Software Project Management

Durga Prasad Mohapatra
Professor
CSE Deptt.
NIT Rourkela

Project Monitoring and Control

Contents

- Introduction
- Project Control Cycle
- Project reporting structures
- Assessing progress
- Collecting progress details
- Partial Completion Reporting
- Project Review

Introduction

- Once work schedules have been published and the project is started,
  - attention must be focused on progress.
- This requires
  - monitoring of what is happening,
  - comparison of actual achievement against the schedule and,
  - where necessary, revision of plans and schedules to bring the project as far as possible back on target.

Introduction

- The project manager designates certain key events such as completion of some important activity as a **milestone.**
- **A few examples of milestones are:** preparation and review of the SRS document, completion of the coding and unit testing, etc.

Introduction cont...

- Once a milestone is reached, the project manager can assume that some measurable progress has been made.
- If any delay in reaching a milestone is predicted, then corrective actions might have to be taken.
- This may entail reworking all the schedules and producing a fresh schedule.

Introduction cont...

- PERT (Project Evaluation and Review Technique) chart is especially useful in project monitoring and control.
- A critical path in this graph is a path along which every milestone is critical to meeting the project deadline. In other words, if any delay occurs along a critical path, the entire project would get delayed.
- It is therefore necessary to identify all the critical paths in a schedule.

Introduction cont...

- There may be more than one critical path in a schedule. The tasks along a critical path are called critical tasks.
- The critical tasks need to be closely monitored and corrective actions need to be initiated as soon as any delay is noticed.
- If necessary, a project manager may switch resources from a non-critical task to a critical task so that all milestones along the critical path are met.

Introduction cont...

- Several tools are available which can help you to figure out the critical paths in an unrestricted schedule, but figuring out an optimal schedule with resource limitations and with a large number of parallel tasks is a very hard problem.
- There are several commercial products for automating the scheduling techniques, are available. Example: MS-Project software available on personal computers.

Introduction cont...

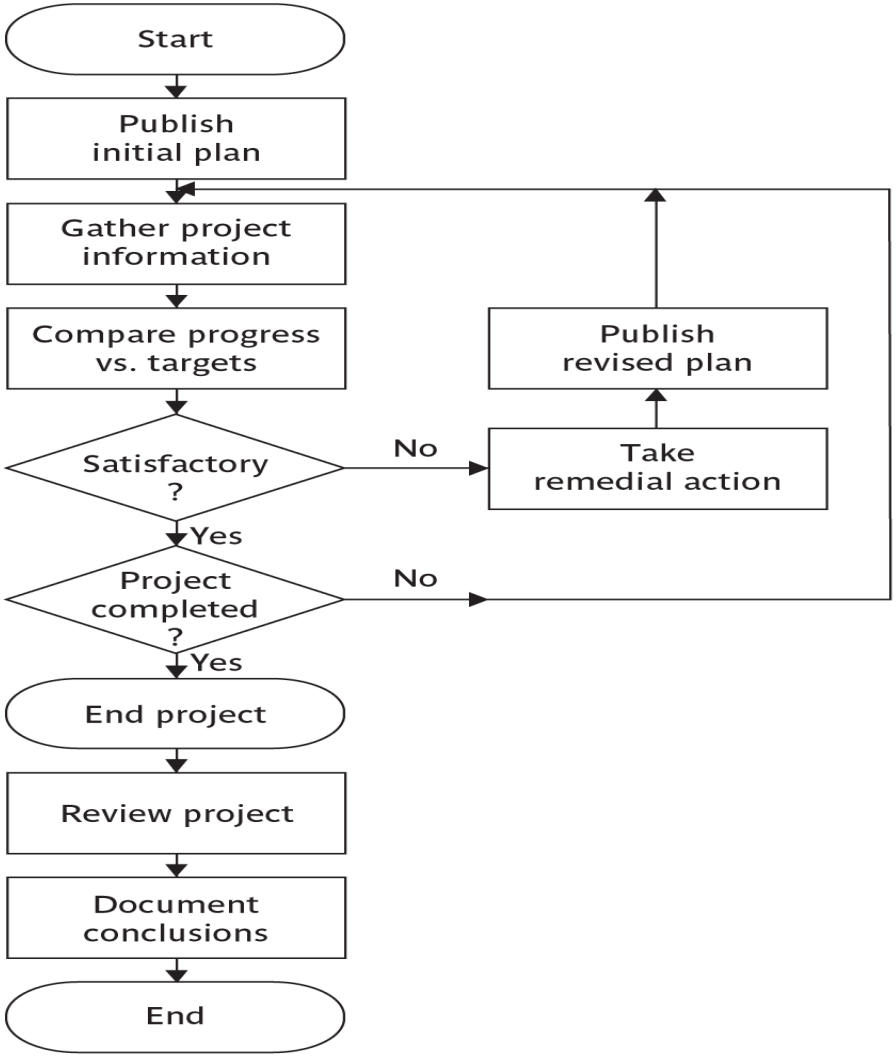
- In earlier classes, we have discussed the importance of producing plans that can be monitored.
- Now, we will discuss how information about the progress of the project is gathered and what actions must be taken to ensure that a project meets its targets.

Creating the Framework

- Exercising control over a project and ensuring that targets are met is a matter of regular monitoring
  - Finding out what is happening and comparing it with targets.

- There may be a mismatch between the planned outcomes and the actual ones. Then, replanning may be needed to bring the project back on target.
- Alternatively, the target has to be revised.

A Model of Project Control Cycle



Creating the Framework cont …

- The project control cycle shows how, once the initial project plan has been published,
  - project control is a continual process of monitoring progress against that plan and, where necessary, revising the plan to take account of deviations.
- It also illustrates the important steps that must be taken after completion of the project so that
  - the experience gained in any one project can feed into the planning stages of future projects,
    - thus allowing us to learn from past mistakes.

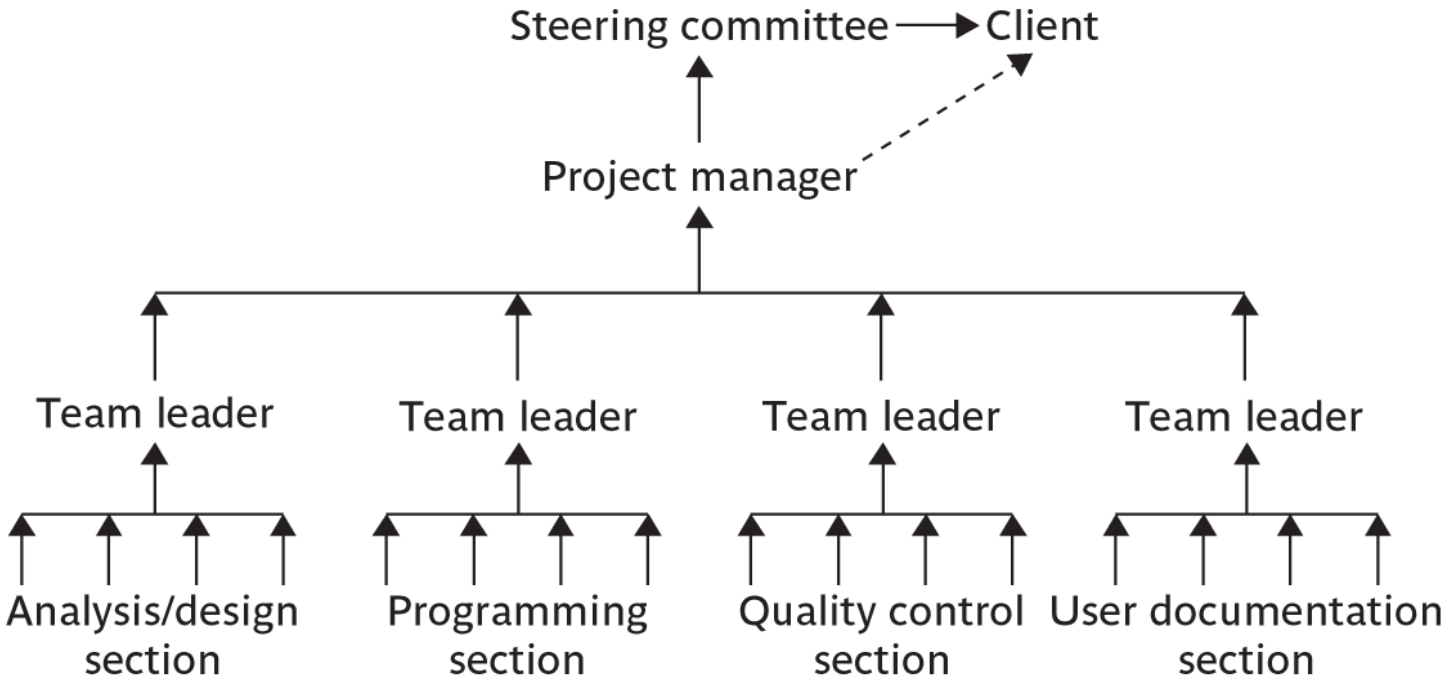
Creating the Framework

- In practice, the project manager normally concerned with four types of shortfall
  - Delays in meeting target dates,
  - shortfalls in quality,
  - inadequate functionality, and
  - costs going over target.

Responsibilities

- The overall responsibility for ensuring satisfactory progress on a project is often the role of the project steering committee, or project management board.
- Day-to-day responsibility will rest with the project manager.
- Other aspects of the projects can be delegated to team leaders.

Project reporting structures



Responsibilities cont ...

- The previous figure illustrates the typical reporting structure found with medium and large projects.
- With small projects (employing around half a dozen or fewer staff), individual team members usually report directly to the project manager, but in most cases team leaders will collate reports on their section's progress and forward summaries to the project manager.
- These, in turn, will be incorporated into project-level reports for the steering committee and, via them or directly, progress reports for the client.

Responsibilities cont ...

- Reporting may be
  - oral or written,
  - formal or informal, and
  - regular or ad hoc.
- Informal communication is necessary and important,
  - but any such informal reporting of project progress must be complemented by formal reporting procedures

Categories of reporting

Report type	Examples	Comment
Oral formal regular	Weekly or monthly progress meetings	While reports may be oral, formal written minutes should be kept
Oral formal adhoc	End-of-stage review meetings	While largely oral, likely to receive and generate written reports
Written formal regular	Job sheets, progress reports	Normally weekly using forms
Written formal adhoc	Exception reports, change reports	
Oral informal adhoc	Canteen discussion, social interaction	Often provides early warning; must be backed up by formal reporting

Assessing progress

- Some information used to assess project progress will be collected routinely,
  - while other information will be triggered by specific events.
- Wherever possible, this information should be objective and tangible
  - for example, whether or not a particular report has been delivered

Assessing progress cont ...

- It is essential to set a series of checkpoints in the initial activity plan.

  Checkpoints – predetermined times when progress is checked

  Two types:

  - Event driven: check takes place when a particular event has been achieved (i.e. tied to specific events such as the production of a report or other deliverable.)
  - Time driven: date of the check is pre-determined, or regular (e.g. Weekly / Monthly)

Frequency of reporting

- The frequency of progress reports will depend upon the size and degree of risk of the project.
- The higher the management level, the less frequent (i.e. longer the gaps between checkpoints) and less detailed the reporting needs to be.
- Example: Team leaders may assess progress daily, where as managers do weekly or monthly.
- Major, or project-level, progress reviews generally takes place at particular points during the life of a project
  - commonly known as review points or control points.

Collecting progress details

Need to collect data about:

- Achievements
- Costs

A big problem: how to deal with *partial completions*

99% completion syndrome

Possible solutions:

- Control of products, not activities
- Subdivide into lots of sub-activities

Collecting the data

- As a rule, managers should try to break down long activities into more controllable tasks of one or two weeks' duration.
- Still it will be necessary to gather information about the partially completed activities and, in particular, forecasts of how much work is left to be completed.
- It can be difficult to make such forecasts accurately.
- Where there is a series of products, partial completion of activities is easier to estimate.

Collecting the data cont ...

- For example, counting the number of record specifications or screen layouts produced, can provide a reasonable measure of progress.
- In some cases, intermediate products can be used as activity milestones, e.g. the first successful compilation of a program, might be considered a milestone, even though it is not a final product.

Partial Completion Reporting

- Many organizations use standard accounting systems with weekly timesheets to charge staff time to individual jobs.
- The staff time booked to a project indicates the work carried out and the charges to the project.
- It does not, however, tell the project manager what has been produced or whether tasks are on schedule.
- It is therefore common to adapt or enhance existing accounting data collection systems to meet the needs of project control.

Partial Completion Reporting cont ...

- Weekly timesheets, for example, are frequently adapted by breaking jobs down to activity level and requiring information about work done in addition to time spent.
- The next figure shows an example of a report form requesting information about likely slippage of completion dates as well as estimates of completeness.

Time Sheet

Staff John Smith Week ending 30/3/07

Rechargeable hours

Project	Activity code	Description	Hours this week	% complete	Scheduled completion	Estimated completion
P21	A243	Code mod A3	12	30	24/4/07	24/4/07
P34	B771	Document take-on	20	90	6/4/07	4/4/07

Total recharged hours	32

Non-rechargeable hours

Code	Description	Hours this week	Comment and authorization
Z99	Day in lieu	8	Authorized by RB

Total non-rechargeable hours	8

A weekly timesheet and progress review form

Partial Completion Reporting cont ...

- Other reporting templates are also possible.
- For example, rather than asking for estimates of percentage complete,
  - some managers would prefer to ask for the number of hours already worked on the task and an estimate of the number of hours needed to finish the task off.

Red/Amber/Green reporting

- One popular way of overcoming the objections to partial completion reporting is
  - to avoid asking for estimated completion dates, but to ask instead for the team members' estimates of the likelihood of meeting the planned target date.
- One way of doing this is the traffic-light method.

Red/Amber/Green reporting cont ...

This consists of the following steps:

- Identify the key (first level) elements for assessment in a piece of work.
- Break these key elements into constituent elements (second level).
- Assess each of the second-level elements on the scale
  - green for 'on target',
  - amber for 'not on target but recoverable', and
  - red for 'not on target and recoverable only with difficulty'.
- Review all the second-level assessments to arrive at first-level assessments.
- Review first- and second-level assessments to produce an overall assessment.

Red/Amber/Green reporting

- Following completion of assessment forms for all activities, the project manager uses these as a basis for evaluating the overall status of the project.
- Any critical activity classified as amber or red will require further consideration and often leads to a revision of the project schedule.
- Non-critical activities are likely to be considered as a problem if they are classified as red, especially if all their float is likely to be consumed.

Activity Assessment Sheet

Staff Justin

Ref: IoE/P/13 Activity: Code and test module C

Week number	13	14	15	16	17	18	
Activity summary	G	A	A	R			
Component							Comments
Screen handling procedures	G	A	A	G			
File update procedures	G	G	R	A			
Housekeeping procedures	G	G	G	A			
Compilation	G	G	G	R			
Test data runs	G	G	G	A			
Program documentation	G	G	A	R			

Sample traffic light assessment

Review

- From a manager's perspective, review of work products is an important mechanism for monitoring the progress of a project and ensuring the quality of the work products.
- Every project is developed through iterations over a large number of work products such as requirements document, design document, project plan document, code etc.
- Each of these work products can have a large number of defects in them due to mistakes committed by the development team members.

Review cont …

- It is necessary to eliminate as many defects in these work products to realize a product of acceptable quality.
- Testing is an effective defect removal mechanism.
- However, testing is applicable to only executable code.
- How can the defects from the non-executable work products such as requirements document and design document be removed?
- Review is a very effective technique to remove defects from all work products including code.

Review cont …

- In fact, review has been acknowledged to be more cost-effective in removing defects as compared to testing.
- Early review techniques focused on code and systematic review techniques were developed for this specific purpose.
- But over the years, review techniques have become extremely popular and have been generalized for use with other work products.

Utility of Review

- A cost-effective defect removal mechanism.
- Review usually helps to identify any deviation from standards including issues that might affect maintenance of the software.
- Reviewers suggest ways to improve the work product such as using algorithms that are more time or space efficient, specific work simplifications, better technology opportunities that can be exploited, etc.

Utility of Review cont …

- In addition to defect identification, a review meeting often provides learning opportunities to not only the author of a work product, but also the other participants of the review meeting.
  - The lessons acquired from a review meeting allows participants to avoid committing similar defects that were discussed in the review meeting and also allows them to make use of the best practices that were suggested.
- The review participants gain a good understanding of the work product under review, making it easier for them to interface or use the work product in their work.

Candidate work products for review

- All interim and final work products are usually candidates for review.
- Usually, the work products considered to be suitable candidates for review are as follows.
  - Requirements specification documents
  - User interface specification and design documents
  - Architectural, high-level, and detailed design documents
  - Test plan and the designed test cases
  - Project management plan and configuration management plan

Review Roles

- In every review meeting, a few key roles need to be assigned to the review team members.
- These roles are
  - Moderator
  - Recorder
  - Reviewer

Moderator

- Plays a key role in the review process.
- The principal responsibilities include
  - Scheduling and convening meetings
  - Distributing review materials
  - Leading and moderating the review sessions
  - Ensuring that the defects are tracked to closure.

Recorder

- The main role is to record
  - the defects found,
  - the time and
  - effort data

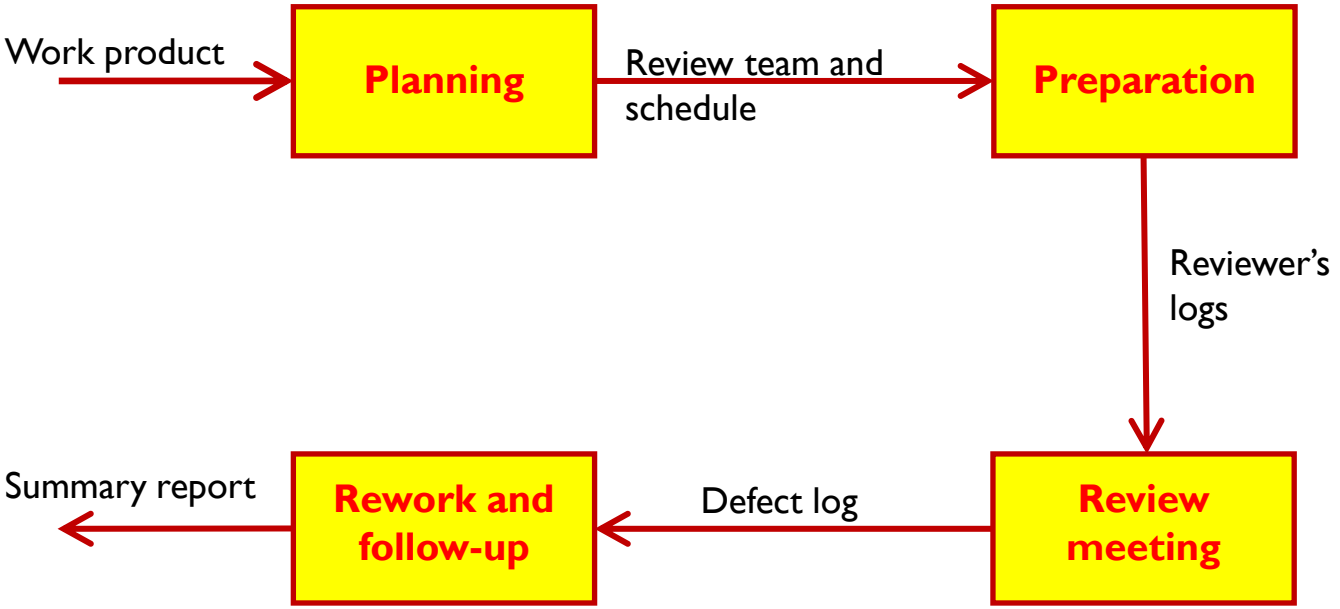
Reviewer

- The review team members
  - review the work product and
  - give specific suggestions to the author about the existing defects and
  - also point out ways to improve the work product.

Review Process

- Review of any work product consists of the following four important activities
  - Planning
  - Review preparation and overview
  - Review meeting
  - Rework and follow up

Review Process Model



Planning

- Once the author of the work product is ready for submitting the work for review; the project manager nominates a moderator.
- A moderator can be someone who is familiar with the work product.
- In consultation with the moderator, a project manager nominates the other members of the review team.
- Usually, the review process works best when the number of members is between five and seven.

Planning cont …

The effectiveness of review drastically reduces if there are less than three members. The review team is usually selected from the following types of project team members.

- The author of preceding work product based on which the work product under review was developed
- The member who would use the work product under review
- Peers of the author
- The authors of the work products that would interface with the work product under review

The moderator usually schedules all review meetings.

Preparation

- To initiate the review process, the moderator convenes a brief preparation meeting.
- In this meeting, copies of the work product are distributed to the review team members. The author presents a brief overview of the work product.
- The moderator highlights the objectives of the review.
- The reviewers then individually carry out review and record their observations in review logs.

Review meeting

- In this meeting the reviewer's give their comments based on the logs. The author responds to the comments.
- Other reviewers also participate in the discussion.
- The recorder scribes all the defects and points that the author agrees to and the review statistics in the form of a review log.

Rework

- The author addresses all the issues raised by the reviewers by carrying out necessary modifications to the work products and prepares a rejoinder.
- The corrected work product along with the rejoinder is circulated among all the review team members.
- In a final brief meeting, the review team members check whether all the issues scribed in the review log have been resolved satisfactorily.
- At the end of the meeting a final summary report is prepared.

Data collection

- The results of the review meetings should be properly recorded,
- The data about the time spent by the reviewers in the review activity must also be captured.
- A record of the defect data is needed for tracking defects in the project.

Data collection cont…

The different reports in which the review data are captured are as follows:

- Review Preparation Log (contains data about defects, their locations, their criticality, total time spent in doing the review)
- Review log (contains the defects that are agreed to by the author)
- Review summary report (summarizes of the review data and presents an overall picture of the review. Contains information regarding the total defects and the total time spent)

Review Process

- The model captures the sequence of the activities that need to be carried out, the input to the activities, and the output produced from the activities.

Summary

- Discussed the importance and need of project monitoring and control
- Explained the Project Control Cycle
- Presented the project reporting structures
- Explained how to assess the progress of a project

Summary

- Discussed how to collect the progress details of a project
- Explained Partial Completion Reporting method
- Presented how to carry out project review

References :

1. B. Hughes, M. Cotterell, R. Mall, *Software Project Management*, Sixth Edition, McGraw Hill Education (India) Pvt. Ltd., 2018.
2. J. Henry, *Software Project Management – A Real-World Guide to Success*, Pearson Education, 2004.
3. R. Mall, *Fundamentals of Software Engineering*, Fifth Edition, PHI Learning Pvt. Ltd., 2018.

Thank you