

SCHEDULE AND COST BEHAVIOUR IN CONSTRUCTION WORKS OF MALAYSIA

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ABSTRACT: Stakeholders have great concern of schedule and cost behaviour in construction works. Due to any loss in schedule and cost performance, one has to bear unrecoverable monetary loss. Currently, construction works are suffering from poor schedule and cost behaviour in almost all the countries of the world including Malaysia. Hence, this paper investigated the schedule and cost behaviour of infrastructure and building projects of Malaysia. This paper addressed the issue by conducting case study of 6 projects including 3 infrastructure works and 3 building works. The findings of the study revealed that 5 projects had overrun. All the three infrastructure works face time overrun problem while only one building project was completed as per schedule and estimated budget where other two projects consumed extra time and budget. These findings are helpful for stakeholder to understand the behaviour of the construction works from time and cost perspective.

Keywords: Schedule performance; cost performance; case study; Malaysia; infrastructure projects and building projects.

INTRODUCTION

Construction Sector registered a strong increase to 5.8% in 2009 which was reached to 8.7% in 2010, whereas overall growth in Gross Domestic Product (GDP) was recorded as of 10.1%. Hence, a lot of money has been spent for construction development. Thus, during third quarter of 2015 and third quarter 2016 worth spent of construction development was increased by 14.0% and 10.7% year-on-year basis to record cost of RM 28.8 billion and RM31.9 billion. While quarter-on-quarter basis comparison revealed that increase in construction works was as 5.9% and 4.9% for year 2015 and 2016 respectively as compared to previous quarter (Zachau *et al.*, 2016). This indicated the importance of construction industry in Malaysian development. Although, construction works in Malaysia have got much attention, but yet this sector has face crucial issue to over run in cost which has affected the development works significantly. This issue is referred as global phenomenon and affecting the amount of physical development that can be under taken.

Poor schedule and cost behaviour are decisive matters (Alias *et al.*, 2014; Chen *et al.*, 2016; Suk *et al.*, 2017; Akram *et al.*, 2017) where in developing countries it is more severe and sometimes amount of cost is overrun by 100% than the original budget cost (Otanuji, 2008). A report of Ethiopia indicated cost overrun as crucial problem (Mustefa, 2015) where research of 15 completed public construction projects of Ethiopia highlighted that cost was increased by more than 80% of the original cost (Dessa, 2010). Besides that, an investigation carried out by (Al-Momani, 2000) involving 130 public projects in Jordan revealed that 106 (82%) of project were facing

time overrun problem. Similarly, in Saudi Arabia, (Assaf and Al-Hejji, 2006) mentioned that on average 70% of projects are delayed with a period of 10% to 30% of the original scheduled period. This problem of cost overrun is common issue in construction works worldwide which needs a serious attention to reduce and achieve construction projects completed as targeted.

A research work conducted in Pakistan reported that almost all the projects faced overrun in cost with a minimum loss of 10% of the project cost. This amount of overrun was more in medium sized projects which were reached up to 60% of project size as compared to large size projects facing overrun up to 40% of project cost (Azhar *et al.*, 2008). In (Zujo *et al.*, 2008), authors studying building projects found that building projects under go overrun in cost on with average increase of 6.84% of estimated cost. Conducting similar research work in Malaysian construction industry (Zujo, 2008; Nadzirah *et al.*, 2014) highlighted that under tenth Malaysian plan 238 projects of worth RM 4.48 billion faced delay problem (Roslan *et al.*, 2015). Hence, this study has focused investigating cost performance of selected construction projects of Malaysian construction industry related to building and infrastructure category projects.

MATERIALS AND METHODS

Construction sector is essentially to construct fundamental infrastructural structures to assist in civilizing community and financial needs of any country (Rahman *et al.*, 2013). It is one of the major sectors contributing with a significant amount in Gross Domestic Product (GDP). It also engages a huge number of local

labour force (Chan, 1999). In (Endut *et al.*, 2009), authors stated Malaysia is a fast developing country in Asian region and it has always added in Gross Domestic Product (GDP) from 3% to 5%. Growth in construction has increased from 6% to 15% (Endut *et al.*, 2009). According to Department of Statistics Malaysia in third quarter 2016, Malaysia construction industry highest growth for type of activity was recorded for civil engineering field 19.3%. Second highest growth was achieved by residential buildings with 16.4% and special trade's activities with 4.2% growth. While, the non-residential buildings sub-sector registered a negative growth of 1.4%. The civil engineering sub-sector contributed 34.9% to the total value of construction work done, nonresidential buildings was 30.7%, residential buildings was 30.0% and special trades activities was 4.4%. Construction sector is directly linked with economic development of Malaysia. Construction works are generally classified as construction and special trade works (Ibrahim *et al.*, 2010).

Data collection: The Research involves six construction projects involving 3 infrastructure construction projects and 3 building construction projects. The data of cost overrun in cost evaluated by the investigation on site as well as documents of the projects and structured interviews of the officials involved in handling those particular projects.

RESULTS AND DISCUSSION

This research work involved case study of Six (6) construction projects. In order to maintain the secrecy of personal information of the respondents and their relative projects, the projects were named as project A, project B, project C, project D, project E and project F. The selected projects are constructed under a construction company that was establishes more than 20 years and sites were managed by the person in charge having experience for more than 20 years in the construction field.

Case Study A: This project is located in Seremban, Negeri Sembilan. This is a private project related to earthwork for building 83 units of terrace house. This project was awarded to contractor A by the developer using conventional method of procurement. The duration of project was four (4) months and the actual completed duration took five (5) months. Therefore, the delay of the project was 1 month and causing cost overrun RM158,067.86 over the contract amount of RM 483,779.00. With this the schedule overrun was about 25 % while cost overrun was 32.67 %. The delay was not caused by contractor but due to changing of project planning by the developer and the developer had to absorb the cost overrun.

Case Study B: This project is located in Seremban, Negeri Sembilan. This is a private project related to retaining wall for building 83 units of terrace house which was awarded to contractor B by the developer using conventional method of procurement. The duration of project was one (1) month and the actual completed duration was three (3) months. Therefore, the delay project was 2 months and causing cost overrun RM8,300.00 over the contract amount of RM158,000.00. With this the schedule overrun was about 200.00% while cost overrun was 5.25%. The delay was caused due to late site handing over by the developer and the developer had to absorb the cost overrun.

Case Study C: This project is located in seremban, Negeri Sembilan. This is a private project related to sewerage reticulation for 83 units' terrace house construction. This project was awarded to contractor C by main contractor as a nominated subcontractor. The duration of project is four (4) months which completed in seven (7) months. Therefore, the delay project was 3 months without causing cost overrun as the general construction materials was purchased and stockpile in early of construction. Overall schedule overrun was about 75.00% while cost overrun was 0%. The delay was caused due to late site handing over by the developer.

Case Study D: This project of high-rise building construction located in Seremban, Negeri Sembilan was in private sector. This project was awarded to contractor D by the developer using conventional method of procurement. The duration of project was seventeen (17) months and the actual completed took nineteen (19) months' due to the changes of building design by developer. Therefore, the amount schedule date up to 7th of January 2016 is RM30,796,137.93 (81.30%) and the actual amount is RM33,750,689.04 (89.10%) which is RM2,954,551.11 (7.80%) cost overrun caused of the changes of building design and the developer has to absorb the cost overrun.

Case Study F: This project is located in seremban, Negeri Sembilan. This is a private project related to a shopping complex construction. This project is awarded to contractor F by the developer using conventional method of procurement. The duration of project completion is fifteen (15) months which is 2nd of March 2016. As per project schedule date up to 15th of February 2016 the completion of work done is 96.00% and the actual completed work in the same day was 92.00% which is 4.00% behind the schedule due to the changes of building design by developer. Therefore, the amount schedule date up to 15th of February 2016 is RM61,601,807.00 (92.84%) and the actual amount is RM55,064,548.05 which is RM6,537,259.56 (9.85%) behind the planned amount schedule due to the changes of building design.

Table 1. Case Study Results.

Cases	A	B	C	D	E	F
Types of project	Infra	Infra	Infra	Building	Building	Building
Duration (Month)	4	1	4	17	20	15
Expecting Date	9/2013	6/2013	9/2013	9/2015	1/2016	3/2016
Completed Date	10/2013	8/2013	12/2013	10/2015	1/2016	2/2016
Time overrun (months)	1	2	3	2	-	1
Time overrun (%)	25	200	75	11.76	5.82	4
Contract Sum (RM)	484.78K	158K	223K	18.97M	37.88M	66.35M
Actual Cost (RM)	641.85k	166.3k	223k	19.57m	30.80m	61.60m
Cost Overrun (RM)	158k	8.3k	0	600K	3M	6.5M
Cost overrun (%)	32.67	5.25	0	3.16	7.8	9.85
Reasons for overrun	changing of project planning	late site handing over	late site handing over	changing of building design	changing of building design	changing of building design
Responsible Party	Client / Owner	Client / Owner	Client / Owner	Client / Owner	Client / Owner	Client / Owner

Table 1 shows that all the cases faced time overrun ranging from one month to 3 months with the time overrun percentages from 4% to 200%. While, most of the cases faced cost overrun ranging from RM8.3K to RM6.5M with the cost overrun percentages from 3.16% to 32.67% and only case C does not experience cost overrun. It can be concluded that from this case study, the construction industry is facing time and cost overrun and this serves as a platform to further investigate the causative factors and its occurrence and severity to construction projects

Conclusion: This paper reported case study of infrastructure and building works undertaken in Malaysia. The projects were studied to understand the behaviour of schedule and cost in of the construction works. Findings of this study showed that all the 3 infrastructure projects considered in the research work were facing problem of schedule and cost behaviour. All the 3 projects were overrun where schedule delay was 25% to 200% while in building work schedule delay was experienced ranging from 4% to 11.76%. Two infrastructures had cost increase ranging from 5.25% to 32.67% while in 2 buildings cost increase was ranging from 3.16% to 9.85%. However, one building project experienced cost saving by 7.8%. These findings help in understanding the behaviour of the construction works and plan according for future developments.

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