Cost Overrun in Construction Projects in Indonesia

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Abstract. Cost overrun is one of the problems faced by most construction projects in Indonesia. The unexpected budget in cost overrun can raise many problems in the project. Hence, it is important for every stakeholder in the project to have a good understanding of the factors causing cost overrun to avoid or to minimize the risk of it in the project. The aims of this study are to identify factors causing cost overrun in a project and to analyze factors that most influence the occurrence of cost overrun in construction projects in Indonesia as perceived by the owner and contractor. This research used a questionnaire to collect data. 15 factors were identified in this research i.e. site availability delay; site conditions; social site conditions; change order; rework; subcontractor and/or vendor performance; approval/permit delay; inaccuracy in budgeting; scheduling and resource planning; materials price fluctuations; rules and regulations; owner additional requirements; inflation; delay in payment; weak cash flow and bad weather. From a total of the 15 factors identified, both parties agreed on rework as the most factor causing cost overrun in construction projects in Indonesia.

1. Introduction
Construction industry in developing countries is nowadays growing rapidly in quantity and quality including in Indonesia. Simanjuntak et al (2014) shows that during 2013 and 2014 the quality of Indonesia’s infrastructure is ranked 82 out of 148 countries[1].

The success factors of a construction project include no overrun in both the duration and project cost [2] [3]. Some previous studies agreed that completing the project within the scheduled duration and planned budget are critical success factors of a construction project [2], [3]. Unfortunately, the main problem faced by most construction projects in developing countries has been related to the occurrence of cost overrun in projects. In Jordan, most infrastructure projects faced problems related to overrun in budget and delay [4]. Similar to this, project constructions in Iran and India also faced problems related to cost overrun [5][6].

Generally, cost overrun arises from the impact of financial risk. However, factors causing cost overrun are not only financial problems, but more complex. Previous research studies have identified some factors causing cost overrun in construction projects. Senouci et al (2016) mentioned that possible factors causing budget overrun in Qatari Public Construction Projects were poor quality in management, control systems, manpower, project estimation, financial constraints and also work scope and objectives [7]. Similar to Senouci et al, Samarghandi et al (2016) has identified factors causing cost overrun in Iran in perspectives by the owner, contractor, consultant, regulations and other general defects, and the result showed that the most important factor causing time delay and cost overrun was different from each parties [5]. In previous research, Al-Hazim et al (2017) has found that the most importance factors causing time delay and cost overrun were terrain conditions [4].
Several previous studies have analyzed the factors causing cost overrun in construction projects. However, there is a lack of research related to cost overrun in construction projects in Indonesia. This is the background of this research’s aim. The aim of this research is to analyze factors causing cost overrun in construction projects in Indonesia while the objectives of this research are to identify cost overrun factors and to assess the factor that is most influential in causing delays in construction projects as perceived by owners and contractors. The findings of this research are (1) list of factors causing cost overrun in construction projects and (2) the most critical factor causing construction cost overrun as perceived by both parties.

2. Materials and Methods
This research used quantitative methods to analyze factors causing cost overrun in construction projects in Indonesia from the owners’ and contractors’ perspectives. Data in this research were gained through distributing questionnaires to 50 respondents who were owners and contractors. Generally, this research was divided into 2 (two) steps: (1) Identifying factors causing cost overrun in construction projects in Indonesia and (2) Analyzing and ranking factors causing cost overrun in construction projects in Indonesia.

Step 1, identifying factors, began with brainstorming cost overrun factors with a person in project manager level. Then, the results were compared with related literatures (i.e. journals, books, newspapers, etc) as shown below.

Table 1. Comparing factors causing cost overrun in construction projects

| No | Factors                                      | Samarghandi et al (2016) | Al-Hazim et al (2017) | Venkateswaran et al (2017) [6] | Renuka et al (2018) [2] | Saiful et al (2019) [8] |
|----|----------------------------------------------|--------------------------|-----------------------|-------------------------------|-------------------------|-------------------------|
| 1. | Site availability delay                       | ✓                        | ✓                     | ✓                             | ✓                       | ✓                       |
| 2. | Site conditions                               | ✓                        | ✓                     | ✓                             | ✓                       | ✓                       |
| 3. | Social site conditions                        | ✓                        | ✓                     | ✓                             | ✓                       | ✓                       |
| 4. | Change order                                  | ✓                        | ✓                     | ✓                             | ✓                       | ✓                       |
| 5. | Rework                                        | ✓                        | ✓                     |                               | ✓                       | ✓                       |
| 6. | Subcontractors’ and/or vendors’ performance   | ✓                        |                       |                               | ✓                       | ✓                       |
| 7. | Approval/ permit delay                        | ✓                        | ✓                     |                               | ✓                       | ✓                       |
| 8. | Inaccuracy in budgeting, scheduling and resource planning | ✓ | ✓ | ✓ | ✓ | ✓ |
| 9. | Materials price fluctuations                  | ✓                        | ✓                     | ✓                             | ✓                       | ✓                       |
| 10. | Rules and regulations                         | ✓                        |                       |                               | ✓                       | ✓                       |
| 11. | Owner’s additional requirements               | ✓                        | ✓                     |                               | ✓                       | ✓                       |
| 12. | Inflation                                     | ✓                        |                       |                               | ✓                       | ✓                       |
| 13. | Delay in payment                              | ✓                        |                       |                               | ✓                       | ✓                       |
| 14. | Weak cash flow                                | ✓                        | ✓                     |                               | ✓                       | ✓                       |
| 15. | Bad weather                                   | ✓                        | ✓                     |                               | ✓                       | ✓                       |

As seen above, 15 factors that were identified in Step (1) and used in later steps of this research are site availability delay; site conditions; social site conditions; change order; rework; subcontractor and or vendor performance; approval/permit delay; inaccuracy in budgeting, scheduling and resource planning; materials price fluctuations; rules and regulations; owner’s additional requirements; inflation; delay in payment; weak cash flow and bad weather.

In Step (2) Rank analysis, the data in this research were collect by distributing a questionnaire to 50 respondents (owners and contractors). The questionnaire used contained 3 parts: (1) General information of the respondents (2) General information of the projects (3) Assessment of factors
causing cost overrun in construction projects using a 5-point Likert scale (1=strongly disagree; 2=disagree; 3=neither agree nor disagree; 4=agree; 5=strongly agree). Then, the data analysis used Kendall’s W test in the Statistical Package for the Social Sciences (SPSS) programme. One of the results from using Kendall’s W test was the finding of the most influential factor causing cost overrun in construction projects.

3. Results and Discussions
In this research, 15 factors were identified i.e site availability delay; site conditions; social site conditions; change order; rework; subcontractor and or vendor performance; approval/permit delay; inaccuracy in budgeting, scheduling and resource planning; materials price fluctuations; rules and regulations; owner additional required; inflation; delay in payment; weak cash flow and bad weather. The results of analysis using SPSS programme on the responses given by the 50 respondents are shown in Table 2 below.

| Factors                                             | N   | Minimum | Maximum | Std. Deviation |
|-----------------------------------------------------|-----|---------|---------|----------------|
| Site availability delay                             | 50  | 1.00    | 5.00    | 1.245          |
| Site conditions                                     | 50  | 1.00    | 5.00    | 0.974          |
| Social site conditions                              | 50  | 1.00    | 5.00    | 0.884          |
| Change order                                        | 50  | 2.00    | 5.00    | 0.990          |
| Rework                                              | 50  | 1.00    | 5.00    | 1.106          |
| Subcontractors’ and vendors’ performance            | 50  | 1.00    | 5.00    | 1.264          |
| Approval/Permits delay                              | 50  | 1.00    | 5.00    | 1.118          |
| Inaccuracy in budgeting, scheduling and resource planning | 50  | 1.00    | 5.00    | 0.986          |
| Materials price fluctuations                        | 50  | 2.00    | 5.00    | 1.124          |
| Rules and regulations                               | 50  | 1.00    | 5.00    | 0.995          |
| Owner’s additional requirements                     | 50  | 2.00    | 5.00    | 0.978          |
| Inflation                                           | 50  | 2.00    | 5.00    | 1.046          |
| Delay in Payment                                    | 50  | 1.00    | 5.00    | 1.166          |
| Weak cash flow                                      | 50  | 1.00    | 5.00    | 1.111          |
| Bad weather                                         | 50  | 1.00    | 5.00    | 1.049          |
| Valid N (listwise)                                  | 50  | 1.00    | 5.00    | 1.245          |

The results of mean rank from Kendal’s W test analysis using The Statistical Package for the Social Sciences (SPSS) are presented in Table 3 below.

| No   | Factors                                             | Mean Rank |
|------|-----------------------------------------------------|-----------|
| 1.   | Rework                                              | 9.830     |
| 2.   | Owner’s Additional Requirements                     | 9.810     |
| 3.   | Inaccuracy in Budgeting, Scheduling and Resource Planning | 9.750     |
| No | Factors                              | Mean Rank |
|----|--------------------------------------|-----------|
| 4  | Materials Price Fluctuations         | 9.440     |
| 5  | Change Order                         | 8.930     |
| 6  | Inflation                            | 8.300     |
| 7  | Site Conditions                      | 8.280     |
| 8  | Weak Cash Flow                       | 8.220     |
| 9  | Site Availability Delay              | 8.140     |
| 10 | Subcontractors’ and Vendors’ Performance | 7.930   |
| 11 | Social Site Conditions               | 7.670     |
| 12 | Approval/Permits Delay              | 6.790     |
| 13 | Delay in Payment                     | 6.360     |
| 14 | Bad Weather                          | 5.500     |
| 15 | Rules and Regulations                | 5.050     |

Table 3 shows that rework was the most influential factor causing cost overrun in construction projects. Furthermore, the data were validated using Kendall’s W test and it resulted in a Kendall’s W value of 0.143 with asymp sig 0.000. This meant that the 15 factors identified only had an effect of 14.3% on cost overrun in construction projects. The hypothesis in this research analysis is as follows:

Ho: factors have no significant effect on cost overrun in construction projects

H1: factors have significant effect on cost overrun in construction projects

Comparing the value of asymp sig: if the probability is larger than 0.050 (> 0.050), then Ho is accepted. Whereas, if the probability is less than 0.050 (<0.050), then Ho is rejected. The results showed that the value of asymp sig was 0.000, which is less than alpha (0.000<0.050), hence Ho was rejected and all of these factors have significant effect on cost overrun in construction projects.

Comparing with statistics table: if the calculated value is less than the table value (calculated value < table value), then Ho should be accepted. Whereas, If the calculated value is larger than statistics (calculated value > table value), then Ho should be rejected. In this research, the value of Chi square using Kendal’s W test was 100.217. However, based on the chi-square table, for df (degree of freedom) = k-1 = 15-1 = 14 with level of significance = 5% (means the level of trust was 95%) then the value obtained from the table = 23.680. It means that the calculated value was greater than the table value (100.217 > 23.680), hence Ho was rejected and meaning that all factors had significant effect on cost overrun in construction projects.

The result analysis shows that both owners and contractors agreed that rework was the most influential factor in causing cost overrun in construction projects. A previous study by Al-Hazim (2017) mentioned that both parties had their special attention in the planning stage including in scheduling and budgeting. Similar to Al-Hazim [4], Dapu et al (2016) mentioned that the occurrence of cost overrun in construction project depended on the planning, coordination and controlling phase [9]. It means that an optimal planning stage would minimize the occurrence of rework in construction project.

4. Conclusions

The study found 15 factors causing cost overrun in construction projects i.e. site availability delay; site conditions; social site conditions; change order; rework; subcontractors’ and/or vendors’ performance; approval/permit delay; inaccuracy in budgeting, scheduling and resource planning; materials price fluctuations; rules and regulations; owner’s additional requirements; inflation; delay in payment; weak cash flow and bad weather. From the total 15 factors identified, both owners and contractors agreed that “Rework” was the most influential factor causing cost overrun in construction projects in Indonesia.
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