COST AND TIME OVERRUNS OF PROJECTS IN MALAYSIA

Intan Rohani Endut, Akintola Akintoye and John Kelly

School of Build and Natural Environment, Glasgow Caledonian University, 70 Cowcaddens Road, Glasgow G4 0BA

E-mail: ien1@gcal.ac.uk

Abstract: Malaysia is a fast developing country in the Asian region and has undergone rapid economic growth since the seventies. The construction sector has being one of the main contributors to the gross domestic product (GDP) since then. However, there is a general impression that the construction industry in Malaysia is associated with time and cost overruns which is affecting the amount of physical infrastructural development that can be undertaken. Many factors may have impacted upon construction time and cost overruns in Malaysia. This paper reports part of an on going PhD programme with the overall aim to develop a system of risk management to proactively minimise cost and time overruns in public sector projects in Malaysia. The objectives of the PhD programme are: to determine cost overrun in Malaysian public sector projects in comparison with the private sector projects; to investigate the contributory factors for cost overrun, to investigate the nature and extent of the risk factors associated with construction projects; to evaluate the links between risk and cost overrun; and to develop risk management system for dealing with cost overrun in Malaysian public sector projects. This paper reports an evidence-based analysis on the time and cost overruns of the private sector and public sector projects in Malaysia and the impact of such project factors as procurement methods, types of projects and, project size.

Keywords: cost overruns, construction, time overruns, Malaysia, procurement.

1. INTRODUCTION

Malaysia is a fast developing country in Asian region and has undergone rapid economic growth since the seventies. The construction industry (CI) has played an important role in the Malaysia economic growth. The industry has been consistently contributed approximately 3% to 5% of the national Gross Domestic Product (GDP) (Shari, 2000, Takim, 2005). The growth in construction has been increase from 6% to 15% since the seventies until middle nineties. (Raftery et al, 1998, Shari, 2000). There are two main sector for construction projects in Malaysia; public and private sector. Most of the public sector projects are handled by Public Works Department (PWD). In Malaysia, the Construction Industry Development Board (CIDB) is a body with the main function of developing, improving and expanding the Malaysian construction industry and is involved with the public and private sectors project development (Takim, 2005).

This empirical study on the time and cost overruns of construction project in Malaysia is undertaken because of a lack of previous study of the causes of cost and time overrun in the Malaysian construction industry. Chan (2001) investigated the relationship between times and cost of building projects using Bromilow's model. The study concluded that the Malaysian public sector project contract costing RM 1 million takes about 269 days to complete and produced a best predictor of average construction time as $T=269C^{0.32}$. This study does not represent the whole of Malaysia, because the data

used was based on one state out of fourteen states in Malaysia. Other studies undertaken have investigated factors affecting construction labour, construction safety and constructability implementation by Abdul Kadir et al. (2005), Abdul Aziz & Hussin (2003) and Nima et al. (2001) respectively. Adnan & Morledge (2003) and Takim, (2005) conducted research related to success factors in Malaysia construction industy. In view of the importance of the construction industry to the Malaysian economy, the study of the time and cost overruns in the Malaysian construction industry and the factors influencing these overruns has become important. These influencing factors can come from all project stakeholders in the construction development such as owners, contractors, consultants, financial and government authorities.

To establish the extent of time and cost overruns of construction projects in Malaysia, the first primary data collection were conducted in early 2005. This paper presents an evidence-based analysis on the time and cost overruns of the public and private sectors projects in Malaysia based a questionnaire survey conducted in early 2005 in Malaysia as part of a PhD research schedule for time and cost overrun in of construction projects.

The premise for the paper is that a construction project can be regarded as successful when the project is completed on time, within budget and with appropriate technical performance or quality (William, 2003). According to Chimwaso (2000), projects completed within budget are rarely found compared with cases of projects with cost overrun. Cost and time overruns are major problems in project development and are regular features in construction industry especially for developing country. This makes projects costly for the parties involved in construction especially for contractors and clients. The same holds for time overrun. Impact of project time overrun or delays for contractors include increased costs, reduced profit margin and battered reputation. Clients are also affected by additional charges and professional fees and reduced incomes because of late occupancy. As part of the factors responsible for delays in construction completion, Ng et. al. (2001) noted that most contractors assume that duration set by the client is realistic and prepare their bid accordingly.

2. OVERVIEW OF COST AND TIME OVERRUN IN CONSTRUCTION INDUSTRY

Construction project time overrun can be defined as an extension of time beyond the contractual time agreed during the tender and cost overrun as an extra cost beyond the contractual cost agreed during the tender. Many previous studies have identified cost and time overruns as general problems in the construction industry worldwide (Kaka & Price, 1991, Elinwa & Buba, 1993, Ogunlana & Promkuntong, 1996, Okuwoga, 1998, Abd. Majid & McCaffer, 1998, Shi et. al., 2001, Ng et. al., 2001, Aibinu & Jogboro, 2002, Choudhury & Rajan, 2003, Koushki et. al., 2005)

A study undertaken by Odeck (2004) for Norwegian Public Roads Adminstration showed that cost overruns ranged from -59% to 183% and this was more predominant on smaller projects compared with larger ones. Aibinu & Jogboro (2002) study indicated that Nigerian construction industry experienced a mean percentage cost overruns of 17.34% Kaming et al (1997) found cost overruns to be more common than time overruns on high-rise projects in Indonesia and consequently suggested a need for

method studies and dissemination of the research results to both large and small firms, so that the most productive working methods can be adopted by all operatives. They saw this as a means to increase operatives output, without necessarily exerting more physical effort.

Research by Flyvberg et. al. (2002) concluded that nine out of ten transportation infrastructure projects costs are underestimated and that for all project types the actual costs are on average 28% higher than estimated costs. Forty four percent (44%) of the respondent in the research undertaken on the Nigerian construction industry by Elinwa & Joshua (2001) indicate that, time overrun often occured. Another research conducted by Barrick, cited by Jackson (2002) on the United Kingdom construction industry found that nearly one third of the clients complaints that their projects generally overran budget. Creedy (2004) is of the view that identification of the existence and influence of cost overrun risk factors in a project can lead to a better control on project cost overrun and also can help in proposing solutions to avoid future overruns.

Scott (1993), Alkass et. al. (1995 and 1996), Abd. Majid and McCaffer (1998), Al-Khalil and Al-Ghafly, (1999) have all show that time overruns occur on the majority of major civil engineering contracts and that this is a most common problem. Completing projects within the time is an indicator of an efficient construction industry (Chan and Kumaraswamy, 1997). According to Chan and Kumaraswamy, (1995), the ability to estimate the completion time is normally dependent on the individual intuition, skill and experience of the planning engineer. Mezher & Tawil, (1998) however noted that time overruns in Lebanon construction industry are costing the country a lot of money and that there is a need to find more effective methods to over come the problem.

3. METHODOLOGY

Data for this study were collected through a survey questionnaire to 150 quantity surveyor consultants in Malaysia. A survey packages containing a covering letter and project data collection form for the firms to provide cost and time information on up to 5 or more projects that they have undertaken. Only 8 consultants returned the questionnaire. Telephone contacts were made to the companies but still the response was poor. Given the situation personal contacts had to be made with public government officials and quantity surveyor consultants to encourage more respondents. This tactic improved the amount of response rate collected. Discussions with the establishments show that the main reason why they did not respond to the questionnaire is because the request is for data on previous projects undertaken which are not readily available. This would demand that they open the previous file to get the data. Pressure from work and lack of time to search for the data were some reasons for not responding to the questionnaire.

The respondents were asked to provide information on previous projects in relation to name of project, starting and completion date, location, numbers of storey and gross floor area for building project, contractual and actual duration, pre-contract budget, contract sum and final account cost (after Pearl et. al, 2003). Specific features of the projects such as type of project (new build or refurbishment), nature of work (sector), procurement methods, nature of works and tendering methods were also requested.

4. DATA COLLECTION

Table 1 shows the project summary and characteristics. Data were collected on 359 projects comprising very small, small, medium and large projects. The procurement methods involved are: traditional, design & build, construction management, management contracting and project management. The nature of works range from residential, infrastructure, commercial, office, educational, health, industrial and recreational. Three tendering methods were considered: open tender, selective and negotiated. All the projects were completed between years 1994 to 2005.

Table 1: Summary of project characteristics

Category	Classification	Number	%
Type	New Build	301	83.8
	Refurbishment	58	16.2
Sector	Public	308	85.8
	Private	51	14.2
Procurement Method	Traditional	291	81.1
	Design & Build	58	16.1
	Management Contracting	1	0.3
	Project Management	9	2.5
Nature of works	Residential	52	14.5
	Infrastructure	139	38.7
	Commercial	13	3.6
	Office	29	8.1
	Educational	111	30.9
	Health	11	3.1
	Industrial	1	0.3
	Recreational	3	0.8
Tendering method	Open tender	176	49.0
	Selected	118	32.9
	Negotiated	65	18.1

The average cost deviation of the project was 2.08%, the minimum cost deviation being -80.38% and the maximum was 80.76%. For the time deviation, the average was 49.71%, the minimum was -19.30% and maximum 440.00% as shown in Table 2. Table 2 also illustrate that the project cost and duration are extremely low as compared with the maximum value. The minimum cost is RM 0.1 million and the duration is 2 weeks.

These wide ranges in the time and cost overruns on projects in Malaysia suggest this is a major problem to the nation. However this is not unusual in the construction industry given Norwegian Public Roads Administration experienced cost overrun between of between -59% and 183% (Odeck, 2004) , 17.34% mean cost overrun of Nigerian projects (Aibinu & Jogboro, 2002) and 90% cost overrun of Denmark transportation infrastructure.

Table 2: Summary of projects' cost and time overruns

	Cost (RM)		Duration (weeks)		Cost Deviation		Time Deviation	
	Contract	Actual	Contract	Actual	RM (m)	%	Weeks	%
Mean	18.46	19.17	55.66	78.81	0.71	2.08	23.15	49.71
Minimum	0.1	0.1	2	3	-16.42	-80.38	-18.00	-19.30
Maximum	563.3	567.3	229	260	128.7	80.76	156.00	440.00

5. ANALYSIS AND DISCUSSION

Public and private construction projects

Table 3 compares cost overruns on public sector and private sector projects. The table shows that overall 8% of public sector projects did not have cost overruns compared with 37.3% private sector projects. In terms of cost overruns of 10% or below, 76.0% of public projects experience cost overruns compared to 84.3% o private projects. Figure 1 shows the comparison of the private sector and public sector projects cost overrun. Both the Table and Figure show little difference in terms of pattern of cost overruns between the public sector and private sector projects. These figures are similar to cost overrun statistics for Bostwana where 7 out of 10 projects had incurred cost overrun (Chimwaso, 2000).

Table 3: Comparison of public sector and private sector projects cost overruns

Range of cost deviation	Public Projects			Private Projects		
	Frequency	%	Cum. %	Frequency	%	Cum.%
<30.1	6	1.9	1.9	0	0.0	0.0
-(20.1)-(-30)	14	4.6	6.5	0	0.0	0.0
(-10.1)-(-20)	39	12.7	19.2	0	0.0	0.0
(-5.1)-(-10)	30	9.7	28.9	5	9.8	9.8
-(0.1)-(-5)	48	15.6	44.5	9	17.6	27.4
0	7	2.3	46.8	5	9.8	37.2
5-0.1	61	19.8	66.6	10	19.6	56.8
10-5.1	29	9.4	76.0	14	27.5	84.3
20-10.1	50	16.2	92.2	3	5.9	90.2
30-20.1	11	3.6	95.8	2	3.9	94.1
40-30.1	6	1.9	97.7	1	2.0	96.1
50-40.1	4	1.3	99.0	1	2.0	98.0
>50.1	3	1.0	100.0	1	2.0	100.0
Total	**308**	**100.0**	**100.0**	**51**	**100.0**	**100.0**

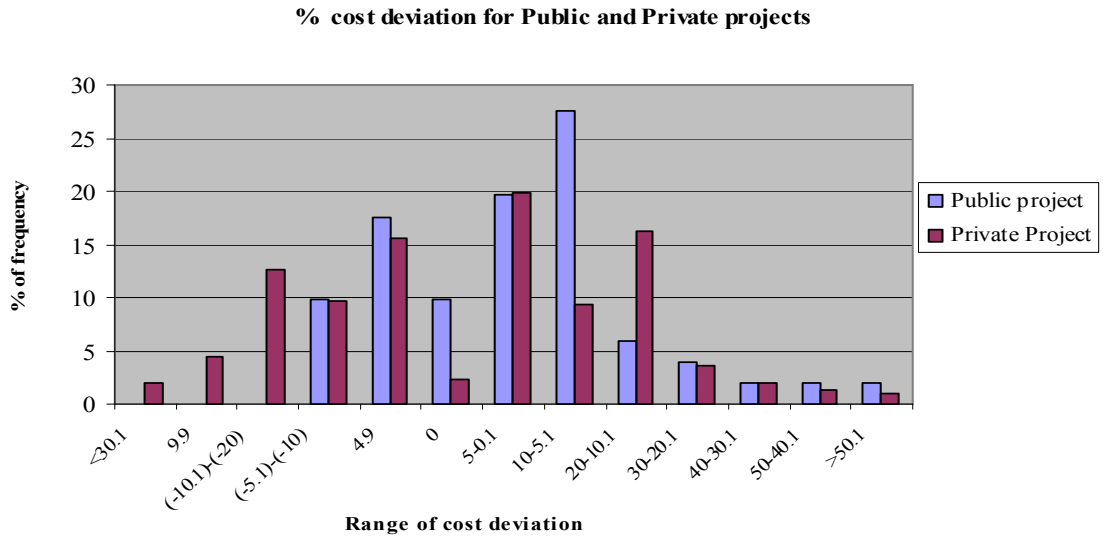

Figure 1: Comparison of cost overruns between public sector and private sector projects

Time overruns in public sector and private sector projects are shown in Figure 2 and Table 4. The Table shows that 18.2% of the public sector projects and 29.45% of private sector projects have 0% time deviation. The Table also shows that 20.5% and 33.3% of the public sector and private sector projects respectively are completed within not more than 10% of the projects duration specified in contract suggesting that 79.5% of public sector projects and 66.7% of private sector projects are not completed at 10% time overruns. This compares with Saudi Arabia construction industry time overruns study by Zain Al-Abedien (cited by Al-Khalil & Al-Ghafly) that 70% of projects undertaken by the Ministry of Housing and Public Works experienced time overruns. According to World Bank (1990) cited by Bordoli & Baldwin (1998), 1627 projects completed between 1974 and 1988 had time overruns of between 50% and 80%.

The figures presented from the analysis of the Malaysian construction industry projects shows that time overruns of Malaysian projects is higher compared with cost overruns. This finding contradicts the research done by Kaming et al, 1997 on Indonesia projects where it was found that cost overruns occur more frequently than time overruns on high-rise construction. This presents the need to investigate further whether the nature of the project, as the case in Indonesia, has influence on the results. In addition, the need to identify the factors influencing time overruns as shown in the level of time overruns experienced on the construction projects in Malaysia has become necessary to ensure that projects can be completed within the time frame specified and at the same time reduce the cost overruns.

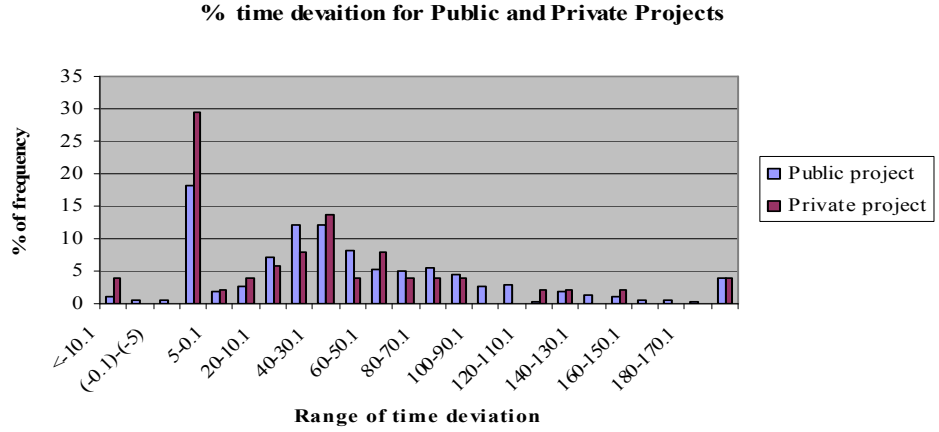

Figure 2: Comparison of time deviation of public and private projects

Table 5 shows that there is not much difference below 0% time and cost deviation based on tendering methods suggesting that tendering methods may not be an influencing factor on time and cost overruns of construction projects in Malaysia. This is not the case with the procurement method which shows cost deviation at below 0% is only be achieved on 11.1% of projects based on project management procurement methods. This tends to suggest that although the use of project management procurement method in Malaysia is growing particularly for large size and complex projects, this is not helpful in achieving project completion within the budget. However, project management procurement method has best results in relation with time overruns with 33.3% of projects completed at below 0% time deviation compared with 21% from traditional procurement method and 27.6% of Design and Build procurement method. Only these three types of procurement methods are considered in

this analysis because the other two had few than five projects: the small number of projects made their inclusion in the comparative analysis of the procurement methods unjustifiable. .

Table 4: Comparison of public sector and private sector projects time deviation

Range of cost deviation	Public Projects			Private Projects		
	Frequency	%	Cum. %	Frequency	%	Cum.%
<-10.1	3	1.0	1.0	2	3.9	3.9
(-5.1)-(-10)	2	.6	1.6	0	0.0	3.9
(-0.1)-(-5)	2	.6	2.3	0	0.0	3.9
0	56	18.2	20.5	15	29.4	33.3
5-0.1	6	1.9	22.4	1	2.0	35.3
10-5.1	8	2.6	25.0	2	3.9	39.2
20-10.1	22	7.1	32.1	3	5.9	45.1
30-20.1	37	12.0	44.2	4	7.8	52.9
40-30.1	37	12.0	56.2	7	13.7	66.7
50-40.1	25	8.1	64.3	2	3.9	70.6
60-50.1	16	5.2	69.5	4	7.8	78.4
70-60.1	15	4.9	74.4	2	3.9	82.4
80-70.1	17	5.5	79.9	2	3.9	86.3
90-80.1	14	4.5	84.4	2	3.9	90.2
100-90.1	8	2.6	87.0	0	0.0	90.2
110-100.1	9	2.9	89.9	0	0.0	90.2
120-110.1	1	.3	90.3	1	2.0	92.2
130-120.1	6	1.9	92.2	1	2.0	94.1
140-130.1	4	1.3	93.5	0	0.0	94.1
150-140.1	3	1.0	94.5	1	2.0	96.1
160-150.1	2	.6	95.1	0	0.0	96.1
170-160.1	2	.6	95.8	0	0.0	96.1
180-170.1	1	.3	96.1	0	0.0	96.1
>180.1	12	3.9	100.0	2	3.9	100.0
Total	**308**	**100.0**	**100.0**	**51**	**100.0**	**100.0**

Table 5: Comparing percentage of projects at below 0% cost and time deviation

Tendering Methods	0% cost deviation	0% time deviation
Open Tender	41.8%	20.6%
Selected	54.8%	17.9%
Negotiated	49..2%	23.7%
Procurement Methods		
Traditional	45.4%	21.0%
Design & Build	51.7%	27.6%
Project Management	11.1%	33.3%
Nature of Works		
Residential	59.6%	26.9%
Infrastructure	38.8%	24.5%
Commercial	30.8%	38.5%
Office	24.1%	17.2%
Educational	53.2%	16.2%
Health	63.6%	27.3%

Project Cost and Time Deviation: Analysis based on Tendering Method, Procurement Methods and Nature of Work

Residential, educational and health projects produced 59.6%, 53.2% and 63.6% respectively less than 0% cost deviation compared to other types of project in the

Table suggesting that the nature of work has an influence on the cost overruns. This is not pronounced in case of time deviation where projects delivered at below 0% time deviation on the basis of nature of projects ranged between 16.2% and 38.5%. What would appear to be outlier time deviation based on the nature of projects is commercial works with 38.5%. Again, industrial and recreational projects were not included in the analysis because less than five projects of these types were involved.

6. CONCLUSION

Time and cost overruns of construction projects occur as a result of many factors: some of which are related to each other. An analysis of the cost and time overruns of the construction projects in Malaysia based on cost and time mean deviation, produced an 2.08% average cost deviation compared with 49.71% average time deviation suggesting that time overrun is more critical in Malaysia construction projects.

The results of the analysis show that both the public sector and private sector projects have similar pattern of cost overruns. Only 46.8% and 37.2% of public sector and private sector projects respectively are completed within the budget. However, 84.3% of the private sector projects are completed within the 10% cost deviation compared with 76.0% of the public sector projects.

Time overrun of public projects was more critical with only 20.5% of the projects completed within the time specified in the contracts compared with 33.35% of the private sector projects. The findings suggest there is a need to investigate further factors responsible for the level of time and cost overruns of the Malaysian construction projects. Hence, further planned data collection will concentrate on the factors contributing to the time and cost overruns in Malaysian construction industry. By doing so it is expected this will ultimately lead to better control of project cost and time and help in identifying alternative solutions to avoid future cost and time overruns.

7. REFERENCES

Abd. Majid M.Z. and McCaffer R., (1998), Factors of non-excusable delays that influence constractors' performance, Journal of Management in Engineering, May/June.

Abdul Aziz, A.R. & Hussin A.A, (2003), Construction safety in Malaysia: A review o industry performance and outlook for the future, Journal of Construction Research, Vo.4, No.2 pp.141-153.

Abdul Kadir M.R., Lee W.P., Jaafar M.S., Sapuan S.M. & Ali A.A.A., (2005), Factors affecting construction labour productivity for Malaysian residential projects.

Adnan H. & Morledge R., (2003), Application of Delphi Method on critical success factors in joint ventures projects in Malaysian Construction Industry, 1st Scottish Conference for PROBE.

Aibinu A.A. & Jagboro G.O., (2002), The effects of construction delays on project delivery in Nigerian construction industry, International Journal of Project Management 20, pp.593-599.

Alkass S., Mozerolle M., & Harris F., (1996), Construction delay analysis techniques, Journal of Construction Management and Economics, 14, pp. 375-394.

Alkass S., Mozerolle M., Tribaldos, E. & Harris F., (1995), Computer aided construction delay analysis and claims preparation, Journal of Construction Management and Economics, 13, pp. 335-352.

Al-Khalil M.I. and Al-Ghafly M.A., (1999), Delay in public utility projects in Saudi Arabia, International Journal of Project Management Vol.17, N0. 2, pp. 101-106.

Bordoli D.W, & Baldwin A.N., (1998), A methodology for assessing construction projects delays, Journal of Construction Management and Economics, 16, pp. 327-337.

Chan A.P.C., (2001), Time-cost relationship of public sector projects in Malaysia, International Journal of Project Management 19, pp.223-229.

Chan D.W.M. & Kumaraswamy M.M., (1995), A study of the factors affecting construction durations in Hong Kong, Journal of Construction and Economics, 13, pp.319-333.

Chan D.W.M. & Kumaraswamy M.M., (1997), A comparative study of causes of time overruns in Hong Kong construction projects, International Journal of Project Management Vo/. 15, No.1 pp. 55-63.

Chimwaso D.K., (2000), An evaluation of cost performance of public projects: Case of Botswana, Proceedings of the 2nd International Conference of the CIB, http://buildnet.csir.co.za/cdcproc/docs/2nd/chimwaso_dk.pdf.

Choudhury I., & Rajan S.S., (2003), Time-cost relationship for residential construction in Texas, Construction Informatics Digital Library http://itc.scix.net/ paper w78-2003-73.

Creedy G.D. (2004), Risk factors leading to cost overrun in highway construction projects, Clients Driving Innovation International Conference, Australia.

Elinwa A.U., & Buba S.A., (1993), Construction cost factors in Nigeria, Journal of Construction Engineering and Management, Vol. 119, No.4, pp. 698-713.

Elinwa A.U, & Joshua M. (2001), Time-overrun factors in Nigerian construction industry, Journal of Construction Engineering and Management, Vol. 127, No.5, pp. 419-425.

Flyvbjerg B., Holm M.S., & Buhl S., (2002), Underestimating costs in public works projects, APA Journal, Summer, Vol.68. No.3,pp. 279-295.

Jackson S. (200), Project cost overruns and risk management, http://icrc-reading.org/publicatios/Project%20cost%20overruns%20and%20risk%20management%20ARCOM%202002.pdf.

Kaka A, & Price A.D.F, (1991), Relationship between value and duration of construction projects, Journal of Construction Management and Economics 9, pp.381-400.

Kaming P.F., Olomolaiye P.O., Holt G.D., and Harris F.C., (1997), Factors influencing construction time and cost overruns on high-rise projects in Indonesia, Journal of Construction Management and Economics, 15, pp. 83-94.

Koushki P.A, Al-Rashid K., & Kartam N., (2005), Delays and cost increases in the construction of private residential projects in Kuwait, Journal of Construction Management and Economics 23, pp.285-294.

Mezher T.M, & Tawil W., (1998), Causes of delay in the construction industry in Lebanon, Journal of Engineering, Construction and Architectural Management Vol.5, No.3, pp. 252-260.

Ng S.T., Mak M.Y. M, Skitmore R.M., Ka C. L., and Varnam M.,(2001), The predictive ability of Bromilow's time-cost model, Journal of Construction Management and Economics, pp. 165-173.

Ogunlana A.O., & Promkuntong K., (1996), Construction delays in a fast-growing economy: comparing Thailand with other economies, International Journal of Project Management Vol. 14, No.1 pp.37-45.

Okuwoga A.A., (1998), Cost – time performance of public sector housing projects in Nigeria, Journal of Habit at International Vol. 22, No.4 pp. 389-395.

Pearl R.G., Akintoye A., Bowen, P.A. & Hardcastle C., (2003), Analysis of tender sum forecasting by quantity surveyors and contarctors in South Africa, Journal for the physical and development sciences, Acta Stuctilla : 10(1&2) pp. 5-35.

Raftery J., Pasadilla B., Chiang Y.H., Hui C.M.E. & Tang B.S., (1998), Globalization and construction industry development: implications of recent developments in the construction sector in Asia, Journal of Construction Management and Economics, 16, pp. 729-737.

Shari I., (2000), Economic growth and income inequality in Malaysia, 1971-95, Journal of the Asia Pacific Economy, 5(1/2): pp.112-124.

Shi J.J., Cheung S.O., & Arditi D., (2001), Construction delay computation method, Journal of Construction Engineering and Management pp.60-65.

Takim R. (2005), A Framework for successful construction project performance, PhD Thesis, Glasgow Caledonian University.

William T, (2003), Assessing extension of time delays on major projects, International Journal of Project Management, 21, pp. 19-26.