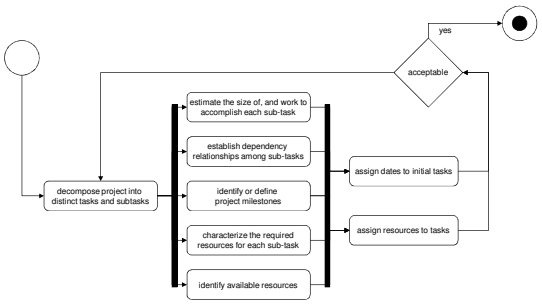
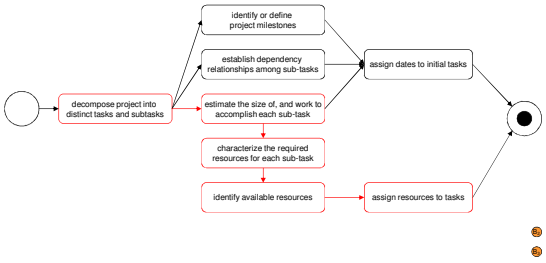
Agenda

- Project Scheduling
  - task dependency (PERT) analysis/charts
  - staffing levels (PNR curves)
  - time lines (Gantt Charts)
- Project Status Tracking
  - Milestones
  - Earned Value Analysis
  - Scrum points and velocity
- Causes of Slippage and Failure

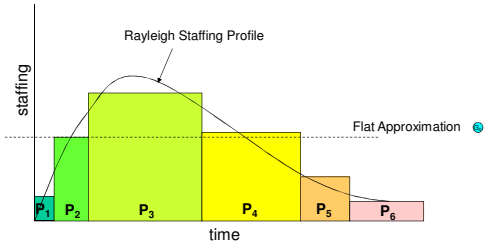
Project Scheduling



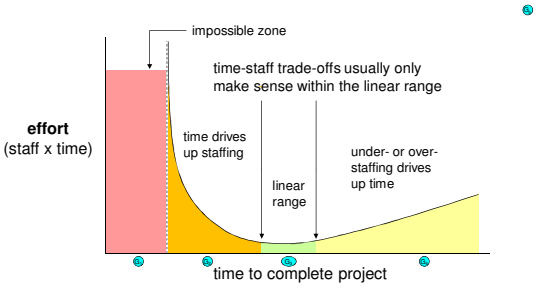
Dependencies (PERT charts)



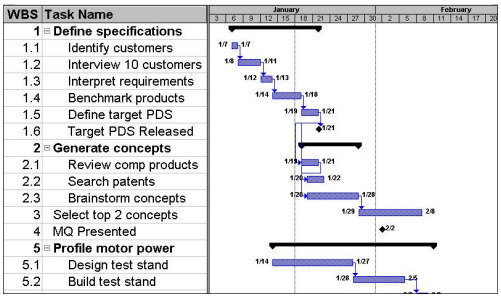
Rayleigh Staffing Profile Curve



PNR Effort/Time Curve
(there is an optimal size and time)

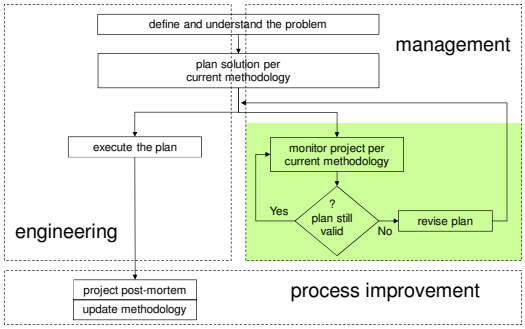


Timelines (Gantt charts)



WBS	Task Name
1	**Define specifications**
1.1	Identify customers
1.2	Interview 10 customers
1.3	Interpret requirements
1.4	Benchmark products
1.5	Define target PDS
1.6	Target PDS Released
2	**Generate concepts**
2.1	Review comp products
2.2	Search patents
2.3	Brainstorm concepts
3	Select top 2 concepts
4	MQ Presented
5	**Profile motor power**
5.1	Design test stand
5.2	Build test stand

Project Management 1A



Project Status Tracking

- what is each person doing
  - what tasks are they have recently finished
  - what tasks they expect to complete next
  - what obstacles they are encountering
- how is project progressing
  - are resources allocated according to plan
  - is progress proceeding according to plan
  - does someone need a little help
  - does the plan need to be revised
    - changes in problem, resources, approach

Project Milestones

- Specific and Measurable
  - an objectively ascertainable moment
  - avoid subjective assessments
- Relevant measures of project progress
  - goals achieved, work completed
  - not merely hours of work done
- Timely (relatively closely spaced)
  - enable fine-grained progress tracking
  - accurate assessment of work state and rate

A Typical Status Discussion

mgr: *Where are we on the app-server?*
engr: I'm about 80% done.
mgr: *You've been 80% done for six weeks!*
engr: The first ¾ was easy.
All the hard stuff is in the last ¼!

Q: How does a project get to be a year late?
A: One day at a time.

Fred Brooks, The Mythical Man-Month

Quantifying Progress

- task completions are obvious milestones
  - **specific**, **measurable**, **achievable**, **relevant**
- they may be poor measures of progress
  - not usually evenly spaced measures of work
  - may be too large for fine grained tracking
- we need a different kind of measure
  - to enable fine grained (e.g. daily) tracking
  - to enable meaningful schedule tracking
  - to enable meaningful budget tracking

Earned Value Analysis

- construction size and effort estimates
  - yield an expected cost for each sub-task
  - this is the budgeted value of that sub-task
- the Earned Value of an effort
  - is the value of all the tasks **completed** so far
    - or … ¼ earned at start, ¾ earned at completion
    - or … partial value for progress (e.g. tests passed)
- Tracking Earned Value enables us to
  - assess project completion and speed
  - meaningfully assess cost-performance

Tracking with Earned Value

Comparing Earned Value with Planned value enables us to determine …

(a) what fraction of the project is complete

(b) whether or not the work is on schedule.

Figure 2

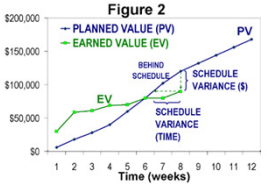
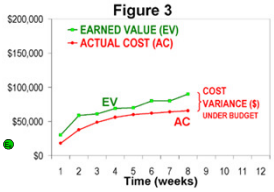


Figure 3



Comparing Earned Value with Actual Cost enables us to

(a) determine whether or not we are within budget (on the work completed so-far).

(b) estimate the cost to completion, based on the performance so-far.

Scrum Points

- relatively easy to estimate
  - developer-convenient unit: "best-case days"
  - less misleading and arbitrary than "dollars"
  - small task estimation is easy and accurate
- excellent progress tracking
  - small tasks enable fine-grained tracking
  - a more linear measure of progress
- well correlated to product progress
  - only accepted features earn points

Scrum Velocity

- self-calibrating measure, corrects for:
  - productivity, bugs, competing priorities
  - systematic estimation error
- uncertainty is recognized and quantified
  - consistency of recent velocity measurements
  - convergence of backlog grooming/estimates
- enables better projections of completion
  - replaces optimistic promises with extrapolations
- enables better management
  - highlights backlog, productivity, distractions
  - makes product owner a partner in development

Common Causes of Slippage

- poor or unstable requirements
- unrealistic schedules (poor estimates)
- "Scope Creep" (continuing input)
- unanticipated construction problems
- unanticipated quality problems
- unanticipated integration problems
- external dependency issues
- unplanned distractions

Why Projects Fail

Rank	Challenged	Failure
1	Lack of user input	Incomplete requirements
2	Incomplete requirements/specs	Lack of user involvement
3	Changing requirements/specs	Lack of resources
4	Lack of executive support	Unrealistic expectations
5	Technological incompetence	Lack of executive support
6	Lack of resources	Changing requirements/specs
7	Unrealistic expectations	Lack of Planning
8	Unclear objectives	Didn't need it any longer
9	Unrealistic time frames	Lack of IT management
10	New technology	Technological illiteracy

Requirements 30% **Planning 25%** **Management 20%** **Technological 7%**