

Proceedings The 2nd International Conference On Global Optimization and Its Applications 2013
(ICoGOIA2013)
Avillion Legacy Melaka Hotel, Malaysia 28-29 August 2013

Comparative Study of Time Management Practices in Construction Industry between Kedah and Kelantan

Ismaaini Ismail,
Faculty of Civil and Environmental Engineering,
Universiti Tun Hussein Malaysia
86400 Parit Raja, Batu Pahat, Johor, Malaysia
is_mujahidah@yahoo.com

Ismail Abdul Rahman,
Faculty of Civil and Environmental Engineering,
Universiti Tun Hussein Malaysia
86400 Parit Raja, Batu Pahat, Johor, Malaysia
ismailar@uthm.edu.my

Aftab Hameed Memon,
Faculty of Civil and Environmental Engineering,
Universiti Tun Hussein Malaysia
86400 Parit Raja, Batu Pahat, Johor, Malaysia
aftabm78@hotmail.com

Ahmad Tarmizi Abd Karim
Faculty of Civil and Environmental Engineering, Universiti
Tun Hussein Malaysia
86400 Parit Raja, Batu Pahat, Johor, Malaysia
tarmizi@uthm.edu.my

Abstract - Effective time management is very important in determining a success of any project. Thus, without proper controlling of time will cause project delay and consequently budget overrun. There are various techniques and software which can be adopted for controlling time in construction projects. Hence, this study is to assess the effectiveness of various techniques of time managements and software packages applied in Malaysia's construction industry. Data collection was carried out quantitatively using structured questionnaire survey amongst the practitioners involved in construction projects. Average index calculation was employed to assess the level of effectiveness of time management techniques and software packages adopted in construction project. It was found that two most effective techniques adopted in Kedah and Kelantan are the same for CPM and Gantt Bar Chart. While the three most effective software packages used for time management for both states are Microsoft Project, Microsoft Excel and Primavera. Hence, it is recommended that time management practices need to be investigated in detail to uncover any activity or action which may contribute to time overrun.

Keywords: *Time management, Time management techniques, Time control Software, Construction Projects.*

I. INTRODUCTION

Time management is an important criterion to ensure the successful completion of projects. Unfortunately, construction industry is experiencing poor time management practices which have resulted in significant amounts of time overrun. These overruns in time have become a global phenomenon.

Like other countries, Malaysia is also facing the same problem of time overrun [1], [2] and [3]. Reference [4] also reported that 90% large MARA

construction projects are facing time overrun problem since 1980. This time overrun is the result of poor and

ineffective time management. Therefore, effective time management is very important as it can help in overcoming this problem of time overrun and achieved completion of construction projects within estimated time.

Although there are various methods and software packages developed for time management, however, very rare studies have focused on assessing the effectiveness of these method and packages. Hence, this study focused on assessing effectiveness methods and software packages of time management adopted in construction management. It will help the practitioners in construction to select appropriate technique and software for achieving effective time management and to ensure completion of construction projects on time. However, the scope of this study is limited to Kedah and Kelantan state.

II. RELATED WORKS

Time management is the application of various methods and techniques to ensure the completion of projects within stipulated time. Without a proper time management, many problems will occur such as extension of time or time overrun which is a common problem in today's construction industry worldwide [1]-[3], [5]-[9]. Time overrun occur when the actual

progress of a construction project is slower than the planned schedule [10]. This problem of time overrun can be reduced by effective use of available time management techniques and software packages as discussed in followings sections.

A. *Time Management Techniques/Methods*

There are several techniques or methods commonly used in construction projects. These techniques have difference function and aim to manage the time in completion of project. It includes:

- 1) Gantt Bar Chart
- 2) Critical Path Networks/Method
- 3) Milestone Date Programming Techniques
- 4) Program Evaluation and Review Technique (PERT)
- 5) Elementary Trend Analysis/Line of Balance Method (LOB)
- 6) Precedence Network Diagram
- 7) Simulation

1) *Gantt Bar Chart*

Gantt bar chart or Gantt charts are one of the basic scheduling techniques. The chart was developed by Henry L [9]. The technique is widely used for project scheduling and control because of its simplicity, ease of preparation and graphical method. Each activity is shown in its schedule position to give an efficient use of resources, the logic and float are presents by dotted line and important constraints or key dates are clearly marked [11].

2) *Critical Path Networks/Method*

The critical path method (CPM) emerged in the late 1950s and used to analyze the network to identify critical path(s) and project duration. It was developed as a project management tool to improve scheduling and project administration tasks, supporting project managers to ensure project is completed on time and on budget [12].

3) *Milestone Date Programming Techniques*

Milestone is a special event that needs an attention in the framework of project management. Milestones do not have durations or resources, but should be considered zero duration activities because that is how they are handled when placed in a schedule and computed with CPM. Besides that, most of the progress shown in the milestone is only on the critical path and

ignore non-critical activities. This is to ensure that the milestones of the project are met even when actually some activities are being ignored.

4) *Program Evaluation and Review Technique (PERT)*

PERT was originated by the U.S. Navy in 1958 as a tool for scheduling the development of a complete weapon system [13]. PERT was originally oriented to time elements of a project and it used probabilistic time estimates to aid in determining probability that a project could be completed by a given date [14]. PERT provides a basis to estimate time performance. It also provides an assessment of probability of reaching certain milestones by specified dates or of achieving overall project completion within a specified time period [15].

5) *Elementary Trend Analysis/Line of Balance Method (LOB)*

According to [16] the line-of balance (LOB) technique is a linear scheduling method that allows the balancing of the operations such as that each activity is continuously and efficiently performed in each consecutive unit. In addition, the method can be used to evaluate interrelationships among a few select activities from a larger group of construction activities included in a network schedule [9].

6) *Precedence Network Diagram*

Precedence Network Diagram is quite similar with CPM and it also widely used in the construction industry. The technique as first was called "circle and connecting line", later the term was changed into "activity on node". The arrows used to connecting the nodes where it became a network to define the relationships between the activities [9]. The advantages of this technique are easier to draw and modify, and additional activities can be inserted without changing node reference numbers.

7) *Simulation*

Simulation techniques have been used to predict activity duration and improve planning [17]-[19]. However, the building up of simulation models requires planners to have a good knowledge of simulation. The main strategies in simulation system for modelling construction process are Process Interaction and Activity Scanning [14]. Activity scanning strategy is the focus on identifying the activities and the conditions under which the activities take place [14].

B. *Software for Time Management*

One of the primary advantages of using computers for construction scheduling is that the mathematical computations are instantaneous and errors free. Of these, commonly adopted software packages in construction industry for time control are as follows:

- 1) Primavera Project Planner
- 2) Microsoft Project
- 3) Asta Power Project
- 4) Microsoft Excel
- 5) Project Commandar
- 6) Deltek Open Plan

1) *Primavera Project Planner*

Primavera software products are designed to support the project management needs of organizations that manage large numbers of projects at one time. In generally, their functions are give us detailed overview for projects, help us to control and manage projects time, control and manage projects budget, manage resources and to control risks. The reports generated from Primavera Project Planner can be presented as numbers, PERT, Gantt charts, bar chart and diagrams.

2) *Microsoft Project*

Microsoft Project software is an internal tool to help manage the huge number of projects. The main purpose of this software is to equip project managers with the right set of robust project management techniques and tools required to effectively and efficiently manage projects. Microsoft Project has various features to support project management such as manual scheduling where this features can be used to set task durations and, starts and finish dates with point and click.

3) *Asta Power Project*

Asta Power Project is a professional project management software tool that is specifically designed to plan and deliver projects on time and within budget. In purpose of time planning Asta Power Project provide comprehensive features such as:

- i) Plan tasks in units from hours, days, weeks, months, years etc.
- ii) Use sophisticated calendaring to schedule tasks and resources.
- iii) Use hammocks, multiple links, link types, link categories, task splitting and joining, task positioning etc. to finely tune a plan.

4) *Microsoft Excel*

Microsoft Excel is most popular project management software which is used widely for common information organization and tracking like a list of sales leads, project status reports, contact lists, and invoicing. The function is more to calculation, graphing tools, pivot tables and a macro programming language called visual basic for applications. In Microsoft Excel there various kind of templates that can be use for the project planning such as Excel project management templates, Gantt Chart and project planning, project reporting, Microsoft Excel formulas for project managers and etc.

5) *Project Commandar*

Project Commandar Software is ideal for project and resource planning, job scheduling or departmental. For construction project, this software has claimed as a low cost standard tool for many major companies in UK. This application has combine simplicity of use with advanced features and so it can be use by anyone even people with no experience in project planning.

6) *Deltek Open Plan*

Deltek open plan is an enterprise project management system that substantially improves an organization's ability to complete multiple projects on time and on budget. Deltek open plan also helps to:

- i) Analyze performance across a program of projects
- ii) Define project priorities
- iii) Allocate resource efficiently across the organization
- iv) Model resource tools and skills

III. DATA COLLECTION AND ANALYSIS

Data was collected using questionnaire survey. A 3-point likert scale was used to understand the perception of practitioners as 1 for not effective, 2 for moderately effective, 3 for very effective. Gathered data was analysed using statistical software SPSS and was calculated using average index method (AI). AI will be calculated with following expression:

$$\text{Average Index} = \frac{\sum (1x_1 + 2x_2 + 3x_3)}{N}$$

where,

X₁= Number of respondents for Not Effective

X₂= Number of respondents for Moderately Effective

X₃= Number of respondents for Very Effective

N = Number of respondents

A total of 100 questionnaire sets were distributed randomly amongst the personnel involved in construction industry who are registered in top 3 classes i.e. G5 to G7 under CIDB and PKK in the Kedah and Kelantan state. As a result 59 responses were received back and Table 1 shows the summary of data collection.

1-5 million	16	27
6-10 million	10	17
10-50 million	21	36
> 50 million	5	8

IV. RESULTS AND DISCUSSIONS

The respondents' organization characteristic investigated in this study is presented in Table 1.

Table 1: Respondents' Organization

Category	Frequency	Percent (%)
<i>State</i>		
Kedah	24	41
Kelantan	35	59
<i>Type of organization</i>		
Consultant	15	25
Contractor	40	68
Client	4	7
<i>Category of organization</i>		
Private	50	85
Government	5	8
Joint venture	2	3
Others	2	3
<i>Project undertaken</i>		
Building	30	51
Infrastructure	16	27
Building and Infrastructure	6	10
Others	7	12
<i>Procurement strategy</i>		
Design and Build	33	56
Turnkey	3	5
Project management	15	25
Others	8	14
<i>Size of project</i>		
< 1 million	7	12

Table 1 show that respondents from Kelantan are the majority in this survey with 59% of the total respondents. While, 41% of respondents involved are from Kedah. In term of their organizational type, the respondents in contracting organization are in the majority (68%), followed by those in consulting organizations (25%) and then those in client organizations (7%). The respondents were involved in handling both type of project i.e. building and infrastructure and most of them were from private organization with 85% of respondents.

Further, majority (36%) of respondents' participating in the survey had experience of handling large projects i.e. projects with contract amount between RM 10-50 Million. The respondents involved in the survey have had several years of experience in handling various types of projects. The characteristics of the respondents participated in survey as summarized in Table 2.

Table 2: Respondents' Qualification and Experience

Category	Frequency	Percent (%)
<i>Experience</i>		
0-10 years	46	78
11-20 years	8	14
21-30 years	4	7
> 31 years	1	2
<i>Position</i>		
Project manager	14	24
Director	13	22
Engineer	19	32
Others	13	22
<i>Qualification</i>		
Diploma	5	8
Degree	31	53
Master	20	34
Others	3	5

As indicated in table 2, majority (78%) of the respondents have less than 10 years professional experience in construction industry, about 14% had between 11-20 years professional experience and only a few respondents (7%) have experience between 21-30

years and more than 31 years experience only 2% respondents. The table also indicates that 32% of respondents are engineer, 24% are project manager and the position of director and others are 22% respectively.

A. Time Management Techniques

The survey results on assessing the level of effectiveness of various time management techniques are as shown in table 3.

Table 3: Effectiveness of time management techniques

Time Management Techniques	Kedah		Kelantan	
	AI	Rank	AI	Rank
Gantt Bar Chart	2.00	2	2.43	2
CPM	2.63	1	2.71	1
Milestone	1.79	3	1.86	4
PERT	1.42	4	1.97	3
LOB	1.21	6	1.23	7
Precedence Network Diagram	1.29	5	1.51	5
Simulation	1.13	7	1.43	6

According to table 4, the respondents rated Critical Path Method (CPM) is the most effective time management method in Kedah and Kelantan. This indicates that respondents believe that this technique is very effective in controlling and monitoring the progress of construction projects.

Coincidentally, second most effective method of time management for Kedah and also Kelantan is Gantt Bar Chart. However, third effective technique for Kedah is Milestone while for Kelantan is PERT. The least effective technique of time management is Simulation for the Kedah. However, LOB technique is the least effective technique for Kelantan.

B. Software Packages

In order to achieve effective time management, there are various software packages available which can facilitate time management effectively. Table 4, shows the result of effectiveness of the software packages adopted in construction project both in Kedah and Kelantan.

Table 4: Effectiveness of Time Management Software

Software Packages	Kedah		Kelantan	
	AI	Rank	AI	Rank
Primavera Project Planner	1.46	3	1.43	3
Microsoft Project	2.54	1	2.49	1
Asta Power Project	0.71	4	0.63	4

Microsoft Excel	1.88	2	2.34	2
Project Commandar	0.71	4	0.51	6
DelteK Open Plan	0.63	5	0.54	5

Top three software packages used in both states are Microsoft project, Microsoft Excel and Primavera Project Planner. Among these, Microsoft Project is rated as most effective software in time management and control for both Kedah and Kelantan. This may be due to easy and friendly application of the Microsoft project software. The least effective method adopted in Kedah is Deltek Open Plan while Project Commandar is for Kelantan.

V. CONCLUSION

Selecting suitable and effective time management techniques and software is very helpful in controlling project time. This study assessed the level effectiveness of techniques and software packages for time management applied in construction industry in the Kedah and Kelantan. Two major findings from this study are as follows:

- CPM, Gantt Bar Chart, PERT and Milestone are most commonly adopted and considered very effective in managing construction time.
- Microsoft Project, Microsoft Excel and Primavera are the most common and effective software packages used in construction industry for both states.

REFERENCES

- Hussin, J. M, Abdul Rahman, I and Memon, A. H (2012). *The Way Forward in Sustainable Construction: Issues and Challenges*. International Journal of Advances in Applied Sciences (IJAAS), Vol. 2 (1), ISSN: 22528814
<http://iaesjournal.com/online/index.php/IJAAS/article/view/1321>
- Memon, A.H, Abdul Rahman, I, Abdullah, M.R and Abdul Azis, A.A (2011). *Time Overrun in Malaysian Construction Projects: Perspective of Project Management Consultant*. Journal of Surveying, Construction and Property, Vol. 2 (1), pages: 54-66. ISSN: 1985-7527.
- Sambasivan M, Soon Y.W, (2007), *Causes and Effects of Delays in Malaysian Construction Industry*. International Journal of Project Management 25 (2007) 517-526
- Abdullah, M.R, A.H, Rahman, I.A, & Azis, A.A.A (2009). *Causes of Delay and Its Effect in*

- Large Mara Construction Project. International Journal of Integrated Engineering.
- [5] Fugar, F D K and Agyakwah-Baah, A B, (2010), Delays in Building Construction Projects in Ghana. *Australasian Journal of Construction Economics and Building*, pp.103-116.
- [6] Endut IR, Akintoye A & Kelly J, (2009). Cost and Time Overruns Of Projects in Malaysia. *Proceedings of the 2nd Scottish Conference for Postgraduate Researchers of the Built and Natural Environment (PROBE)*, Glasgow Caledonian University. Rotterdam (Netherlands) Pp. 243-252
- [7] Enshassi A, Al-Najjar J, Kumaraswamy M,(2009). Delays And Cost Overruns In The Construction Projects In The Gaza Strip. *Journal of Financial Management of Property and Construction* Vol. 14 No. 2, pp. 126-151.
- [8] Le-Hoai,L, Lee,Y.D., and Lee,J.Y., (2008), Delay and Cost Overruns in Vietnam Large Construction Projects: A Comparison with Other Selected Countries. *KSCE Journal of Civil Engineering* (2008) 12(6), pp. 367-377
- [9] Olawale Y.A & Sun M, (2010), *Cost And Time Control Of Construction Projects: Inhibiting Factors and Mitigating Measures in Practice*. Construction Management and Economics, vol. 28, pp. 509–526
- [10] Mahamid I, (2011), Risk Matrix for Factors Affecting Time Delay in Road Construction Projects: Owners' Perspective. *Engineering, Construction and Architectural Management*, Emerald Group Publishing Limited. Pp. 609-617
- [11] Smith,N.J. (2002), "Engineering Project Management", Second Edition, United Kingdom, Blackwell Science Ltd.
- [12] Kim, K. Garza, M.J. (2003), "Phantom Float", *Journal of Construction Engineering and Management*, Vol.129, No. 5: 507-517.
- [13] Cottrell, D.W. (1999). "Simplified Program Evaluation and Review Technique (PERT)" *Journal of Construction Engineering and Management*, Vol.125 No. 1: 16-22.
- [14] Lu, M. and Abourizk, M.S. (2000) "Simplified CPM / PERT Simulation Model" *Journal of Construction Engineering and Management*, Vol.126, No. 3: 219 – 226
- [15] Callahan, T.M., Quackenbush, G.D. and Rowings, E.J. (1992), "Construction Project Scheduling." New York: McGraw Hill, Inc.
- [16] Yang I-T and Ioannou, P.G (July 2004), "Scheduling system with focus on practical concerns in repetitive projects", *Construction Management and Economics*, 22, 619–630.
- [17] Halpin, D.W., and Riggs, L. S. (1992), "Planning And Analysis Of Construction Operations", John Wiley & Sons, Inc., New York, N. Y.,245
- [18] Shi J. J., Activity-based construction (ABC) modelling and simulation method, *J. Constr. Engrg Mgmt*, ASCE, 1999, 125(5), 354–360.
- [19] Zhang H., Shi J. J., Tam C. M., Iconic animation for activity-based construction simulation, *J. Comp. Civil Engrg*, ASCE, 2002, 16(3), 157–164.