Chapter 9 and 10
Monitoring and control
&
Managing Contracts

Framework for Management and control

Objectives

☐ Once the project is started, attention must be focused on the following

- Monitor the progress of the projects
- Assess the risk of slippage
- Visualize and assess the state of a project
- Revise targets to correct or counteract drift
- Control changes to a project's requirements

Creating Framework

- Project control cycle
  - Starts when the initial project plan is published
  - Continuous process of monitoring the progress against the plan
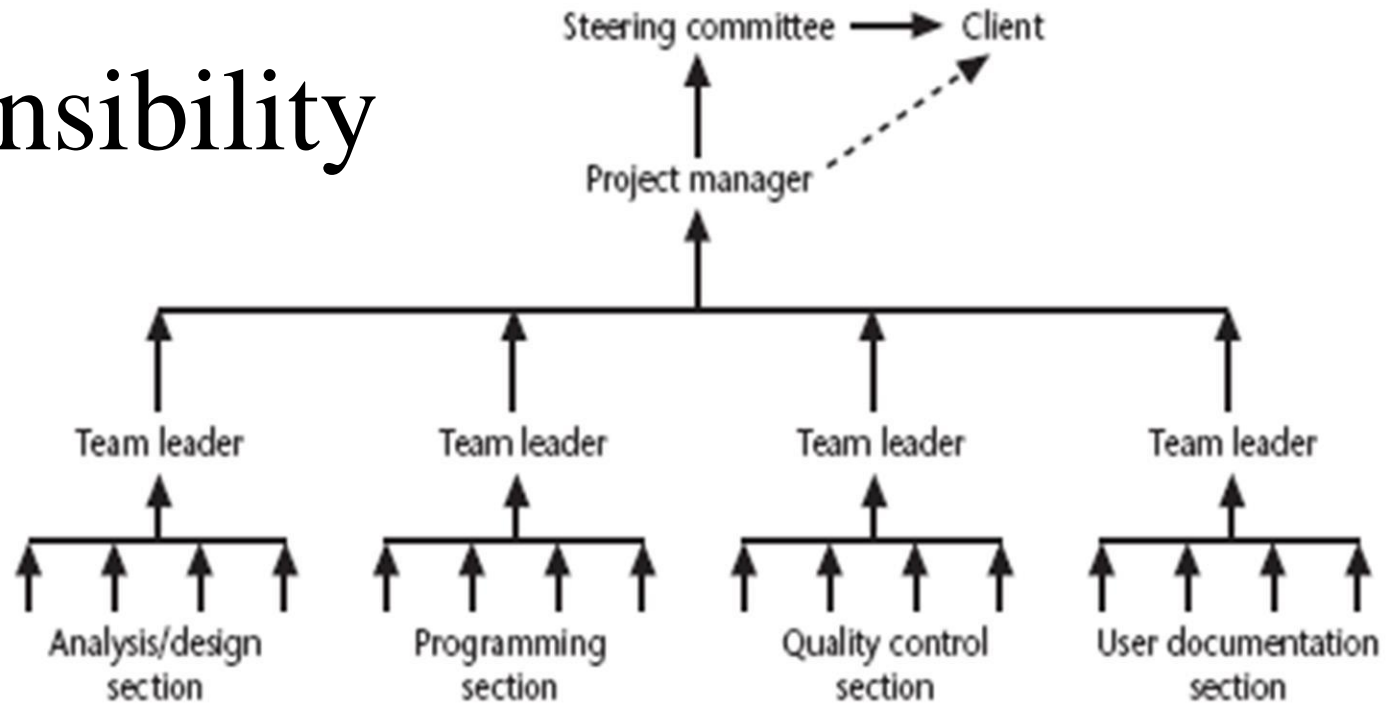 - Revising the plan takes place whenever necessary
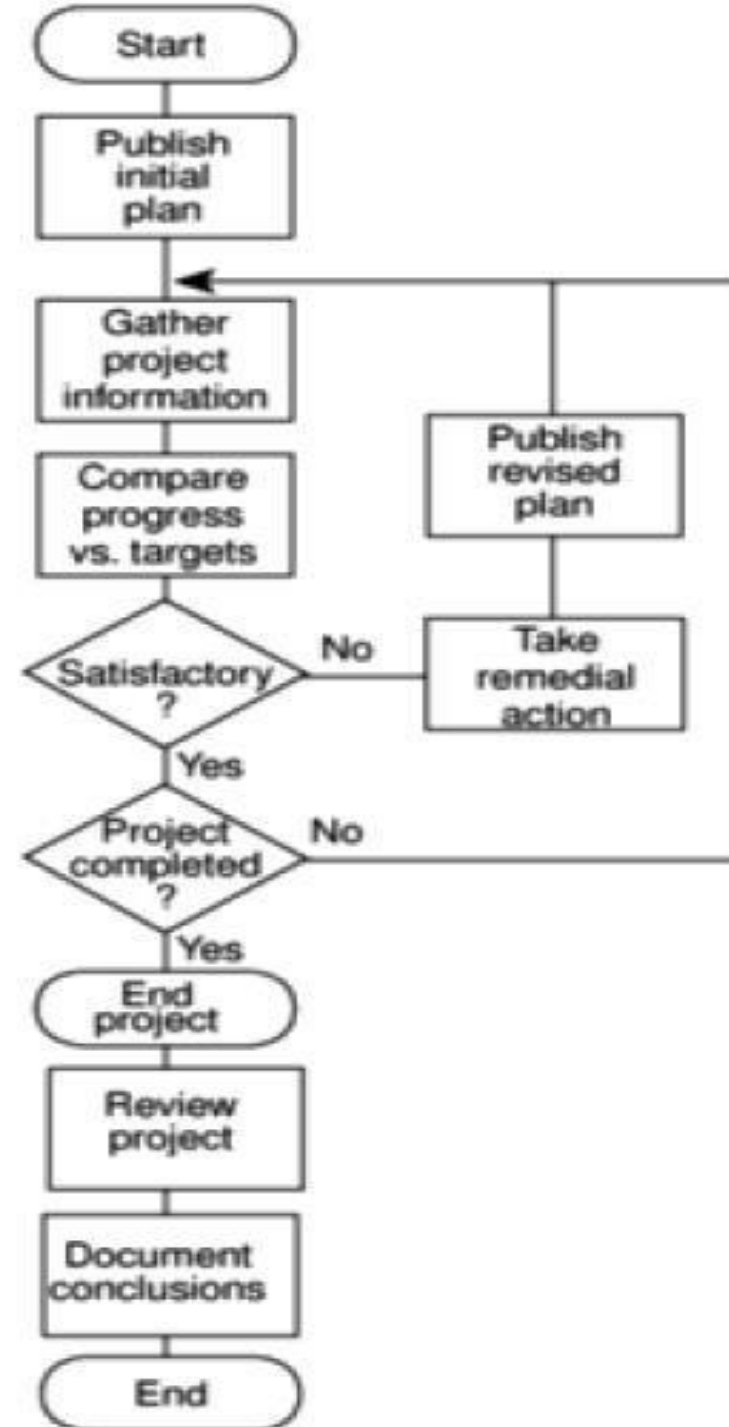
Four types of shortfalls

1. Delays in meeting the target dates
2. Shortfalls in quality
3. Inadequate functionality
4. Cost going over target

□ Focus is given more on 1 and 4
  ▫ Delays in meeting the target dates   and
  ▫ Cost going over target

Responsibility

Project reporting structure for medium and large projects

❑The overall responsibility for ensuring satisfactory progress on a project is often the role of
  ❑Project steering committee or
  ❑Project management board or
  ❑Project board

Categories of Reporting

☐Reporting may be oral or written, formal or informal and regular or ad hoc

Report type	Example	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

- Information used to assess project progress will be
  - Objective and tangible
  - Collected routinely or
  - Triggered by specific events
  - Dependent on the proportion of the current activity that has been completed

Setting check points

- It is essential to set a series of check points in the initial activity plan
- Check points may be
  - Regular(ex: monthly)
  - Tied to specific events (ex. Production of a report)

Taking snap shots

- Frequency of progress reports depends upon
  - The size of the project
  - The degree of the risk of the project
  - Ex : team leaders   - assess the progress daily

    Project managers – weekly or monthly assessment
  - Higher the level – the less frequent and less detailed report
- Review points or control points
  - Major or project level progress review generally takes place at a particular point during the life of a project

Collecting the data

- Generally long activities are broken down into controllable tasks(1 or 2 weeks)
- It is necessary to gather information about partially completed activities to forecast the work to be completed
- Partial completion reporting
  - Many organizations have their own templates for partial completion reports
    - Ex: weekly time sheets
  - Does not tell the project manager what has been produced and whether the tasks are on schedule

Weekly time sheet and progress review form

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

Red/Amber/Green (RAG) reporting

❑ Traffic light method is used to overcome the objections of partial completion reporting

❑ It consists of the following steps

❑ Identify key elements(first level)

❑ Break down into constituent elements(second level)

❑ Assess constituent elements on the scale:

   ❑ **Green** – 'on target'

   ❑ **Amber** – 'not on target but recoverable'

   ❑ **Red** – 'not on target and recoverable only with difficulty'

Red/Amber/Green (RAG) reporting

❑ Status of 'critical' tasks is particularly important

❑ Review all the second level assessments to arrive at first level assessments

❑ Review first and second level assessments to produce an overall assessment

❑ Any critical activity classified as Amber or Red will require further consideration and often leads to a revision of the project schedule

Review

☐ Review of work products is an important mechanism for

  ⧠ monitoring the progress of a project and

  ⧠ ensuring the quality of the work products

☐ Review is a very effective and cost effective technique to remove defects from all work products including code

Utility of review

- In addition to the cost effective defect removal mechanism, review has the following benefits
  - Identifies any deviations from standards
  - Obtains suggestions to improve the work products
  - Provides learning opportunities for the participants
  - Provides   good understanding of the work products for the review participants

Candidate work products for reviews

□ Usually work products are considered as candidates for reviews. They 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

⬚ Moderator

■ Plays a key role in the review meeting

■ Responsibilities

■ scheduling and convening meetings

■ distributing review materials

■ leading and moderating the review sessions and

■ ensuring that the defects are tracked to closure

Review roles

- Recorder
  - To record the defects found, the time, and effort data
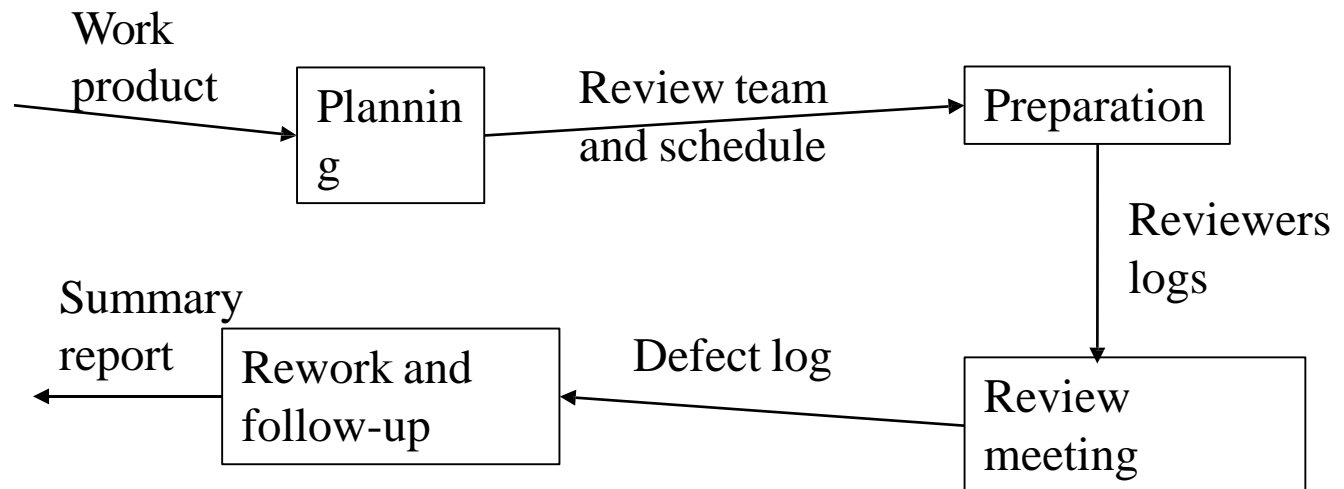- Reviewers
  - Review the work product
  - Gives specific suggestions to the author about the existing defects and
  - To point out ways to improve the work product

Review process

☐ Consists of four important activities

　▯ Planning

　▯ Review preparation and over view

　▯ Review meeting

　▯ Rework and follow-up

Review process model

Work product → Planning → Review team and schedule → Preparation → Reviewers logs → Review meeting → Defect log → Rework and follow-up → Summary report

Review process model

□ **Planning**

  - **Project manager nominates a moderator (someone who is familiar with the work product) and review team**

  - **Review process works best when the no. of team members is between 5 and 7. Moderator usually schedules all review meetings**

□ **Preparation**

  - **To initiate the process, the moderator convenes a brief preparation meeting.**

  - **In the meeting, copies of the work product are distributed to the reviewers. Author presents the 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 separate document called "review logs"**

Review process model (cont..)

- **Review meeting**
    - In the meeting, the reviewers give their comments based on the logs
    - The comments may be pertain to a : Defect, Work simplification & Maintainability
    - Moderator ensures that the discussion remains focused and productive. The recorder scribes all the defects and review statistics in the form of review log

- **Rework**
    - Author addresses all the issues raised by the reviewers   by carrying out the necessary modification and prepares a rejoinder to all the points scribed in the review log
    - Rejoinder is circulated among all the reviewers
    - In a final meeting the reviewers check whether all the issues have been resolved satisfactorily. At the end of the meeting, final summary report of the review is prepared

Data collection

- Data representing the results of the meetings is recorded.

- In addition to recording all the defects ,the data about the time spent by the reviewers in the review activity must also be captured.

- The different reports in which the review data are captured are as follows
  - Review Preparation Log
    - Each reviewer prepares a review preparation log
    - The different items recorded by the reviewer are
      - Data about the defects, their locations , their criticality and total time spent
  - Review Log : The defects which are agreed by the author are logged
    - The defect logs are crucial record since these help in tracking defects to closure
  - Review Summary Report : Summarizes the review data and presents the overall picture of the review
    - Contains information about total defects and the amount of time spent

Project Termination Review

- Project termination reviews are important for successful, failed as well as prematurely abandoned projects

- It marks the official closure of the project

- It provides important opportunities to learn from past mistakes as well as success

- Reasons for project termination before the natural closing date
  - Project is completed successfully and handed over to the customer
  - Incomplete requirements
  - Lack of resources
  - Some key technologies used in the project have become obsolete
  - Economics of the project has changed

Project termination process

- Project Survey
  - The objective is to collect various types of information pertaining to the project
  - An electronic survey is usually very effective
  - The information is collected through a set of questionnaire to bring out important process and management.
- Collection of Objective Information
  - A critical aspect of the review is to collect various project metrics. The metrics include cost, schedule & quality reviews
- Debriefing Meeting
  - This preparatory meeting helps to ensure the final review meeting focuses on the most relevant aspects
  - Only the seniors members of the team participate

Project termination process

- The meeting helps to obtain some direct feedback about the project from the senior members of the team

□ Final project review

- This meeting addresses various issues like
  - Project planning and tracking, preliminary phases, configuration management, verification and validation

□ Result publication

- Project leader summarizes the positive and negative findings as well as prescription for improvement
- Summary is published for necessary correction for future projects

Visualizing Progress

☐ After collecting the data about the progress of the project, a manager needs to present the data.

☐ Some methods of presenting the picture of a project and its future are

- Gantt chart
  - Essentially an activity bar chart indicating the scheduled activity dates and duration with activity floats

- Slip chart
  - Provides a more striking visual induction of the activities
  - The more the slip line bends, the greater the variation from the plan. Very jagged slip line indicates a need for rescheduling

- Timeline
  - A method of recording and displaying the way in which targets have changed throughout the duration of the project
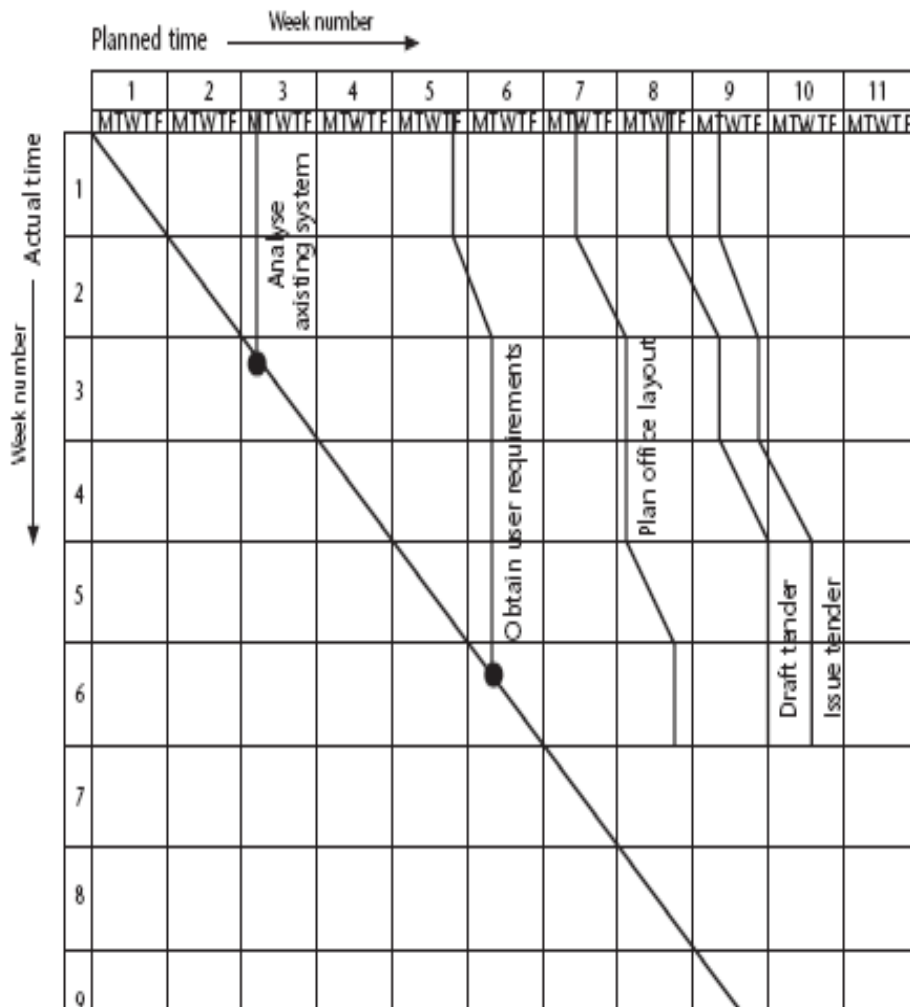
Gantt charts

Slip charts
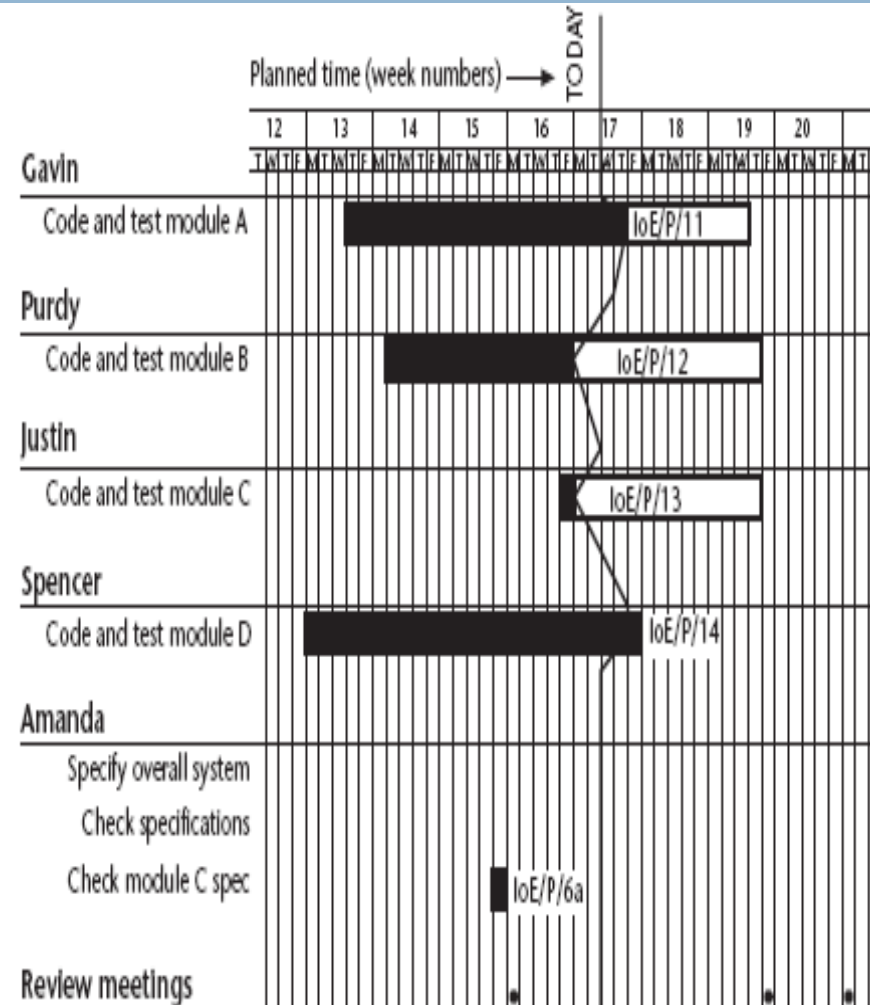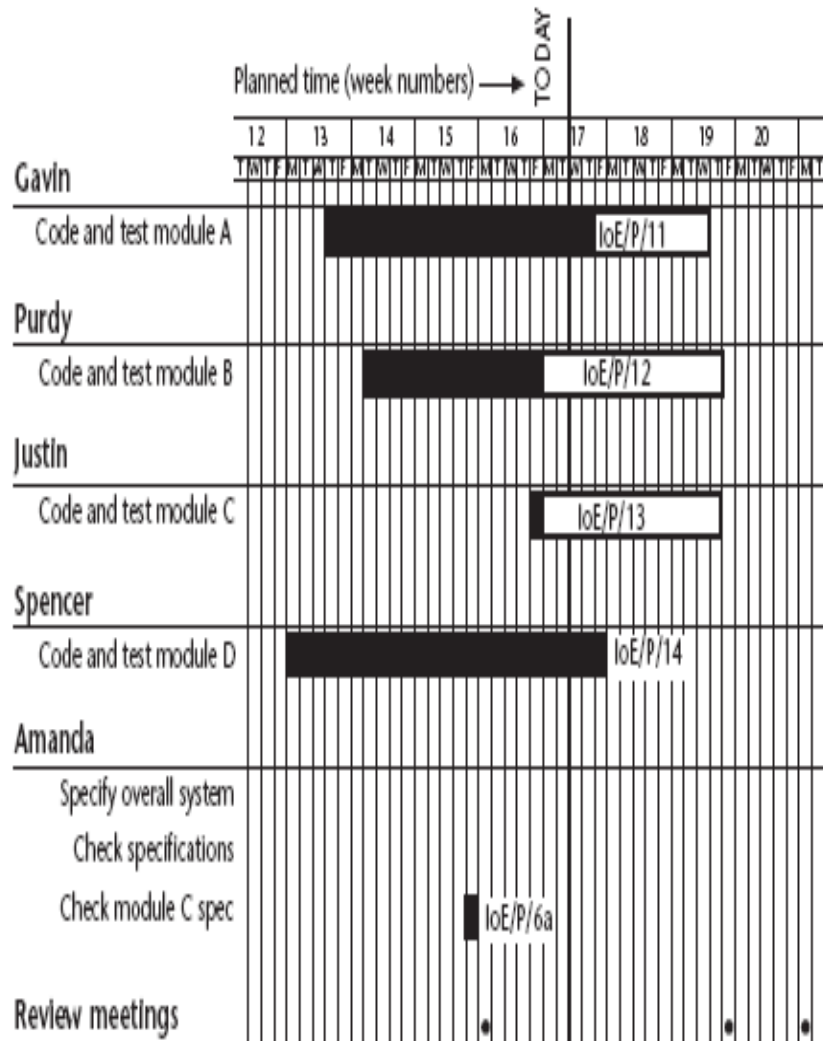
The timeline

Records the way targets have changed throughout the project

Cost monitoring

- A project could be late because the staff originally committed, have not been deployed

- In this case the project will be *behind time* but *under budget*

- A project could be *on time* but only because additional resources have been added and so by *over budget*

- Need to monitor both *achievements* and *costs*

Earned value analysis

- Planned value (PV) or Budgeted cost of work scheduled (BCWS) –
  - The assigned value
  - The original budgeted cost for the item
- Earned value (EV) or Budgeted cost of work performed (BCWP) –
  - The total value credited to a project at any point of time

Earned value – an example

- Tasks
  - Specify module   5 days
  - Code module   8 days
  - Test module   6 days

- At the beginning of day 20, Planned Value (PV) = 19 days
- If everything but testing completed, EV = 13 days
- Schedule variance = EV-PV i.e. 13-19 = -6
- Schedule performance indicator (SPI) = EV/PV
  i.e 13/19 = 0.68

Earned value analysis – actual cost

- Actual cost (AC) is also known as Actual cost of work performed (ACWP)
- In previous example, if
  - 'Specify module' actually took 3 days (planned 5 days)
  - 'Code module' actually took 4 days (planned 8 days)
- Actual cost = 7 days
- Cost variance (CV) = EV-AC   i.e. 13-7 = 6 days
- Cost performance indicator (CPI) = EV/AC   i.e 13/7 = 1.86
- Positive CV or CPI > 1.00 means project under budget or the work is completed better than planned

Common method of assigning Earned Value(EV)

☐ **The 0/100 technique**

  ▯ **A task is assigned a value zero until it is completed. On completion its value will be 100% of the budgeted value**

☐ **The 50/50 technique: At the starting 50% of the budgeted value. Upon completion 100% (remaining 50%)of the budgeted value**

☐ **The 75/25 technique: At the starting 75% of the budgeted value. Upon completion 25% of the budgeted value**

☐ **The Milestone technique**

  ▯ **Value is given based on the achievement of the milestones**

☐ **Percentage complete**

  ▯ **Value will be assigned based on the objective measurement of the work completion. 0/100 technique is preferred for software development**

Prioritizing Monitoring

Prioritizing is important to decide the level of monitoring

List of priorities

- Critical Path Activities
- Activities with no free float
- Activities with less than a specified float
- High risk activities
- Activities using critical resources

Getting project back to target

- When the project goes beyond the target, it is the responsibility of the project manager to ensure the scheduled project end date remains unaffected
- Renegotiate the deadline – if not possible then
  - Try to shorten activities on critical path e.g.
    - Work overtime
    - Re-allocate staff from less pressing work
    - Buy in more staff
  - Reconsider activity dependencies
    - Over-lap the activities so that the start of one activity does not have to wait for completion of another
    - Split activities

Change control

□ Requirements may change due to change in circumstances which may lead to adapt change control

□ The requirements being developed may be of many different versions

□ Final version

  ▫ Baseline as a foundation for the development of future products

□ Change control

  ▫ *Set of procedures to ensure that changes made only after a consideration of the full impacts.*

Typical change control process

1. One or more users might perceive the need for a change

2. User management decide that the change is valid and worthwhile and pass it to development management

3. A developer is assigned to assess the practicality and cost of making the change

4. Development management report back to user management on the cost of the change

5. User management decide whether to go ahead

6. One or more developers are authorized to make copies of components to be modified

7. Copies are modified after initial testing; a test version might be released to users for acceptance testing

8. When users are satisfied, then operational release is authorized

Software Configuration Management(SCM)

❑SCM is concerned with tracking and controlling changes to the software

❑In software development process, every work product would have to be accessed and modified by several members

❑Hence a proper configuration management system is required to avoid several problems

Purpose of SCM

- Problems that may occur if a proper SCM is not used
  - Concurrent access
  - Undoing changes
  - System accounting
  - Handling variance
  - Accurate determination of project status
  - Preventing unauthorized access to the work products

Configuration management process

- Configuration management is carried out through the following two principle activities
- Configuration identification
  - It involves deciding which parts of the system should be kept under configuration management
- Configuration control
  - It is used to ensure that changes to a system occur smoothly

Modification to a work product under configuration control

- When a developer needs to change a work product, they make a reserve request

- After the successful execution of reserved commands, a private copy of the work product is created in the local directory along with the changes

- The changes made need to be restored in configuration management repository

- Restoring the changed work product requires the permission of a Change Control Board(CCB)

- CCB is usually constituted among the development team members

Change Control Board(CCB)

- CCB reviews the changes made to the work product certifies certain aspects about the change such as
  - Change is well motivated
  - Developer has considered and documented the effects of the change
  - Changes interact well with the changes made by other developers
  - Appropriate people (CCB) have validated the change
- Incompletely modified or improperly modified work products cannot be updated in the configuration

Open source configuration tools

- SCCS (Source Code Control System) and RCS (Revision Control System)
- are two popular configuration management tools available on most UNIX systems
- They are used for controlling and managing different versions of text files
- They do not handle binary files
- They provide an efficient way of storing versions that minimize the amount of occupied disk space.
- The change control facilities provides by these tools are
  - The ability to incorporate restrictions on set of individuals who can create new versions and facilities for checking components in and out

Contract Management

Definition: Contract management or contract administration is the management of contracts made with customers, vendors, partners, or employees.

Types of contract

Acquiring software from external supplier could be done via: (one way of classification)

- a *bespoke system* - created specially for the customer
- *off-the-shelf* - bought 'as it is'
- *customized off-the-shelf* (COTS) - a core system is customized to meet needs of a particular customer

Types of contract (based on payment)

❑ Fixed price contracts

❑ Time and materials contracts

❑ Fixed price per delivered unit

Fixed price contracts

❑ **Advantages to customer**:

❑ known expenditure

❑ supplier motivated to be cost-effective

❑ **Disadvantages**:

❑ supplier will increase price to meet contingencies

❑ difficult to modify requirements

❑ upward pressure on the cost of changes

❑ threat to system quality

Time and materials

Advantages to customer:

- easy to change requirements
- lack of price pressure can assist product quality

Disadvantages:

- Customer liability - the customer absorbs all the risk associated with poorly defined or changing requirements
- Lack of incentive for supplier to be cost-effective

Fixed price per unit delivered

FP count	Design cost/FP	implement-ation cost/FP	total cost/FP
U pto 2,000	$242	$725	$967
2,001-2,500	$255	$764	$1,019
2,501-3,000	$265	$793	$1,058
3,001-3,500	$274	$820	$1,094
3,501-4,000	$284	$850	$1,134

Fixed price/unit example

- Estimated system size 2,600 FPs
- Price
  - 2000 FPs x $967 *plus*
  - 500 FPs x $1,019 *plus*
  - 100 FPs x $1,058
  - i.e. $2,549,300
- What would be charge for 3,200 FPs?

Fixed price/unit

Advantages for customer

☐ customer understanding of how price is calculated

☐ comparability between different pricing schedules

☐ emerging functionality can be accounted for

☐ supplier incentive to be cost-effective

Disadvantages

☐ difficulties with software size measurement - may need independent FP counter

☐ changing (as opposed to new) requirements: how do you charge?

# The tendering process

- Open tendering
  - any supplier can bid in response to the *invitation to tender*
  - all tenders must be evaluated in the same way
  - government bodies may have to do this by local/international law
- Restricted tendering process
  - bids only from those specifically invited
  - can reduce suppliers being considered at any stage
- Negotiated procedure
  - negotiate with one supplier e.g. for extensions to software already supplied

Stages in contract placement

requirements analysis

evaluation plan

invitation to tender

evaluation of proposals
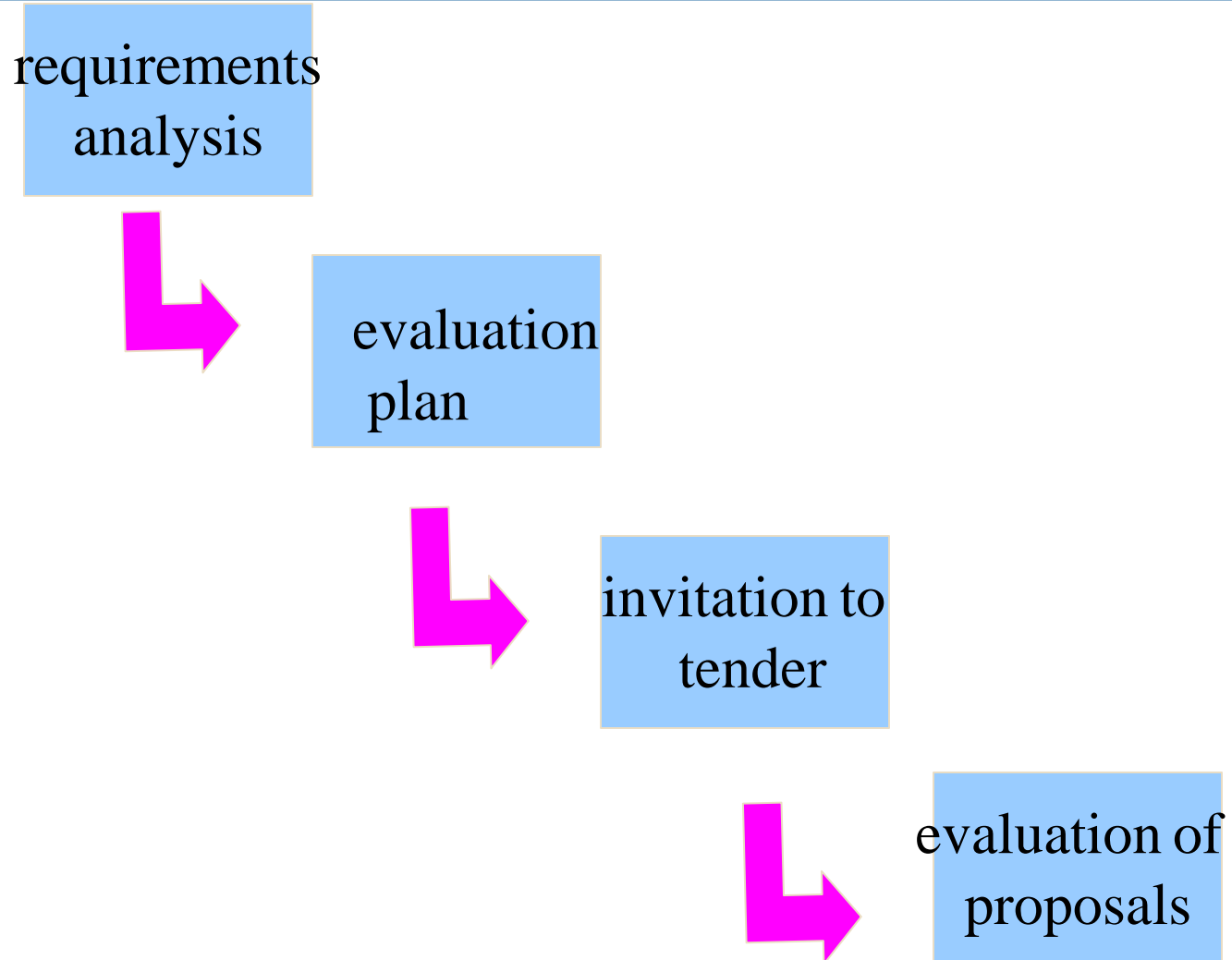
Requirements document

- Introduction
- Description of existing system and current environment
- Future strategy or plans
- System requirements - mandatory/desirable features
- Deadlines
  - Functions in software, with necessary inputs and outputs
  - Standards to be adhered to
  - Other applications with which software is to be compatible
  - Quality requirements e.G. Response times
- Additional information required from bidders

Evaluation plan

☐ How are proposals to be evaluated?

☐ Methods could include:

- reading proposals

- interviews

- demonstrations

- site visits

- practical tests

Evaluation plan - contd.

- Need to assess value for money for each desirable feature
- Example:
    - feeder file saves data input
    - 4 hours a month saved
    - cost of data entry at RM20 an hour
    - system to be used for 4 years
    - if cost of feature RM1000, would it be worth it?

Invitation to tender (ITT)

- Note that bidder is making an *offer* in response to ITT

- *acceptance* of offer creates a *contract*

- Customer may need further information

- Problem of different technical solutions to the same problem

Memoranda of agreement (MoA)

- Customer asks for technical proposals

- Technical proposals are examined and discussed

- Agreed technical solution in MoA

- Tenders are then requested from suppliers based in MoA

- Tenders judged on price

- Fee could be paid for technical proposals by customer

Evaluation of proposals

- Check the document that it contains all requirements
- Interviewing suppliers
- Demonstrations
- Site visits
- Practical tests

Typical terms of a contract

- Definition-Form of agreement-lease, license, Sale
- Goods and services to be supplied
- Ownership of software
- Environment
- Acceptance Standards
- Time table
- Price and payment method
- Legal requirements

Acceptance

❑ When work is completed, customer needs to carry out acceptance testing.

❑ Contract may put a time limit to acceptance testing – customer must perform testing bf time expired.

❑ Part or all payment to the supplier should depend on acceptance testing

Contract Management-STEPS

- There must be communication between supplier and customer while the contracted work is carried out.

- This interaction leads to changes which vary the terms of contract.

- When the contract is negotiated, certain points in project may be identified where customer approval is needed.

- Example :a project to develop the large system could be divided into increments ,for each increment there is interface design phase, customer has to approve the interface first

- For each decision point, the deliverable to be presented by suppliers.

- Most changes to requirement may emerge .This vary the contract terms.

Acceptance

- When the work is completed, customer needs to tack action to carry out acceptance testing.

- The contract may put a time limit on how long acceptance testing can take.