Software Project Planning

CITS1220 Software Engineering
Lecture Overview

- Problems for SW Project Planning
- Planning Terms
- Work Breakdown
- Dependencies
- Schedule
- Tracking
Planning SW Projects

- Your boss: “How long will this take?”
- You: “Between 1 and 6 months.”

- People are not happy when you respond that way.
  - You figure out that finishing anytime before six months will meet your promise.
  - Your boss figures that with some hard work you can be done in a month!

- In reality, you don’t have the slightest clue how long it will take, because you don’t know the work to be done.
SW Planning Solution

- Use divide and conquer
  - To give a good answer you have to break the work down into activities for which you can get good timing estimates
  - From these estimates you compute the estimated project duration
Activities to obtain good time estimates

- Identify the work that needs to be done
  - Work breakdown structure (WBS)
- Identify the dependency between work units
  - Dependency Graph
- Estimate the duration of the work to be done
  - Schedule
Project Management Terms (you should know)

- Tasks
  - activities which must be completed to achieve the project goal

- Milestones
  - important checkpoints

- Deliverables
  - milestones with an external output
More terms

- **Work Breakdown Structure (WBS):** Set of activities to do
- **Dependency Graph:** Identification of dependency relationships between activities identified in the WBS
- **Schedule:** Dependency graph decorated with time estimates for each activity
- **PERT:** One of the first techniques proposed to analyse complex dependency graphs and schedules
- **Gantt Chart:** Notation used to visualize schedule
Work Breakdown Structure

- A “to-do” list, sorted by category
- Task description (what)
- Estimated time (length)
- Person responsible for task (who)
- Resources required
- Cost ($)
3 Steps to a SW Project Plan

- Step 1: Identify Tasks & Resources
- Step 2: Identify Milestones
- Step 3: Analyse Dependencies and Define Schedule with a Gantt or Pert Chart
Initial Plan, Tasks & Resources

- Tedious and hard......but must be done
- What ==> tasks
- When ==> schedule
- How ==> people, materials, equipment costs
- Set scope and avoid "scope creep"
Identifying Tasks & Resources

- State each task using "verb-noun" form
  - *Examples*: Write manual; Implement Prototype; Review requirements with client
- Use appropriate level of detail
- *Function*, not *form*, known at start of project
  - Example: "Build concept demonstration prototype"
- Make each task significant
  - e.g. "Identify competitive products" not "Go to library"

*Defining tasks is hard but worthwhile!*
Identifying Milestones

- Milestones are key targets for *completion* of certain phases of a project
  - Provide tangible interim goals
  - Demonstrate progress and so provide motivation
  - Used to enforce schedule

- A milestone requires both the *state of the task/phase* and a *date/time* to be set.

- State each milestone in "noun-verb" form
  
  *Examples*: Mission stated; Mid-quarter review presented; Prototype completed
Example Milestones

- Group plan agreed
- Lego NXT prototype complete
- Requirements specifications completed
- NXT sensor tests complete
- Systems documentation completed
- Test data sets completed
- User prepared test data has been run
- User manuals completed
- Client acceptance tests run and approved
- Post-implementation review completed
Identify Dependencies

- Organise the tasks in a hierarchy of tasks and sub-tasks
  - Finding this organization involves categorization and refinement (so do after, not during brainstorming)
- Identify dependencies between tasks
  - Show these in a dependency graph
    - Nodes are activities
    - Lines represent temporal dependencies
Prepare Report

1.0 Prepare draft report
2.0 Review draft report
3.0 Prepare final report
   3.1 Write final report
   3.2 Print final report

Org-Chart Format

Outline Format

Bubble Format
Scheduling and Tracking

- **Scheduling** is the process of deciding:
  - In what sequence a set of activities will be performed.
  - When they should start and be completed.
- **Tracking** is the process of determining how well you are sticking to the cost estimate and schedule.
Scheduling with GANTT charts

- Best basic scheduling tool for tracking progress
- Developed in 1917 by Henry L. Gantt
- Pick appropriate time scale (days/wks)
- Decide who is responsible for each task
- Good software (e.g. MS Project) is available.
- GANTT charts *don’t* show dependencies between tasks explicitly
Figure 1: Gantt Chart

Source http://searchcio.techtarget.com/
Gantt Chart components

- horizontal axis = total time span of the project
- vertical axis = project tasks
- horizontal bars = sequences, timing, and time span for each task
- bar spans (tasks) may overlap
- secondary bars, arrowheads, or darkened bars added as project progresses to indicate completed tasks
- vertical line = report date
RISK

Potential points of failure. Most risks or potential failures can be overcome or resolved, given enough time and resources.
Heuristic: Identifying Risk

- When you identify activities for a work breakdown structure, you can also identify the risks in your project.
- Risks are usually associated with “unknown information”.
- Unknown information comes in two flavors
  - A known unknown: *Information that you don’t have but someone else does.*
    - Find out who has the information and determine what the information is. (Interviews, Phone calls, tasks analysis)
  - An unknown unknown: *Information that you don’t have because it does not yet exist.*
    - Develop contingency plans for each of these risks.
    - These contingency plans need be followed when you find out the information does not exist.
- Write these risks down
Risk Management Examples

- Risk: The project is falling behind schedule.
  - Contingency Plan?
  - Review plan and revise priorities and times as needed.

- Risk: Sub-team 1 cannot provide functions needed by sub-team 2.
  - Contingency Plan?
  - Both teams get together to solve this problem, possibly reassigning effort

- Risk: The Lego NXT sensors or motors don’t provide the functionality you need.
  - Contingency Plan?
  - Test feasibility of your plans for sensor and motors at the start of the project.
Exercise

- Brainstorm a SW project plan for the group Lego project
- Start with work breakdown structure
- And then move to a schedule
- You have 6 people to assign to different tasks
- You only have 4 weeks to complete the project