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Time and Cost Perfomance in Costruction Projects in Southern and Cenrtal Regions of Penisular Malaysia

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ABSTRACT

Time and cost performance is the fundamental criteria for success of any project. Unfortunately construction industry in Malaysia has been regarded as industry facing poor performance leading to failure in achieving effective time and cost performance. As a consequence most of the project face huge amount of time and cost overrun. This study assessed the time and cost performance of construction projects in Malaysia using structured questionnaire survey. The findings of study revealed that 92% of construction projects were overrun and only 8% of project could achieve completion within contract duration. The amount of time overrun was in between 5-10% as agreed by respondents. In terms of cost performance only 11% of respondents mentioned that normally their projects are finished within the budgeted cost while 89% of respondents agreed that their projects were facing the problem of cost overrun with average overrun at 5-10% of contract price. The major contributors of this poor performance include design and documentation issues, financial resource management and project management and contract administration issues. Further, qualitative study was carried out using semi-structured interviews with the experience personnel involving in managing construction project which resulted in developing 13 mitigation measure to improve time performance and 15 mitigation measure to improve cost performance in construction project. This study will help the practitioners to implement the mitigation measure at planning stage in order to achieve successful construction projects.

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1. INTRODUCTION

Construction industry is highly dynamic sector and plays very important role in the development of country and hence in Malaysia, construction industry started a rapid growth since its independence. However, construction industry in Malaysia is facing chronic problems including poor performance of time and cost, construction waste, poor productivity and over dependent of foreign workers. Of these challenges, poor time and cost performance is considered as a critical issue. As reported by [1] only 46.8% of public sector and 37.2% of private sector projects were found completed within the stipulated budget in Malaysia while only 20.5% of the public projects 33.35% of the private sector projects were completed within the time. Further, [2] stated that in Malaysia, there is lack of investigation on construction cost factors. This motivated the authors to study the issues of time and cost performance of construction projects in Malaysia. However, this study was limited to the construction projects in southern and central part of peninsular Malaysia. Southern

part of Malaysia consists of states of Johor, Melaka and Negri Sembilan while central part of Malaysia includes Kuala Lumpur and Selangor states.

2. RELATED WORKS

In the construction industry, the aim of project control is to ensure that projects finish on time, within budget and achieve other project objectives [3]. A successful project is the only project which has accomplished its technical performance, maintained its schedule, and remained within budgetary costs. Project management tools and techniques play an important role in the effective management of a project [4]. Construction time and cost are fundamental considerations in project management and regarded as most important parameters for measuring success of any project. Poor performance of time and cost can lead to a significant amount of time and cost overrun which is global phenomenon.

Time overrun can be defined as late completion of works as compared to the planned schedule or contract schedule. It occurs when the progress of a contract falls behind its scheduled program. It may be caused by any party to the contract and may be a direct result of one or more circumstances. A contract delay has adverse effects on both the owner and contractor (either in the form of lost revenues or extra expenses) and it often raises the contentious issue of delay responsibility, which may result in conflicts that frequently reach the courts [5] Cost overrun can be considered as the difference between actual cost of a project and its Cost limit. It occurs when the resultant cost target of a project exceed its cost limits where Cost limit of a project refers to the maximum expenditure that the client is prepared to incur on a completed building project while cost target refers to the recommended expenditure for each element of a project [6]. Construction cost which is out of control adds to investment pressure, increases construction cost, affects investment decision-making and wastes the national finance might result in corruption or offence [7].

Numerous researches have outlined the issue of poor time and cost performance of construction projects worldwide. In a study of 8,000 projects, [8] found that only 16% of the projects could satisfy the three famous performance criteria: completing projects on time, within budgeted cost and quality standard, while in a global study on cost overrun issues in transport infrastructure projects covering 258 projects in 20 nations [9] concluded that 9 out 10 projects face cost overrun. Time and cost overrun has been reported as major problems globally [10]-[16]. Malaysian construction industry is also facing these problems significantly. In a survey of delay practices in Malaysian construction industry [17] found that 87% of the respondent reported that they have encountered delays in their projects with overrun in time of 10-40% of contract duration while in study of MARA large projects [18] concluded that construction projects encountered an overrun with average of 23.74% of contract duration. Ref [2], [7], [19] have reported that the in construction projects of Malaysia cost overrun is very common.

3. DATA COLLECTION

Data collection was carried out in two stages combining quantitative and qualitative methods. In first stages quantitative methods was adopted using structured questionnaire survey to gather information regarding time and cost performance of construction. 5-point likert scale as E.S (Extremely Significant); V.S (Very Significant); M.S (Moderately Significant); S.S (Slightly Significant) and N.S (Not Significant) was adopted to understand the perception of personnel of the client, consultant and contractors organization involved in handling construction projects in Malaysia respondents regarding significant causes of time and cost overrun. Relative Importance index (RII) calculation was used to determine relative significance and ranking of cost and time overrun factors. Ref [20] used same method to investigate causes of delay in construction projects in Kuwait, similarly [21] also used same approach to investigate the causes and effects of construction delay in Malaysian construction industry. RII will be calculated with following expression:

$$RII = \frac{\sum_{i=1}^{5} w_i x_i}{A \times N}$$

Where;

RII = Relative importance index
w = weighting given to each factor by respondents and it ranges from 1 to 5
x = frequency of ith response given for each cause
A = highest weight (i.e. 5 in this case)
N = total number of participants

Correlation test was performed to assess the strength of association between the causes of time and cost overrun. As data collected in this study is nonparametric and ordinal variables, the powerful method of

examining the relationship between pairs of variables is by using Spearman's correlation [22]. The correlation value coefficient (or "ρ") value ranges from -1.0 to +1.0. The closer ρ is to +1 or -1, the more closely the two variables are related. The value of ρ close to 1 implies there is strong positive linear relationship between the two variables while the value of ρ close to -1 is a strong negative linear relationship between the two variables [23] Ideally, the correlation coefficient value of ± 1 is said to be a perfect correlation. Assume correlation coefficient value lies between ± 0.5 and ± 1, then it is said to be a high degree of correlation and for the correlation coefficient value lies between ± 0.3 and ± 0.5, then it is said to be moderate degree of correlation. If correlation coefficient value lies between ± 0.1 and ± 0.3 then it is said to be a low degree of correlation and suppose correlation coefficient value lies around zero, then there is no correlation [24].

4. RESULTS AND DISCUSSION

A total of 200 questionnaire sets were distributed randomly amongst the personnel involved in construction industry in the southern part of peninsular Malaysia. As a result 140 responses were received back. The data was analyzed with statistically with SPSS v17.0. The findings of study are discussed below:

4.1. Demographics of Respondents

The respondents involved in the survey have had several years of experience in handling various types of projects. The demographics of the respondents participated in survey as summarized in Table 1.

Table 1. Demographic Characteristics of Respondents

	Frequency	%age	Cumulative %
Type of Organization			
Client	23	16.4	16.4
Consultant	53	37.9	54.3
Contractor	64	45.7	100.0
Size of Projects			
1-5 Million	20	14.3	14.3
6-10 Million	21	15.0	29.3
10-50 Million	37	26.4	55.7
Above 50 Million	62	44.3	100.0
Academic Qualification			
BE (Civil)	104	74.3	74.3
ME (Civil)	17	12.1	86.4
Diploma (Civil)	12	8.6	95.0
BSc	5	3.6	98.6
BBA	2	1.4	100.0
Working Experience			
0-5 years	24	17.1	17.1
6-10 years	34	24.3	41.4
11-15 years	28	20.0	61.4
16-20 years	25	17.0	79.3
More than 20 years	29	20.7	100.0

Table 4 shows that that majority of the respondents (45.7%) participated in survey were contractor's personnel followed by consultant and clients with %age of 37.9 and 16.4 respectively. More than 50% of respondents had more than 10 years experience of handling construction projects and significant number of respondents had obtained engineering degree which shows that the respondents were competent enough and capable to participate in the survey.

4.2. Time Performance of Construction Projects

Respondents were asked about the performance of construction projects in terms of extent of time overrun measuring the approximate %age of time overrun for the projects they were involved in past ten years. The results are summarized in table 2.

Table 2. Time Perfromance of Construction Projects

Percentage Of Time Overrun	Frequency	Percent (%)	Cumulative Percent
0%	11	8	8
1-5 %	20	14	22
5-10 %	24	17	39
10-15 %	48	34	74
More Than 15%	37	26	100
Total	140		

Results show that a quite small number of responses mentioned that the projects were completed within estimated time i.e. facing 0% [22]time overrun. On the other hand a significant number of respondents (34% of respondents) mentioned that more commonly time overrun in construction projects is approximately 10-15% and 26% respondents mentioned that normally construction projects experience overrun of more than 15%. While only 14% and 17% of respondent mentioned that they experience the overrun of time in construction projects as 1-5% and 5-10% respectively

4.3. Cost Performance of Construction Projects

Most of the projects are facing the problem of cost overrun. However, the degree of overrun varies from project to project. In survey of cost overrun it was notably found that only 11% of respondents mentioned that normally their projects are finished within the budgeted cost while 89% of respondents agreed that mostly the projects are overrun compared to budgeted cost. The results of cost overrun are presented in Figure 1.

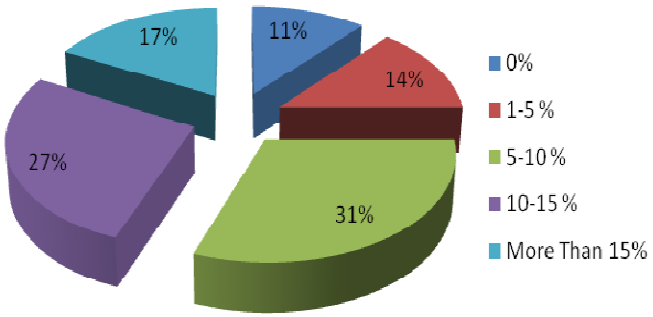

Figure 1. Cost Perfromance of Construction Projects

Figure 1 shows that majority of respondent (43 of 140) mentioned that normal range of cost overrun is 5-10% followed by 10-15% of cost overrun as agreed by 38 (27%) respondents. This shows that cost overrun is common phenomenon in construction industry. However, the amount of this overrun varies from project to project. This lead to need of serious attention to be paid on cost control.

4.4. Major Factors Affecting Time and Cost Performance

For improving time and cost performance, the first and foremost important step to understand the contributing factors. The study investigated common causes affecting time and d cost performance as shown in Table 3.

Table 3. Major Factors Affecting Time and Cost Performance

	Factors Affecting Time and Cost Performance	**RII**	**Rank**
DDF	Design and Documentation Issues	0.80	1
FIN	Financial Resource Management	0.79	2
PMCA	Project Management and Contract Administration	0.79	2
CSM	Contractors Site Management	0.78	3
ICT	Information and Communication Technology	0.78	3
MMF	Material and Machinery Resource	0.74	4
LAB	Labour (Human) Resource	0.74	4
EXT	External Factors	0.71	5

Table 3 shows that design and documentation issues are very dominant in construction, affecting significantly on time and cost performance of construction projects. Frequent design changes is commonly practiced which is major inhibiting factors in achieving successful completion of projects. Second major factor was found as financial resource management. The respondent's argues that delay in payment of completed works from owner affects significantly on cash flow of contractor and it cause delay in procurement of resource. Consequently time and cost performance of projects is affected. Project management and contract administrated was also rated as second major contributor affecting time and cost performance. Respondents believe that changes in scope and inadequate site investigation at the planning stage leads to major changes and rework in construction projects. Further, Spearman correlation test was used to assess the correlation between factors as shown in table 4.

Table 4. Corelation Between Factors Affecting of Time and Cost Performance

	MAT	LAB	FIN	DDF	PMCA	CSM	ICT	EXT
MAT	1.000	.599**	.605**	.489**	.633**	.584**	.533**	.281**
LAB	.599**	1.000	.411**	.323**	.492**	.531**	.506**	.167*
FIN	.605**	.411**	1.000	.440**	.420**	.378**	.236**	.038
DDF	.489**	.323**	.440**	1.000	.705**	.529**	.354**	.176*
PMCA	.633**	.492**	.420**	.705**	1.000	.584**	.497**	.335**
CSM	.584**	.531**	.378**	.529**	.584**	1.000	.626**	.340**
ICT	.533**	.506**	.236**	.354**	.497**	.626**	1.000	.351**
EXT	.281**	.167*	.038	.176*	.335**	.340**	.351**	1.000

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 4 shows that design and documentation issues were highly correlation with project management and contract administration. This is true because changes in scope and lack of site investigation can lead to changes in design and mistakes in design which can affect on project performance significantly. Also, contractor's site management and information & communication technology were highly correlated with each other. Poor coordination and communication is often observed a major issue on construction site which many times cause variations in work and rework which generate huge amount of construction waste and schedule delay.

4.5. Mitigation Measures to Improve Time and Cost Performance

Questionnaire survey findings showed that in Malaysia construction industry was significantly facing with the poor performance of construction time and cost. Hence, interviews were conducted to develop mitigation measure to control time and construction cost. Table 5 shows the characteristic of the respondents who participated in interview.

Table 5. Charactersitc of Respondnts Participated in Qualititative Part of Study

No	Organization	Working Position	Experience
1	Consultant	Project Manager	12
2	Contractor	Sr. Man	29
3	Consultant	Principal	20
4	Contractor	Project Manager	10
5	Contractor	Senior Project Manager	20
6	Client	Senior Assistant Director	24
7	Client	Technical Assistant Director	24
8	Contractor	Managing Director	20
9	Client	Senior Project Engineer	8
10	Contractor	Managing Director	15
11	Contractor	Project Manager	10
12	Contractor	Director	25
13	Consultant	Project Manager	17
14	Client	Project Director	25
15	Consultant	Project Manager	21

Table 6 shows the mitigation measures for improving time and cost performance of construction projects. Mitigation measures were classified into three categories in accordance with implementation strategy as pro-active, re-active and organizational measures. These measures will be helpful in improving time and cost performance at different stages from planning as proactive measure to construction as reactive measure. Some of the measure may be fluid and applicable in applied at both planning and execution stage..

Table 6. Mitigation Measured to Improve Time and Cost Performance

No	Mitigation Measure To Improve Time Performance
1	Proper planning work
2	Committed leadership and management
3	Send clear and complete message to worker to ensure effective communication
4	Hire skilled workers to achieve good progress, avoid poor quality of work, more rectification and double handling
5	Close monitoring
6	Training and development of all participant to support delivery process
7	Focus on the quality, cost and delivery of the project
8	Use new construction technologies (IBS-Industrialize Building System)
9	Adoption of tools and techniques i.e.: Value Management, Lean Thinking, Total Quality Management
10	Provide knowledge/training to unskilled workers based on their scope of work.
11	Fully utilize the construction team
12	Focus on client's need
13	Measure performance against other projects
	Mitigation Measure To Improve Cost Performance
1	Effective strategic planning
2	Proper project planning and scheduling
3	Effective Site management and supervision
4	Frequent progress meeting
5	Proper emphasis on past experience
6	Use of experienced subcontractors and suppliers
7	Use of appropriate construction methods
8	Use up to date technology utilization
9	Clear information and communication channels
10	Frequent coordination between the parties
11	Perform a preconstruction planning of project tasks and resources needs
12	Developing human resources in the construction industry
13	Comprehensive contract administration
14	Systematic control mechanism
15	Improving contract award procedure by giving less weight to prices and more weight to the capabilities and past performance of contractors

5. CONCLUSION

Poor time and cost performance are major problems faced by today's construction industry. Hence, this study assessed time and cost performance in construction industry of Malaysia and identified major inhibiting factors. Structured questionnaire survey was carried out amongst the contractors, consultant and client personnel which resulted in gathering 140 samples. Analysis was carried out statistically using software package SPSS V17. Also, mitigation measures to improve time and cont performance of construction cost were developed by adopting qualitative mode of study using interviews. The major finding of the study can be concluded as:

- Time overrun is major issue in cost projects as agreed by 92% of respondent

- Cost overrun is major issue in cost projects as agreed by 89% of respondent
- Amount of time and cost overrun is commonly in between 5-10% of contract duration and price of project
- The study also developed 13 mitigation measures to improve time performance and 15 measures to improve cost performance of construction projects which were classified into 3 categories as proactive, reactive and organization.
- Proactive measure will help the practitioner to adopt suitable guidelines at planning stage.

REFERENCES

[1] I. R. Endut, A. Akintoye, and J. Kelly, "Cost and time overruns of projects in Malaysia," retrieved on August 21, 2009, from http://www.irbnet.de/daten/iconda/CIB10633.pdf, pp. 243-252, 2009.

[2] T.-C. Toh, K.-N. Ali, and G.-U. Aliagha, "Modeling Construction Cost Factors in the Klang Valley Area of Malaysia," in IEEE Symposium on Business, engineering and Industrial Applications (ISBEIA) Langkawi, Malaysia, 2011.

[3] Y. A. Olawale and M. Sun, "Cost and time control of construction projects: inhibiting factors and mitigating measures in practice," Construction Management and Economics, vol. 28, pp. 509–526, 2010.

[4] Y. Frimpong, J. Oluwoye, and L. Crawford, "Causes of delay and cost overruns in construction of groundwater projects in a developing countries; Ghana as a case study," International Journal of Project Management, vol. 21, pp. 321–326, 2003.

[5] M. I. Abbas, "Causes and Effects of Delays in ACEH Construction Industry ". vol. Masters Thesis: Universiti Teknology Malaysia, 2006.

[6] O. Jackson and O. Steven, "Management of cost overrun in selected building construction project in Ilorin," Review of Business and Finance, vol. 3, 2001.

[7] A. S. Ali and S. N. Kamaruzzaman, "Cost performance for building construction projects in Klang valley," Journal of Building Performance, vol. 1, pp. 110-118, 2010.

[8] J. D. Frame, "Establishing project risk assessment teams," in Managing risks in projects, K. Kahkonen and K. A. Artto, Eds.: E & FN Spon, London., 1997.

[9] B. Flyvbjerg, M. K. S. Holm, and S. L. Buhl, "How common and how large are cost overruns in transport infrastructure projects?," Transport Reviews, vol. 23, pp. 71-88, 2003.

[10] A. Omoregie and D. Radford, "Infrastructure delays and cost escalation: Causes and effects in Nigeria," in Proceeding of sixth international postgraduate research conference Netherlands: Delft University of Technology and TNO, 2006, pp. 79-93.

[11] O. J. Ameh, A. A. Soyingbe, and K. T. Odusami, "Significant factors causing cost overruns in telecommunication projects in Nigeria," Journal of Construction in Developing Countries, vol. 15, 2010.

[12] [12] A. Enshassi, J. Al-Najjar, and M. Kumaraswamy, "Delays and cost overruns in the construction projects in the Gaza Strip," Journal of Financial Management of Property and Construction, vol. 14, pp. 126-151, 2009.

[13] L. Le-Hoai, Y. D. Lee, and J. Y. Lee, "Delay and Cost Overruns in Vietnam Large Construction Projects: A Comparison with Other Selected Countries," KSCE Journal of Civil Engineering, vol. 12, pp. 367-377, 2008.

[14] N. Azhar, R. U. Farooqui, and S. M. Ahmed, "Cost Overrun Factors In Construction Industry of Pakistan," in First International Conference on Construction In Developing Countries (ICCIDC–I) "Advancing and Integrating Construction Education, Research & Practice": NED University of Engineering and Technology, Karachi, Pakistan, 2008.

[15] H. P. Moura, J. C. Teixeira, and B. Pires, "Dealing With Cost and Time in the Portuguese Construction Industry," in CIB World Building Congress, 2007.

[16] R. Apolot, H. Alinaitwe, and D. Tindiwensi, "An Investigation into the Causes of Delay and Cost Overrun in Uganda's Public Sector Construction Projects," in Second International Conference on Advances in Engineering and Technology, 2011, pp. 305-311.

[17] S. A. Ahmad, F. Hassan, S. Hassan, M. C. Mat, N. M. Nasir, and Z. A. Samad, "A study on the practise of delay analysis techniques In the Malaysian construction industry," in 13th Pacific Association of Quantity Surveyors Congress (PAQS), 2009, pp. 24-31.

[18] A. H. Memon, I. a. Rahman, M. R. abdullah, and A. A. A. Aziz, "Time Overrun in Construction Projects from the Perspective of Project Management Consultant (PMC)," Journal of Surveying, Construction & Property, vol. 2, 2011.

[19] A. H. Memon, I. A. Rahman, M. R. Abdullah, and A. A. A. Azis, "Factors Affecting Construction Cost in Mara Large Construction Project: Perspective of Project Management Consultant," International Journal of Sustainable Construction Engineering & Technology, vol. 1, pp. 40-53, 2010.

[20] H. M. Al-Tabtabai, "Causes for delays in construction projects in Kuwait," Engineering Journal of University of Qatar, vol. 15, pp. 19-37, 2002.

[21] M. Sambasivan and Y. W. Soon, "Causes and effects of delays in Malaysian construction industry," International Journal of Project Management, vol. 25, pp. 517–526, 2007.

[22] A. Bryman and D. Cramer, Quantative Data Analysis with SPSS Release 10 for Windows, 2nd ed.: Taylor and Francis inc,, 2002.

[23] Z. M. Daud, M. H. Ahmad, and F. Yusof, Elementary Statistics: Preatice Hall, Pearson (M) Sdn Bhd,, 2009.

[24] J. Cohen, Statistical power analysis for the behavioral sciences, 2nd ed., 1988.

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