Prioritization of Problems Impacted to Construction Delay by Contractors Attitude

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Abstract

The delay of construction is important obstacle of construction operators. The duration in construction operating impacted to customers business benefit. Research objectives are to study the problems impacted the delay of construction work and prioritize of these problems. The research start off collect various problems that impacted to delay of construction work from several databases. These data will be screened by expert. Thirteen problems are most impacted to delay of construction work. Research applied thirteen issues to generate questioners, they have seventy eight questions which are pairwise comparisons. Respondents are seventeen construction contractors. The data from respondents answer are calculated and analyzed by matric method. It is the major part of analysis hierarchy process. The most important weight is labors lack problem for impacted to the delay of construction work, it obtained 0.157. Resulting, this problem engender the delay of construction conducting is most. The results showed to this research are just data of happening on current. These data may have discrepancy in the future, because; technology, economy, environment and regulation of government will be changed.

Keywords: The delay of construction work/ Contractors/ Problems

Introduction

Nowadays, the expansion rate and competition of construction business is increasing. Many construction companies need adapt to current economics, society and environments conditions. The most of customers are interested to construction quality, particularly: condominiums, townhouses, housing estate etc. In order to respond customer needs, operators have to work with good construction results that meet requirements, beautiful and quality, especially: the duration of construction. It must be not delay.

Construction delay is the main problem and obstacle of construction conducting. The duration may impact to business interests of customers. These problems are divided into several factors such as; labors and construction equipment lacks, labors ability, complicated design etc. Several constructions companies are obtained these problems to the same, it is collected by construction works attitudes with its real experience.

Research Objectives

Researcher have seen these problems impacted to construction delay. It contributes to the difficulty of work. Therefore, this research is to study various problems impacted to construction delay and prioritize of these problems.

Scope of Research

This research study the problem impacted to construction delay in Bangkok and metropolitans areas. Researcher is collected data by 17 construction contractors of private companies. The research uses discrepancy value of 0.50-0.48 which is decreased to 0.2.

Relevant literature review

This part is to study the other literature, in order to be obtained the knowledge and guidelines for research conducting. We expect that periodization of various problems impacted to construction delay will help operators focus on major problem respectively. The detail on this section consist of: construction type, various problems impacted to construction delay happened in the present, and the method of analytic hierarchy process.

Construction types

The most of people emphasized to residence and building for business such as shopping mall, office, market, factory, shop, etc. The companies have to build these things in order to respond customers need. However, it has several types of constructions that occurred on the world. Researcher describes 3 main construction types impacted to human subsistence (Chaijaroen, 2018). 1) The type used in industrial applications is construction of various industrial plants as follows: large industrial factory and hotel, etc. 2) the type used in commercial is construction of all kinds buildings that human are available to live such as school, hotel, hospital, commercial building, public building, etc. 3) civil work for utilities divided to 2 types such as highway construction work and large building (dam, irrigation, large bridges, airport work, etc.).

Commercial construction may be good trends for retail business that emphasis on the accordance style with the changing consumer behavior, include access to more community source. It consists of; small shop styles and community mall. Most big operators in the market aimed to expand small retail shop and develop service types are several. Community mall is continually growing up market and beginning expand to other major provinces. However, the launch of new projects direction, it may slow down in the future because of the competition is higher (Kasikorn research center, 2009).

The problem impacted to construction delay

Many problems are in the construction work. It is directly impacted to the delay of construction work. Therefore, it has explored to often problems in construction. Construction problems are mainly caused by contractor, designer, owner, designer, and external factors (Royal Irrigation Department, 2011). There are 18 problems impacted to construction delay as follows; 1) the problem of purpose changing of work plan (Sutep Bootko et al., 2014), 2) erroneous design (Boris construction pro, 2016), 3) lack of experiences and working skills of the workers (Nitithon, 2011), 4) lack of construction equipment (Wuttipong aonsrisombat, 2013), 5) labors lack (Worapol jantanasin , 2010), 6) construction machines lack (Nitithon, 2011), 7) Contractor finance received from the employer (Boris construction pro, 2016), 8) applying for permission from government agencies, 9) Environmental conditions

such as rain, hot weather and social factors (Sutep Bootko, 2014), 10) Conflicts between contractors and consultant engineers (Worapol jantasin , 2010), 11) Coordination and internal communication are mistaken (Worapol jantasin , 2010), 12) lack of equipment and machinery maintenance, 13) Transportation of materials and tools (Sutep Bootko, 2014), 14) material price fluctuations based on economic conditions (Sutep Bootko, 2014), 15) inadequate infrastructure system such as electricity, water supply, telephone, etc (Sutep Bootko, 2014), 16) complicated construction model, 17) stop working condition, and 18) Security control (Boris construction pro, 2016).

Technique of analytic hierarchy process

Analysis Hierarchy Process (AHP) is one of the methods used in analysis to decide the best alternative. This method was developed by Thomas L. Saaty in 1970. AHP used to be management tools which is principle divided problem structure into layers as follows; first is goal, second is criteria, third is sub criteria, and the last is alternative determination respectively. We could analyze best alternative by pairwise comparison. In order to easy decision which criteria is more important, we must provide the important score in various criteria. The data will be considered and analyzed to alternatives by various pairs. The important scoring is reasonable, it will be prioritized alternative for the best choice (Saaty, 2008).

Hana microelectronic company in Thailand applied Analysis Hierarchy Process (AHP) with its manager decision. The research used questioners for data collection. The result showed to important criteria for selection of logistics service providers (Nareerat Potikulom, 1993). In 2003, Pranadda Yentrakul from Thailand used Analysis Hierarchy Process (AHP) with alternative to find suitable warehouse location. Simultaneously, they bring this technique analyzed to suitable industrial estate for investigators as well (Pranadda Yentrakul, 2003).

Research methodology

This part describes research conducting. It must be achieved two research objectives. Researcher propose to study various problems impacted to construction delay and prioritize of these problems. In order to achieve research objectives referred above, we will explain more details on research procedures, it showed various steps on figure 1.

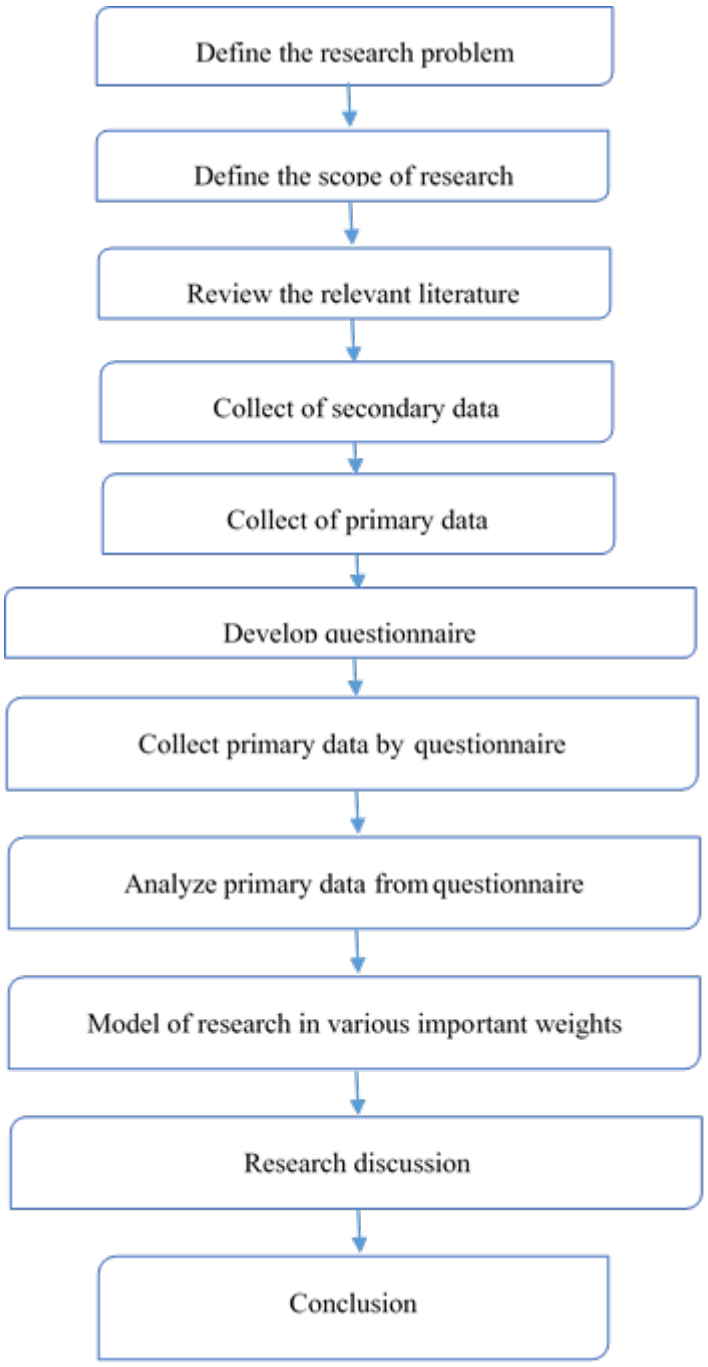

Figure 1 Research procedures

1) Determine the research problem, researcher propose to study various problems impacted to construction delay and prioritize of these problems. The issues will be sorted most impact weight to lowest.

2) Determine the research scope, researcher aimed to various problems impacted to construction delay, they are in Bangkok and metropolitans areas. Large, medium and small building projects are the case of this research. The research data will be collected by construction contractor perspectives and attitudes directly.

3) Relevant literature review, in order to understand construction type's and various problems impacted to construction delay, include other techniques for data analysis, researcher study several suggestion and improvement method each research questions.

4) Collect of secondary data, researcher gather data on several databases from academic articles, books, journals, websites, and other database related to problems impacted construction delay. Eighteen problems are the main factors impacted construction delay, we referred to above on the part of relevant literature review.

5) Collect of primary data, researcher applied technique of analytic hierarchy process be the prototype for primary data collection. Eighteen problems from secondary data will be analyzed and suggested by experts. Thirteen problems are the suitable factor impacted to construction delay. Some problems are similar issues and very little impacted to construction delay. Therefore, specialists group any problems and cut off with reasonableness. This research obtained suitable 13 problems from expert's suggestion as follows; 1) the problem of purpose changing of work plan, 2) the design is insufficient detail, 3) lack of experiences and working skills of the workers, 4) Materials delivery is wrong required, 5) labors lack, 6) Mechanical is not obtained maintenance, 7) Contractor finance received from the employer, 8) Environmental conditions such as rain, hot weather and social factors, 9) lack of coordination between contractors and consultant engineers**,** 10) Transportation of materials from production sites to construction sites is not catch up, 11) material price fluctuations based on economic conditions, 12) the construction site is not space enough to accommodate the utilities, 13) Security control is not standard.

6) Develop questionnaire, the questions will cover about problems impacted construction delay. These problems are suggested by experts thirteen factors .In various questions divided to 9 alternative for important scoring. It is followed saaty table, shows in

Intensity of importance	Definition	Explanation
1	Equal importance	Two factors contribute equally to the objective
3	Somewhat more important	Experience and judgement slightly favour one over the other.
5	Much more important	Experience and judgement strongly favour one over the other.
7	Very much more important	Experience and judgement very strongly favour one over the other. Its importance is demonstrated in practice.
9	Absolutely more important.	The evidence favouring one over the other is of the highest possible validity.
2,4,6,8	Intermediate values	When compromise is needed

Figure 2 Importance score in various pairwise comparisons

Source: Thomas saaty (1980)

7) Collect primary data by questionnaire, questionnaire was developed for 17 respondents. Researcher provide it to construction contractors in various projects. The respondents are divided construction project per person. They select only one important weight alternative. The providing important weight is directly related to number of respondents answers. The research uses discrepancy value of 0.50-0.48 which is started decreasing to 0.2. It is researched by California Junior Colleges Association (CJCA) in 1971, shows in table 1.

Table 1 Suitable respondents number for data collection

Respondents number	Range of discrepancies	Discrepancies
1 – 5	1.02 – 0.70	0.05
5 – 9	0.70 – 0.58	0.12
9 – 13	0.58 – 0.54	0.04
13 – 17	0.54 – 0.50	0.04
17 – 21	0.50 – 0.48	0.02
21 - 25	0.48 - 0.46	0.02
25 - 28	0.46 - 0.44	0.02

Source: Macmillan (1971)

8) Analysis primary data from questionnaire, after finished collecting data with 1 7 respondents, researcher will analyze these data from questioners. The data are calculated geometric mean, then they are computed and analyzed important weight impacted to construction delay by metric method. They are calculated consistency ratio with 1.56 random index value, shows in table 2, and data obtains the reasonable when consistency ratio is not over 0.1.

Table 2 Random Index (RI) values in various respondents' number

N	1	2	3	4	5	6	7	8	9	10	11	12	13
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49	1.51	1.48	1.56

Source: Thomas saaty (1980)

9) Model of research in various important weight, after finished all steps of conducting, researcher are received problem impacted to construction delay each important weight. The results of this research help construction operators ready to prepare themselves with problem impacted to construction delay.

10) Research discussion

11) Research conclusion

Results and discussions

This research has led to expert suggest, which consists of 13 problems. Ii is generated questioners in the part of pairwise comparison, 78 pairs. Researcher went to hand out the questioners at construction projects, contractors are respondents of this research, shows in figure 3.

Figure 3 Respondent is answering to the questionnaire

The respondent's answers are calculated by geometric mean, 17 contractors. The left side answer is an integer of scoring, and right side is fraction. These data will be computed again with metric method. We have to define abbreviation various problems in order to easy to understand as follows;

P1 = the problem of purpose changing of work plan

P2 = the design is insufficient detail

P3 = lack of experiences and working skills of the workers

P4 = Materials delivery is wrong required

P5 = labors lack

P6 = Mechanical is not obtained maintenance

P7 = Contractor finance received from the employer

P8 = Environmental conditions such as rain, hot weather and social factors

P9 = lack of coordination between contractors and consultant engineers

P10 = Transportation of materials from production sites to construction sites is not catch up

P11 = material price fluctuations based on economic conditions

P12 = the construction site is not space enough to accommodate the utilities

P13 = Security control is not standard

After we obtained data from geometric mean calculation, the next step go on compute column total values in various problems shows in figure 4. For example, column total of P1 is 1.00 + 0.50 + 0.88 + 0.95 + 1.13 + 0.92 + 1.57+ 1.33 + 1.18 + 2.17 + 1.14 + 2.60 + 1.11 = 16.48. Calculate the weight of problem (Eigenvectors) is showed in figure 5. For example, pairwise P1 and P1 is $\frac{1.00}{16.48} = 0.06$. The column total will be simple weight with 1.00. Row total of them have to equal total number of problems. In order to calculate eigenvectors value, row total in various problems will be divided by factors total number, as P1 is $\frac{0.88}{13.00} = 0.07$. The eigenvectors value represented to rank various problems. Researcher calculates average value of quotient (λmax) in order to check reasonable of data, shows in figure 6. Various problem columns are multiplied by eigenvectors value as 0.06 × 0.07 = 0.0041. Quotients value are rows total divided by various eigenvectors value as 0.08/0.0059 = 13.00. λmax is averaged of quotient = 13.00. Next step, we look for consistency index (CI) = $\frac{(\lambda max - N)}{(N-1)} = \frac{(13-13)}{(13-1)} = 0$, and consistency ratio (CR) = $\frac{CI}{RI} = \frac{0}{1.56} = 0.00$. Consistency ratio is not over 0.1. Therefore, this research data is reasonable, shows in table 3.

Factors	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
P1	1.00	2.00	1.14	1.05	0.89	1.09	0.64	0.75	0.85	0.46	0.88	0.39	0.90
P2	0.50	1.00	0.72	1.00	0.61	1.50	0.81	2.19	0.84	1.21	1.08	0.87	1.21
P3	0.88	1.39	1.00	1.39	0.79	1.28	1.01	1.55	2.40	1.23	2.41	2.32	1.68
P4	0.95	1.00	0.72	1.00	0.39	1.29	0.38	0.86	1.02	1.07	1.39	0.76	1.19
P5	1.13	1.65	1.26	2.53	1.00	4.19	1.67	2.38	2.19	3.69	3.79	3.33	3.04
P6	0.92	0.67	0.78	0.77	0.24	1.00	0.54	1.31	0.51	1.18	1.58	0.76	0.69
P7	1.57	1.24	0.99	2.65	0.60	1.84	1.00	3.49	2.63	3.58	2.26	2.62	2.60
P8	1.33	0.46	0.65	1.16	0.42	0.76	0.29	1.00	2.21	0.91	0.87	0.69	1.02
P9	1.18	1.19	0.42	0.98	0.46	1.95	0.38	0.45	1.00	2.12	1.93	0.76	1.49
P10	2.17	0.83	0.81	0.93	0.27	0.85	0.28	1.09	0.47	1.00	1.09	0.90	0.91
P11	1.14	0.93	0.41	0.72	0.26	0.63	0.44	1.15	0.52	0.92	1.00	1.40	1.28
P12	2.60	1.15	0.43	1.32	0.30	1.32	0.38	1.46	1.31	1.12	0.71	1.00	1.33
P13	1.11	1.21	0.59	0.84	0.33	1.45	0.38	0.98	0.67	1.10	0.78	0.78	1.00
Columns total	16.48	14.71	9.92	16.35	6.56	19.17	8.20	18.66	16.61	19.59	19.79	16.57	18.33

Figure 4 The compute column total values in various problems

Factors	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	Rows total	Eigenvectors	Priority ranking
P1	0.06	0.14	0.12	0.06	0.14	0.06	0.08	0.04	0.05	0.02	0.04	0.02	0.05	0.88	0.07	4
P2	0.03	0.07	0.07	0.06	0.09	0.08	0.10	0.12	0.05	0.06	0.05	0.05	0.07	0.90	0.07	4
P3	0.05	0.09	0.10	0.09	0.12	0.07	0.12	0.08	0.14	0.06	0.12	0.14	0.09	1.29	0.10	3
P4	0.06	0.07	0.07	0.06	0.06	0.07	0.05	0.05	0.06	0.05	0.07	0.05	0.06	0.78	0.06	5
P5	0.07	0.11	0.13	0.15	0.15	0.22	0.20	0.13	0.13	0.19	0.19	0.20	0.17	2.04	0.16	1
P6	0.06	0.05	0.08	0.05	0.04	0.05	0.07	0.07	0.03	0.06	0.08	0.05	0.04	0.71	0.05	6
P7	0.10	0.08	0.10	0.16	0.09	0.10	0.12	0.19	0.16	0.18	0.11	0.16	0.14	1.69	0.13	2
P8	0.08	0.03	0.07	0.07	0.06	0.04	0.03	0.05	0.13	0.05	0.04	0.04	0.06	0.76	0.06	5
P9	0.07	0.08	0.04	0.06	0.07	0.10	0.05	0.02	0.06	0.11	0.10	0.05	0.08	0.89	0.07	4
P10	0.13	0.06	0.08	0.06	0.04	0.04	0.03	0.06	0.03	0.05	0.05	0.05	0.05	0.74	0.06	5
P11	0.07	0.06	0.04	0.04	0.04	0.03	0.05	0.06	0.03	0.05	0.05	0.08	0.07	0.69	0.05	6
P12	0.16	0.08	0.04	0.08	0.05	0.07	0.05	0.08	0.08	0.06	0.04	0.06	0.07	0.90	0.07	4
P13	0.07	0.08	0.06	0.05	0.05	0.08	0.05	0.05	0.04	0.06	0.04	0.05	0.05	0.72	0.06	5
Columns total	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	13.00	1	

Figure 5 The calculate weight of problem (Eigenvectors)

Factors	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	Rows total	Eigenvectors	Quotients
P1	0.0041	0.0094	0.0114	0.0038	0.0213	0.0031	0.0101	0.0024	0.0035	0.0013	0.0024	0.0016	0.0027	0.08	0.0059	13.00
P2	0.0020	0.0047	0.0072	0.0036	0.0145	0.0043	0.0128	0.0069	0.0035	0.0035	0.0029	0.0036	0.0037	0.07	0.0056	13.00
P3	0.0036	0.0066	0.0100	0.0051	0.0190	0.0036	0.0160	0.0049	0.0099	0.0036	0.0065	0.0097	0.0051	0.10	0.0080	13.00
P4	0.0039	0.0047	0.0072	0.0037	0.0095	0.0037	0.0060	0.0027	0.0042	0.0031	0.0037	0.0032	0.0036	0.06	0.0045	13.00
P5	0.0046	0.0078	0.0126	0.0092	0.0239	0.0119	0.0265	0.0075	0.0090	0.0108	0.0102	0.0140	0.0092	0.16	0.0121	13.00
P6	0.0038	0.0031	0.0078	0.0028	0.0057	0.0028	0.0086	0.0041	0.0021	0.0034	0.0042	0.0032	0.0021	0.05	0.0041	13.00
P7	0.0064	0.0058	0.0099	0.0097	0.0143	0.0052	0.0159	0.0110	0.0108	0.0104	0.0061	0.0110	0.0079	0.12	0.0096	13.00
P8	0.0055	0.0022	0.0065	0.0042	0.0101	0.0022	0.0046	0.0031	0.0091	0.0027	0.0023	0.0029	0.0031	0.06	0.0045	13.00
P9	0.0048	0.0056	0.0042	0.0036	0.0109	0.0055	0.0060	0.0014	0.0041	0.0062	0.0052	0.0032	0.0045	0.07	0.0050	13.00
P10	0.0089	0.0039	0.0081	0.0034	0.0065	0.0024	0.0044	0.0034	0.0019	0.0029	0.0029	0.0038	0.0028	0.06	0.0043	13.00
P11	0.0047	0.0044	0.0041	0.0026	0.0063	0.0018	0.0070	0.0036	0.0021	0.0027	0.0027	0.0059	0.0039	0.05	0.0040	13.00
P12	0.0106	0.0054	0.0043	0.0048	0.0072	0.0037	0.0060	0.0046	0.0054	0.0033	0.0019	0.0042	0.0040	0.07	0.0050	13.00
P13	0.0046	0.0057	0.0059	0.0031	0.0079	0.0041	0.0061	0.0031	0.0028	0.0032	0.0021	0.0033	0.0030	0.05	0.0042	13.00
															λmax	13.00

Figure 6 The calculate average value of quotient (λmax)

Table 3 Reasonable calculation

Consistency Index (CI)	**0.00**
Random Index (RI)	1.56
Consistency Ratio (CR)	0.00
0.00 < 0.1 is reasonable	

From calculation above can summary priority the problems impacted to construction delay as follow; number one, two, and three are labors lack (eigenvector = 0.16), contractor finance received from the employer (eigenvector = 0.13), lack of experiences and working skills of the workers (eigenvector = 0.10). Number four are the problem of purpose changing of work plan, the design is insufficient detail, lack of coordination between contractors and consultant engineers, and the construction site is not space enough to accommodate the utilities (eigenvector = 0.07). Number five are materials delivery is wrong required, environmental conditions such as rain, hot weather and social factors, and security control is not standard (eigenvector = 0.06). Finally, number six are mechanical is not obtained maintenance, and material price fluctuations based on economic conditions (eigenvector = 0.05).

Conclusions

The 13 main problems impacted to construct delay are mentioned above. Particularly, lack labor of problem is a major factor for construction operators, contractors, and other related to construction field. They should be more awareness about this problem. The regulation of Thailand are quite strict in the part of foreign workers number who come to work in country, and encourage Thai workers are more worked in the country. In fact, it is unreasonable for work with very few Thai workers. Thai labors are more interested to work on abroad, because of its income is very higher Thailand. Therefore, the labors in construction industry are many lacking now with other construction projects are increasing. The other part of problem are few mentioned which they are also a major obstacle to the construction. However, lack labor

include to other problems impacted to construction delay are just main issues occurred to Thailand. Overseas, there may be other issues that are more important, these problems are prioritized to high or low level, it based on technology, economy, environment and regulation of government will be changed.

These problem are prioritized in various factors. The results are ranking number 1-5 with 13 problems. This research are answered just one group respondent. The results should be compared to other group respondents as well. Including, the matric analysis method may not be enough for data calculation tool. These data should be obtained more calculation tools, in order to be more analysis resolution. Mechanical is not obtained maintenance and material price fluctuations based on economic conditions are fewest problem impacted to construction delay. In the future, two problem mentioned may be main factor, depend on technology, economy, environment and regulation of government will be changed too.

However, the results from prioritizing each problem in this research will be beneficial to future. It is basis and guidelines for improving the working system in construction industry. It is important thing to remind the operator, contractor, and people in the construction industry should be cautious before these problems happen to themselves.

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