frequency index shows the appearance of the factors that affect the contractor's performance. Severe
index shows the impact of each factor so as to affect the smoothness of the project. Calculate the frequency index value using Equation 1. While the severe index can use Equation 2. Analysis is also done by Assaf, (2006) [7]; Azhari, et. Al. (2014) [11], Le-Hoai, et. Al. (2008) [17]; Shebob, (2012) [18]; Sweis, (2013) [19]; Alinaitwe, et. Al. (2013) [20]; Nizamuddin, et. Al. (2013) [21] and Alavifar, et. Al. (2014) [22].

\[
F_i(\%) = \frac{\sum_{i=1}^{7}(a_i\cdot n_i)}{N} \cdot \frac{100}{7} \quad (1)
\]

\[
S_i(\%) = \frac{\sum_{i=1}^{7}(a_i\cdot n_i)}{N} \cdot \frac{100}{7} \quad (2)
\]

Where \(F_i\) is the frequency index in percent; \(S_i\) is the severe index in percent; \(i\) is the category index from 1 to 7; \(a_i\) is the weight of the response value; \(n_i\) is the frequency of the response appears; \(N\) is the number of respondents; 7 is the recommended maximum Likert Scale (Budiaji, 2013) [15].

4.2 Importance Index Analysis
Importance index shows the result of the multiplication between the frequency and the influence of the cause factors of the delay. Calculating the importance index can use Equation 3. Complete calculation results are presented in Table 5.

\[
I_i(\%) = \frac{[F_i(\%) \cdot S_i(\%)]}{100} \quad (3)
\]

Where \(I_i\) is an importance index with a percent unit, ranging from 0 (minimum) to 100 (maximum). If the value is close to 100, then the contributing factors will contribute to project delays.

5. Results and Discussion
5.1 General characteristics of respondents
Respondents who filled and returned questionnaires amounted to 40 people with a percentage of 66.67%. The contractor has an average experience of about 21 years. But the consultant has an average experience of about 18 years. The random sample stratified sample technique is used in the selection of respondents from the available list.

About 80% of contractors and 100% of participating consultants, stated the number of permanent employees working between 10 to 30 people. Approximately 70% of contractors handle the project, in the last 5 years, with an average value of between 10 to 25 billion rupiah. While consultants in the last 5 years, only handle the project with an average value of 20 billion rupiah. There are 30% of contractors experiencing at least 3 projects that are late in the last 5 years. The Contractor experienced an average of 30% less than 30 days and above 30 days 30%. Approximately 28.57% of projects declared unfinished just in time. There are 4 out of 14 projects that are not completed on time.

But 100% of the consultants involved, in the last 5 years, experienced a 20% delay. A total of 30% of consultants experience delays under 30 days of the contract limit and 20% of consultants experience delays over 30 days. Approximately 27.03% of projects declared not completed in time. From 74 projects handled, 20 of them are delay. The selected project owner has more than one project experience. Participating owners include companies engaged in refining, packing, smelting, raw material or finished material processing, warehousing and offices.

5.2 Rank Cause of Delay
Ranking causes of delay from the point of view of the contractor, consultant and project owner obtained
from the results of importance index. A list of 45 factors causing delays representing 8 categories is presented in Table 3.

| No | Category                  | Cause Factor                                           |
|----|---------------------------|--------------------------------------------------------|
| X1 | Contracts and project     | Estimation of contract duration at the beginning too short |
| X2 | Contracts and project     | Incorrect and incompatible document plans              |
| X3 | Contracts and project     | Late issue a plan document                            |
| X4 | Contracts and project     | No details of job description                          |
| X5 | Contracts and project     | Not yet plan to collect data on survey                 |
| X6 | Owner                     | Late payment, against work progress                    |
| X7 | Owner                     | Late of handover                                       |
| X8 | Owner                     | Asked for work changes, during construction            |
| X9 | Owner                     | Late approve images and materials                      |
| X10| Owner                     | Communication and coordination are poor                |
| X11| Owner                     | Late in decision making                                |
| X12| Owner                     | Difficulty in financial cash flow                      |
| X13| Owner                     | Interfere in the affairs of the construction process   |
| X14| Owner                     | Representative who is not competent                    |
| X15| Contractor                | Financial difficulties and funding difficulties        |
| X16| Contractor                | Contractor Conflict scheduling between sub-contractors |
| X17| Contractor                | Correction work of contractor Error                    |
| X18| Contractor                | Contractor Management executing and supervisor is bad  |
| X19| Contractor                | Contractor communication and poor coordination         |
| X20| Contractor                | Contractor scheduling plan of work is not effective    |
| X21| Consultant                | Method of construction implementation is not appropriate|
| X22| Contractor                | Sub-contractor is late for work                        |
| X23| Contractor                | Experience has not yet qualified                      |
| X24| Contractor                | Technical staff qualification does not meet the criteria|
| X25| Consultant                | Late checking and testing work                         |
| X26| Consultant                | Communication and poor coordination                    |
| X27| Consultant                | Experience not yet qualified                          |
| X28| Consultant                | Negligence plan specification and quantity             |
| X29| Materials                 | Lack of construction materials on the market           |
| X30| Materials                 | Changes in types and specifications of materials       |
| X31| Materials                 | Late material delivery to the field                    |
| X32| Materials                 | Important material is damaged during storage           |
| X33| Materials                 | Poor procurement management                            |
| X34| Materials                 | Prices of construction materials continue to rise      |
| X35| Equipment                 | Damage equipment and heavy equipment                   |
| X36| Equipment                 | Lacking equipment                                     |
| X37| Equipment                 | Tools Low efficiency and productivity                  |
| X38| Labor                     | Work shortage completes the project                    |
| X39| Labor                     | Qualifications of workers do not meet the standards    |
| X40| Labor                     | Productivity of workers is low                         |
| X41| Other Conditions           | Different conditions from previous inspections         |
| X42| Other Conditions           | Strategic project location for downtown                |
| X43| Other Conditions           | Late to obtain permits such as building permit etc.    |
| X44| Other Conditions           | Disasters, floods, earthquakes, volcanoes, etc.       |
| X45| Other Conditions           | Accident during construction                           |

The highest and lowest rankings of the most important delays are described separately. Factors causing delays based on the point of view of contractors, consultants and project owners are presented in Table 6. There are three common causal factors of all parties, namely the repair errors work of contractors, before planning not to collect data and late release of planning documents.

Repairing the work of a contractor's error occurred, because of the consultant's late release of the planning document. While the delay in issuing the planning documents is caused by the owners who do
not provide the time to collect the data and the initial survey. While the lowest rank, of all parties involved, are natural disasters and accidents during the construction period. This proves, is not expected to occur natural disasters and work accidents. If unavoidable, most projects are not implemented or temporarily suspended. Each party is responsible for the consequences that occur, so it will not demand in the future. The ranking of factors causing delays associated with the frequency index of events, severe index rates and importance index by contractors, consultants and owners is presented in Table 5.

6. Concluding Remarks

Research on project delays in Medan City, involving 20 contractors, 10 consultants and 10 owner representatives, to study the factors causing delays. The results obtained the following conclusions:

a. There are 45 factors causing project delays, which have been categorized into 8 categories and the highest factor is the owner requesting change of work during construction with percentage of 71.84%.

b. There are different points of view on the factors causing project delays, with the highest rating from the point of view of the contractor and the consultant being the owner requesting a change of work during construction. While from the owner side is the contractor lack of equipment and heavy equipment.

Suggestions to prevent future project delays are as follows:

a. The project owner must be vigilant in requesting job change and quick in making decisions.

b. The contractor should prioritize the efficiency and effectiveness of the work, so that the delay does not occur and optimize the use of equipment.

c. The consultant should check the completeness of each planning document before submission.

d. Planners should produce the documents of plan on time, collect data and surveys before planning.

Suggestions given for future research are as follows:

a. Research for more specific projects such as road projects, ports and airports can be done.

b. A study to evaluate the scarcity of material and equipment resources required for project delays.

c. Similar research can be taken, to investigate effect of financing on delays in construction projects.

Table 4: Importance Cause of Delay

| No | All | Contractor | Consultant | Owner |
|----|-----|------------|------------|-------|
|    |     | Highest Rating |            |       |
| 1  |     | Owner requested changes during construction | Owner requested changes during construction | Owner requested changes during construction | Lack of equipment and heavy equipment |
| 2  |     | Owners are late in making decisions | Owner is late paying work progress | Owners are late in making decisions | Contractor is late to send materials to the field |
| 3  |     | Correction work of contractor error | Owners are late in making decisions | Correction work of contractor error | Correction work of contractor error |

Table 5: Ranking Factors Cause of Delay

| Var | Cause Factor                                | Coefficient | Coefficient | Coef. | Local Rank | Ranking Global |
|-----|---------------------------------------------|-------------|-------------|-------|------------|----------------|
|     |                                             | F (%) rank  | S (%) rank  | I (%) |            |                |
| X1  | Estimation of contract duration at the beginning too short | 49.2857  36 | 63.2143  30 | 31.1556  5 | 34          |                |
| X2  | Incorrect and incompatible document plans   | 65.7143  12 | 78.5714  9  | 51.6322  4 | 10          |                |
| No | Faktor Penyebab Keterlambatan Pekerjaan Konstruksi Bangunan Gedung |
|----|---------------------------------------------------------------|
| X1 | Late issue a plan document                                  |
| X2 | No details of job description                               |
| X3 | Not yet plan to collect data on survey                       |
| X4 | Late payment, against work progress                          |
| X5 | Late of handover                                             |
| X6 | Asked for work changes, during construction                  |
| X7 | Late approve images and materials                            |
| X8 | Communication and coordination are poor                        |
| X9 | Contractor scheduling plan of work is not effective           |
| X10| Contractor Management executing and supervisor is bad         |
| X11| Representative who is not competent                          |
| X12| Difficulty in financial cash flow                            |
| X13| Interfere in the affairs of the construction process          |
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| X21| Method of construction implementation is not appropriate      |
| X22| Sub-contractor is late for work                              |
| X23| Experience has not yet qualified                             |
| X24| Technical staff qualification does not meet the criteria      |
| X25| Late checking and testing work                               |
| X26| Communication and poor coordination                          |
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| X31| Late material delivery to the field                          |
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| X33| Poor procurement management                                  |
| X34| Prices of construction materials continue to rise            |
| X35| Damage equipment and heavy equipment                          |
| X36| Lacking equipment                                            |
| X37| Tools Low efficiency and productivity                        |
| X38| Worker shortage completes the project                        |
| X39| Qualifications of workers do not meet the standards          |
| X40| Productivity of workers is low                               |
| X41| Different conditions from previous inspections                |
| X42| Strategic project location for downtown                      |
| X43| Late to obtain permits such as building permit etc.          |
| X44| Disasters, floods, earthquakes, volcanoes, etc.              |
| X45| Accident during construction                                  |

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