Project Time Management

…an essential element to project success

Abstract

This paper discusses the reasons behind the necessity to apply sound Project Time Management principles and processes to projects in order to better control time and resources throughout a projects lifecycle.

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Introduction

The basic control elements of a project are to complete the scope of work within a specified time, to a set budget and to the clients' specification (Time, Cost and Quality). If these three elements are controlled to achieve their individual objectives then the project has the potential of being a resounding success remembering that a change in any one of these elements will result in a change in the other two.

Project Cost Management

The cost of the project is generally controlled in the strictest manner by a host of tools and personnel that constantly review how much has been spent against the project compared with the approved budget. Each and every dollar expended as a result of manhours booked, materials bought or equipment hired has to be approved by the responsible manager, allocated an approved project cost code, entered into the company's journal, general ledgers and accounts to indicate profitability to company directors, shareholders and in public listed companies, the stock exchange. A host of checks and balances are maintained throughout the project lifecycle (PLC) to ensure the accountability of the project expenditure.

Project Quality Management

The quality of goods and/or services are controlled by a myriad of standards, procedures and processes that are usually demanded by the client as a basic requirement before being considered as a contender for the execution of their project. Contractors go to extreme lengths and costs to ensure these standards are implemented and audited on a regular basis in order to remain compliant to international standards.

Project Time Management

Project time management looks at the control of time and resources, however both these elements involve costs in terms of budgeted manhours and/or dollars. Project time management depicts activities of work across a timeframe required to be executed in order to achieve the contractual deliverables and is visually portrayed in a tool called a Gantt chart. Elements of project costs like earned value and forecasting at completion can be derived very accurately from this tool.

The Gantt chart or project schedule provides the project stakeholders with valuable information such as:

- comfort that the contractor understands the full scope of work
- comfort that the scope of work and/or separable portions can be delivered within the required timeframe
- the sequence in which the work will be undertaken
- the duration each activity takes to produce the deliverables
- interface points with other works
- where the critical path runs through the project
- budgeted, earned and actual manhours/costs per period for earned value analysis

In addition to these, the schedule forms the basis in producing resource histograms and progress 'S' curves to determine:

- the distribution of manhours and/or costs to deliver the scope of work
- the quantity and distribution of resources required
- earned value performance versus scheduled and actual performance
- project cash flow

However, the findings of recent research by the writer suggested that the majority of organisations surveyed, only undertook project time management to conform with certain client driven criteria rather than the inherent value that it returns to the project and business as a whole.

Project Time Management & the PLC

Project time management plays a vital role through all stages of the PLC and should therefore be given the attention that is afforded to cost and quality management.

Project Initiation

When an organisation decides to embark on a new external project it generally goes through a tendering stage. This is the first time that project time management is visited, and the project requirements with respect to time management are detailed in the tender schedule.

The essential input to producing a meaningful tender schedule is a full understanding of the contractual scope of work. In some industries this can be more difficult to obtain than in others. For example in software development

the full requirements may not be known at the tender stage and will only become evident during the design stage of the project. To this end a high level schedule can only be representative of the major deliverables being developed through their phases culminating in the final contractual delivery milestone.

Traditionally at the tendering stage of the project the level of detail within the schedule is kept to a high level; level 2 or 3 of the work breakdown structure (WBS). The importance of the tender schedule is to portray the contractual deliverables derived from the scope of work document and depicted as the lowest level of the WBS.

Project 'S' curves and resource histograms would in this situation only be indicative until a fully developed project schedule is produced after the award of the project.

Where a full scope of work is available then a level 4 schedule can be detailed with full histograms and progress 'S' curves.

Project Planning

After award of the contract the project schedule makes its grand entrance into the project arena with the project team. It is absolutely essential that the project schedule is developed and owned by the project team members and not by any one individual, i.e. the planning engineer. This is the most common mistake made by projects in the writers' experience and the main reason why the project schedule is paid only lip service too instead of being used as a tool to drive and control the project with.

The project scope should now be fully defined and a WBS developed to represent the deliverables therein. The WBS is used to form the structure for the project schedule and to break the scope of work into meaningful portions. The lowest level of the WBS should represent the contractual deliverable with the WBS title defined as a noun.

The number of levels within the WBS will vary between projects but typically a WBS should contain between 4 to 6 levels. I once received a call from a client who was currently establishing a WBS in a planning software package and had 'run out of levels'. After initial enquiries I requested the client to fax me the WBS structure to which he replied this would be too difficult as it would take over 100 A4 pages. Further investigation revealed the WBS was being used as an indented bill of materials and not as a project WBS.

The WBS structure also contributes to the change management process with regard to scope changes and will be discussed later in the PLC.

The activities within each WBS level should describe what work needs to be done in order to produce the deliverable with the activity description made up as a verb/noun. All to often I have seen activities such as 'Pipe racks' or 'P&ID's ' unbeknown to the reader what is to be done to, or with the said item.

Typically the activity should read ‘Erect Pipe Racks in Area A’ and ‘Develop P&ID’s for Area C’ to remove all assumptions and intangibility especially during the progress update cycles.

Another consideration in the activity definition stage is the method of progress measurement. Each activity should result in some tangible deliverable that can be measured to ensure an objective percent complete assessment. All the effort in developing a schedule and resource allocation will go to waste if, when it comes to updating the schedule, a subjective assessment is used to progress the activities.

In most cases the project schedule is developed within a proprietary planning software package and is the result of a network diagram built up from activities, durations and logical relationships. The main functionality of the software is that of performing the forward and backward pass to calculate the scheduled dates, critical path, total float, free float etc. In order for software to return accurate results, two fundamental processes must have been performed, activity duration estimation and activity logic relationship assignment.

Activity Duration Estimation

Most software packages available today only allow for a single point activity duration estimation requiring the user to enter an accurate assessment of the ‘most likely’ duration. This again requires the project team to establish the duration of each activity bearing in mind human beings are, in general terms optimistic in estimations.

The general rule in activity duration estimation is to keep the duration as close to the duration of the reporting period as possible. This eliminates the possibility of inaccurate progress updates. If an activity is found to be outside this general rule then either break the activity down into smaller portions or ensure the method of measuring the progress of the activity can be calculated objectively by the measurement of defined deliverables. This will be discussed later under ‘Execution & Control’

Activity Logic Relationships

Assigning activity logic relationships ensures an accurate critical path is calculated and the correct sequence of performing the work is adopted. It is also essential for forecasting the project completion date and manhour estimate to complete.

If activities are logic deficient as in Activity ‘C’ in Figure 1 then an unrealistic amount of total float will be calculated resulting in inaccurate scheduled dates. During resource leveling, activities will be leveled taking into consideration the resource availability and the amount of available total float resulting in the activity being re-scheduled further out in time and returning skewed resource manning histograms.

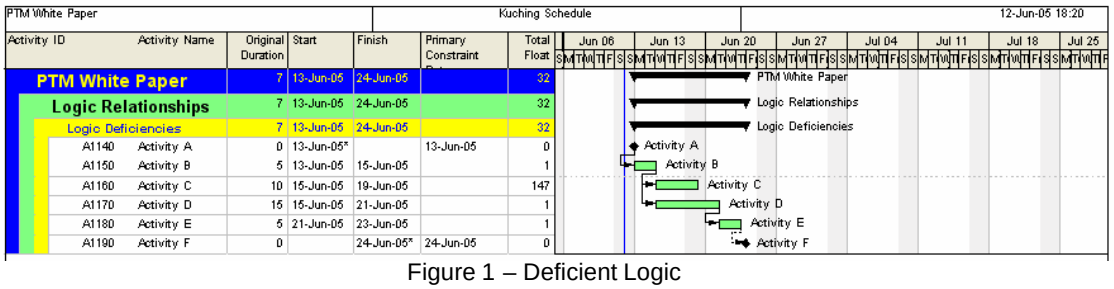

Figure 1 – Deficient Logic

Logic relationships should be applied only to determine the logical sequence of the activities and not used as an artificial means for resource leveling.

Activity constraints should not be used in place of logical relationships as these will generate individual critical paths unless of course they are depicting separable portion deliverables of the contract (Refer Figure 2)

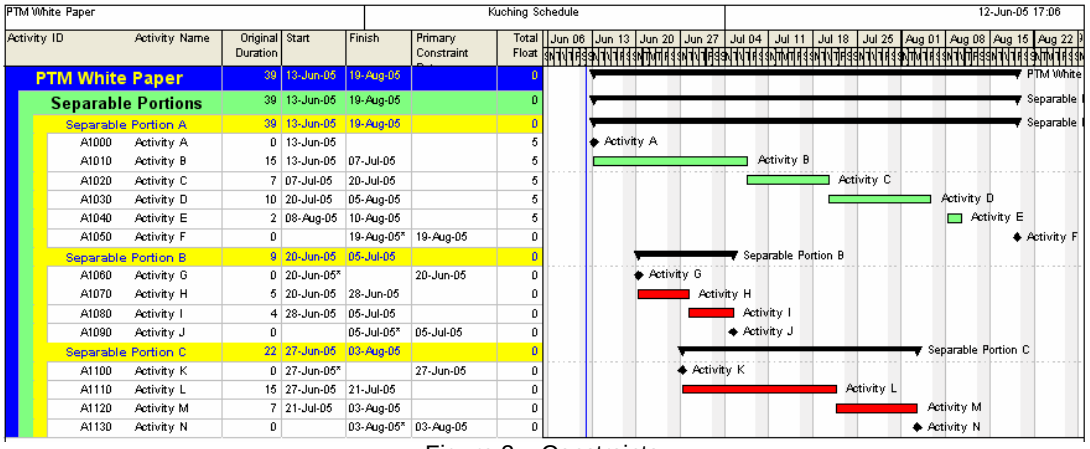

Figure 2 – Constraints

The final act in logical relationship assignment is to determine the critical path (Refer Figure 3) and to ensure no activity has either an unrealistic amount of total float, indicating missing logic, or negative float. If activities are reflecting negative float then the schedule is identifying work that cannot be completed in the specified time.

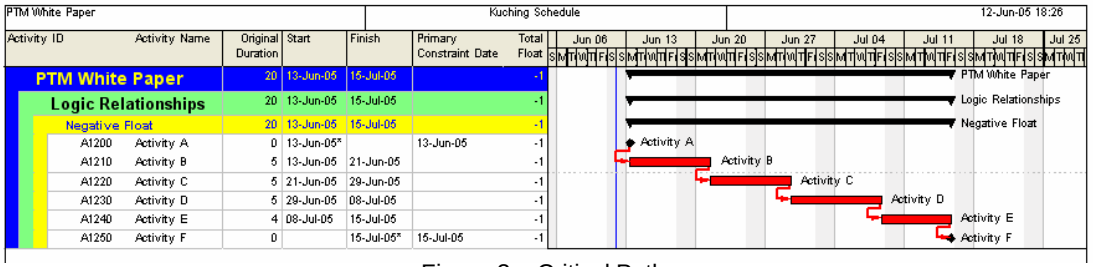

Figure 3 – Critical Path

This is an essential process prior to baselining or resource leveling.

Resource Assignment

Resource assignment forms an integral part of the time management process because the quantity of resources assigned to an activity can influence the activities duration. If, for instance, 1 team of pipe installers were to take 8 weeks to install a pipeline then it is quite feasible to say that 2 teams would reduce this time to 4 weeks.

However, this does not hold true for all industries. Take for example software development. Assigning additional resources above an optimum level would only be costly to the project and achieve no beneficial time savings.

Assigning resources to activities is necessary to determine:

- the effort required to complete the task
- the effort required to complete the deliverable (activity roll up to WBS)
- the effort required to complete the project (WBS roll up to the project)
- the project manning levels
- the progress 'S' curves
- resource leveling
- the project cashflow

Before assigning resources to activities first determine the level of detail that is required. It is usual to represent resources by direct/indirect labour and overheads and so this should be the highest level that resources are represented by in the schedule. If a lower level of detail is required ie trades within the direct labour level, then these should be determined prior to assignment to the activity.

Budgeted manhours must be assigned to each resource and if financial reporting is required then the relevant corporate cost account can be assigned to the individual resources also.

Resource leveling

Resource leveling optimises the allocated resources by moving activities with overloaded resources to a time where the resource is available within its limits. The amount the activity can move is determined by the amount of total float available to it (time constrained leveling). This type of resource leveling is useful for determining the optimum quantity of resources required to complete the project within the given timeframe.

Baselining

Baselining the schedule is the final process prior to the schedule being progressed and is the process that is most commonly omitted in the writer's experience.

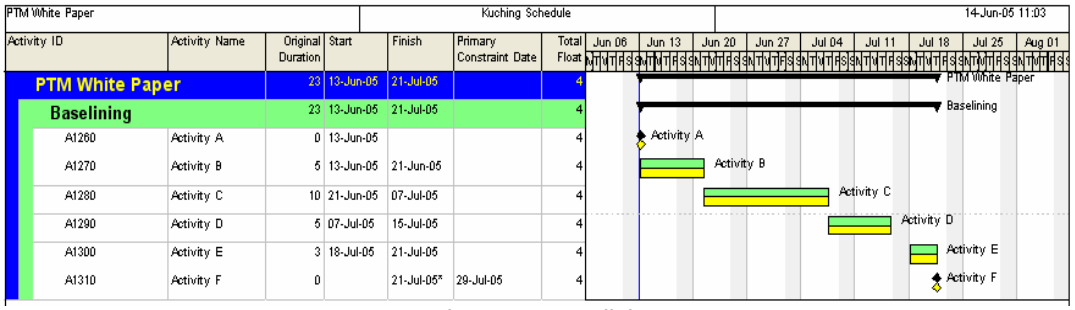

Figure 4 – Baselining

The baseline (Refer Figure 4) is used as a benchmark during progressing to visually display slippage in time when an activity does not occur as scheduled.

It also 'sets in concrete' the defined scope of work that can only be changed after approval of scope variations or a complete re-schedule, should the current schedule become impossible to achieve.

Without a baseline the project manager cannot determine if the project is behind schedule, on schedule, or ahead of schedule after progressing and moving the reporting period up by 1 month (Refer Figure 5).

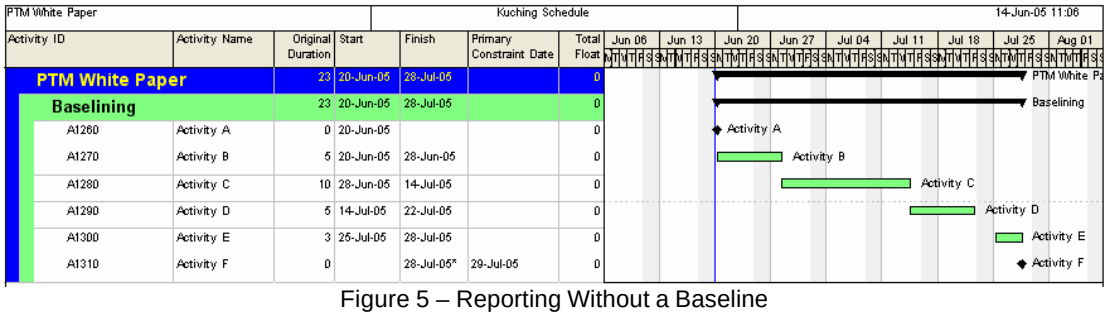

Figure 5 – Reporting Without a Baseline

However, with the baseline in place it is visibly obvious that the project has slipped by 1 month (Refer Figure 6).

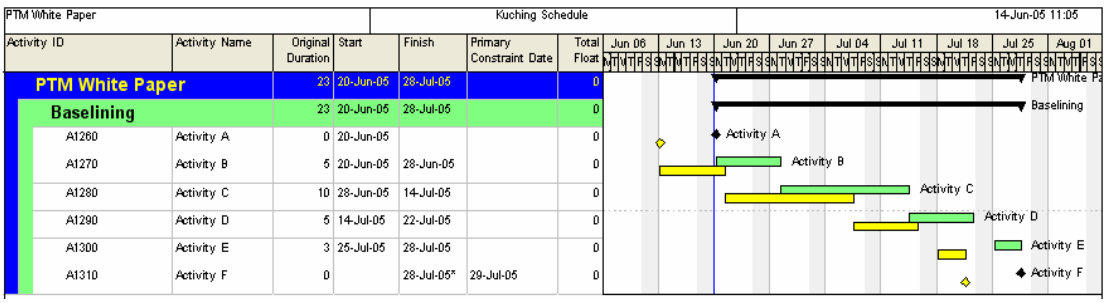

Figure 6 – Reporting With a Baseline

Project Execution & Control

Once the project is under way and effort is being expended, the job of the schedule is twofold. The first is the monitoring of the project, and it will advise the project team of how much progress has been achieved to-date. This is represented in terms of percentage complete of the activity rolled up to the

WBS levels through to the project level. It can also advise what actuals have been spent represented in manhours, dollars and/or resources.

The second is the forecast to completion of the remaining work which can also be represented in manhours, dollars and/or resources. It is this second aspect of the schedule that most organisations tend to overlook for various reasons and which is, in the writers opinion, the most important as it this element that alerts the project manager to possible budget, resource and time overruns.

Like any journey that is embarked upon the first thing in determining how much further there is to go is to understand where you are now. The accuracy of measuring the progress to date is crucial in determining the forecast to complete.

This statement may seem very simplistic but it never ceases to amaze me how the importance of this formula is overlooked, with progress measurement given nothing more than a subjective cursory assessment. Statements like *'…what percentage did I give it last week?'* or *'…just give it another 10%'* which continues until the activity reaches what is commonly known as the 'nervous nineties' when suddenly all progress ceases but manhours continue to be booked against the activity. Unless an objective method of measurement is developed then the old adage of 'garbage in, garbage out' springs to mind.

When defining the method of measurement the activity should be broken down into defined deliverables and assign a weighted percent to each. When and only when the deliverable has been completed, the relevant weighting is assigned to the activity. This continues until the activity is completed.

Examples of these are shown for:

- Engineering drawings:
  - 5% - Title block
  - 45% - Issue 1st draft for comment
  - 20% - Issue for clash check
  - 15% - Final squad check
  - 10% - AFC
  - 5% - IFC

- Document writing:
  - 15% - Table of Contents
  - 30% - Weighted across each chapter written in draft form
  - 5% - Receive 1st draft comments
  - 25% - Weighted across each chapter written in final form
  - 5% - Receive final comments
  - 10% - Final amendments completed
  - 5% - Issued

Scope management

As mentioned earlier, the WBS is used as a means to manage the scope of work. This is essential when additional work is required by the client for if the activity cannot be placed under an existing WBS element in the project schedule, then it is automatically deemed a scope change and a new WBS element must be created.

Any change in the scope of work must be managed through a controlled change management process which requires approval from management and/or the client. Changes to the scope of work must be noted within the schedule so that variations can be readily identified by selecting the relevant activities. This allows for an aggregation of the manhours and/or costs of the of the activities that were not included in the original scope of work for later reimbursement.

Project Closeout

At project completion the team should determine the positives and negatives of the project and enter the positives into templates for use on subsequent projects to eliminate the 'reinvention of the wheel' and to document its mistakes to ensure they are not made on subsequent projects.

Usually this phase is ignored in total as project resources are reassigned to the next project or move on to other organisations but if done correctly will save the company money in the long term.

Summary

This paper has discussed what many would think are very basic aspects of project time management, in fact that is exactly what they are, however if they are so basic then why are so many organisations not doing them?

Only by documenting the time management processes and procedures for use across the enterprise; implementing the processes and procedures in a rigorous and methodical manner; receiving full support from senior management especially during the change management process of the organisations culture towards project management; will organisations realise the project time management objectives, project success and ultimately business success.

Time, cost and quality are explicitly linked and a change in one will affect the other two. Therefore if project time management is not managed and controlled correctly then it will realise a cost blowout and reduction in quality.

Project time management methodologies are an essential element in realising project success.