

Project Time and Budget Monitor and Control

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Abstract: With the marketing competitiveness growing, it is more and more critical in time and budget control of each project. This paper discusses that in the construction phase, how can a project manager be successful in time and budget control. This paper also evaluates some pitfalls the project manager will meet in his endeavors to monitor and control the project. There are many methods and five kind pitfalls are discussed in this paper, it reveals that to be successful, the project manager must concern all this methods and avoid pitfalls successfully.

Key words: Project; monitor and control; time control; cost control; ranking the priority; CPM; non-delay approach; precedence; optimal timing; crashing; pitfall

1. INTRODUCTION

The survey shows that most projects encounter cost and time over-runs (Williams Ackermann, Eden, 2002,p192). According to Wright (1997)'s research, a good rule of thumb is to add a minimum of 50% to every time estimate, and 50% to the first estimate of the budget (Gardiner and Stewart,1998, p251). It indicates that project is very complex and full of challenge. Many unexpected issues will lead the project cost and time over-runs. Therefore, many technologies and methods are developed for successful monitoring and control to lead the project to success. In this article, we will discuss in the construction phase, how can a project manager to be successful in time and budget control. Another part we will discuss what pitfalls will wait for the manager in his endeavors to monitor and control the project.

2. THE CONCEPT AND THE PURPOSE OF PROJECT CONTROL AND MONITOR

Erel and Raz (2000) state that the project control cycle consists of measuring the status of the project, comparing to the plan, analysis of the deviations, and implementing any appropriate corrective actions. When a project reach the construction phase, monitor and control is critical to deliver the project success. Project monitoring exists to establish the need to take corrective action, whilst there is still time to take action. Through monitoring the activities, the project team can analyze the deviations and decide what to

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do and actually do it (Gardiner and Stewart 2000,p252). The purpose of monitor and control is to support the implementation of corrective actions, ensure projects stay on target or get project back on target once it has gone off target (Erel and Raz, 2000,p253).

3. SETTING UP AN EFFICIENT CONTROL SYSTEM

For the purpose of achieving time and cost target, the manager need to set up an efficient management framework including: reporting structure, assessing progress, and communication system. The employees' responsibility and authority need to be defined in the reporting structure. The formal and informal assessing progress can help getting a general perspective between reality and target. It is significant to help identify what is the risk and should be monitored and controlled. Project success is strongly linked to communication. The efficient communication system benefit for teamwork and facilitate problem solving (Diallo and Thuillier, 2005).

4. TIME AND COST MONITOR AND CONTROL

4.1 Ranking the priority of monitoring

In construction phase, many activities are carried out based on the original plan. It is need to know what kind of activities or things are most likely to lead the project delay and disruption. Therefore, the first step is ranking the priority of the activities. Because the duration of a project is determined by the total time of activities on critical path, any delay in an activity on the critical path will cause a delay in the completion date for the project (Ackermann Eden, Howick and Williams,2000,p295). Therefore, the activities on critical path should firstly to be monitored and controlled. Secondly, monitoring the activities with no free float remaining, a delay in any activity with no free float will delay some subsequent activity inevitably. These subsequent delays will discomfit the resource schedule significantly. Some resources are unavailable because they are committed elsewhere. Thirdly, monitoring the activities with less than a specified float, because if an activity has very little float, it might use up the time before control decision is made once such an activities has a variance with the target. Fourthly, managers should monitor high risky activities. High risky activities are most likely to overrun or overspend. Fifthly, managers should monitor the activities using critical resource. Some resource is critical because they are very expensive or limited (Cotterell and Hughes,1995)

4.2 Methods of time control

4.2.1 CPM

Based on the original plan(Gantt charts), we can analyze what activities are on the critical path, what activities with no free float and what activities with less than a specified float via network diagram, then monitoring these activities, take control actions to avoid delay.

Once an activity on critical path is going to delay, commonly, there are the ways to avoid delay or even can shorten the time of activities:

- a) Increasing resource levels, such as adding labour.
- b) Improving resource efficiency, such as transferring high skill employees to the activity, improving efficient tools.
- c) And means that can shorten critical path timescales to bring a project back on target, such as overtime, outsourcing, etc.

4.2.2 Non-delay approach

In addition, for shortening project time, it is still required to use “early start” or “as soon as possible” approach for those activities having slack (float) time. Through this method, it is more flexible for a project to adjust various resources when urgency burst into the activity on the critical path. For example, an activity is on the critical path, it will delay inevitably if there is no more people work on it. In most of this case, the people can move from non-critical task to the urgent work. The non-delay concept was found to be more efficient in reducing project risk, reducing project duration (Cohen, Sadeh and Zwikael, 2006).

4.2.3 Precedence requirement

Reconsidering activities precedence is another important control way for getting project back on target (Cotterell and Hughes, 1995). Because the original project network will probably have been produced for an ideal situation, with the project going, many issues will affect the activity implement, the actual result is quite different with the imagination. The manager should always combine the reality and think about the following questions:

- a) Do unstarted activities really have to await the completion of other activities before they can start? If no, start the activities
- b) If an activity has to wait for the completion of other activities, can that activity be broken down into sub-activities and some of the sub activities completed at an earlier date? If no, break down the activity into sub-activities and start the urgent one at once.

Herroelen and Reyck (1999) also state that managers have to tackle the challenging problem of scheduling activities to minimize the project duration, in which the activities (a) are subject to generalized precedence relations, (b) require units of multiple renewable, non-renewable and doubly constrained resources for which a limited availability is imposed, and (c) can be performed in one of several different ways, reflected in multiple activity scenarios or modes.

4.2.4 Optimal timing

Considering optimal timing of project monitoring and control points is significant to success (Falco and Macchiaroli, 1998). Falco and Macchiaroli suggest that we should determine the optimal frequency of the monitoring and reviewing to different activities in different stages. It can help us to efficient monitor and correct control so as to reach time and cost target.

4.2.5 Crashing

In recent years, network crashing was developed along with the critical path method (CPM) for planning and controlling large scale project. The purpose of crashing is the minimization of the pessimistic time estimate in PERT (Program Evaluation and Review Technique) networks by investing additional amounts of money in the activities on the critical path. Sometimes, crashing methods are required to combine in the monitoring and controlling process when the duration of the activity that has to be completed within a specified time (Abbasi and Mukattash, 2001, p181).

4.3 Methods of cost control

The main cost of a project includes staff cost, material cost and delay cost. To control these cost, managers should first set up a cost control system to:

- a) Allocate responsibilities for administration and analysis of financial data

- b) Ensure all costs are properly allocated against project codes
- c) Ensure all costs are genuinely in pursuit of project activities
- d) Ensure contractors payments are authorised
- e) Check that other projects are not using the budget.

Then, managers should monitor and control change to the project budget. It means the following things:

- a) Concerned with key factors that cause changes to the budget
- b) Controlling actual cost changes as they occur
 - Monitor cost performance to detect variances
 - Record all appropriate changes accurately in the cost baseline
 - Preventing incorrect, unauthorized changes being included in the cost baseline
 - Determine positive and negative variances
 - Integrated with all other control processes (scope, change, schedule, quality)

As a project is dynamic, sometimes the project managers know the project is going out off target by monitoring, but don't know the best action to take. In this circumstance, net present value (NPV) should be used as an ongoing monitor and control mechanism, because NPV takes account of the time element and discounts future cash flows, it is the result of the time effect on cash (Gardiner and Stewart,2000, p253-255).

4.4 Change monitor and control

Voropajev (1998) states that dynamic changes of project environment will influence the process of project implementation, the project itself and may cause heightened risk. When carried out some activities, the methods different from that in the original plan must be used to keep the process moving forward (as experienced under practice). Therefore, changes are inevitable and need to be managed during project life-cycle (Voropajev.1998,p16-17) .An effective change control system should be established to ensure change procedure is clear and unambiguous and easy for employee to request a change. And the following things need to be concerned:

- a) Monitoring and forecasting most probable changes Key factors that generate change to ensure good results; make sure that change is beneficial Requesting for change must be checked by suitable person before being approved.
- d) Changes should take place once it is approved and be monitored to check whether it worked as expected
- e) All changes in project should be recorded in the project documentation (Voropajev, 1998,p18).

5. EVALUATE THE PITFALLS OF SOME METHODS OF MONITOR AND CONTROL

As it is mentioned above, to avoid the project delay, some monitor and control methods are used to avoid delay and budget overrun. Next, we will discuss pitfalls of some methods.

5.1 CPM

Ackermann, Eden, Howick and Williams (2000) point out the pitfall of using CPM. They are:

- a) When a network is resource-constrained, there is no agreed definition of what a 'critical path' actually is.
- b) Many effects, such as change orders, impact many activities simultaneously. In such cases, single-activity analyses in CPM do not really work, and more sophisticated analyses or network simulation is needed.
- c) CPM cannot take account of soft factors such as demotivation. Disruption affects productivity in a fashion that means it varies over time, CPM times do not usually take account of changes in productivity, let alone when it is a variable factor.
- d) CPM does not take into account management actions to deal with delays and disruptions.

5.2 Adding resource

Adding resource is most common methods for shortened project time. But there are limits, such as some of activities cannot be shortened by adding staffs and equipment and some time the relation between staffs size and time shorten is not linear. Adding resource, you cannot achieve as your want.

5.3 Overtime

This is the easiest way to add more labour and not add more staffs. But need to face the challenge of team numbers' antipathy and the low efficiency in the overtime work.

5.4 Outsourcing

This is also a common method to shortening the project time by subcontracting the activities. The issue is most of the time, the subcontractor need to warm up before start their project jobs.

5.5 NPV

The problem that exists within the field of NPV is that after getting a project authorized.

There will be no further consideration given to the project's NPV until a post investment appraisal can be carried out. However, at this point the damage has been done (Gardiner and Stewart, 2000, p252).

6. CONCLUSION

This article shows the best methods of time and budget control. First, an efficient control system must be set up. Secondly, It is required to recognize and rank the important factors affecting time and budget target. Thirdly, manager should combine different control techniques such as CPM · NPV, crashing, Non-delay approach, Precedence requirement, etc. and avoid the pitfalls to reach the success of a project .

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