Lecture 4: Planning

Administrative

• Submit team formation survey today!
  o Either someone on your group submits "complete and partial teams"
  o OR you submit "ungrouped individuals"
• Schedule a meeting with your client
  o See Canvas homepage for course staff appointments
• Project plan (today's topic) due Fri, Feb 11

Objectives

1. Assess project feasibility
   • Estimation
   • Scheduling
   • Risk
2. Produce a project plan

Should you commit to a project?

• Before committing, conduct a study to inform a go/no-go decision
• Result may be a proposal or lead to a budget request

Feasibility studies are difficult

• Must grapple with uncertainty
  o Unclear scope
  o Uncertain or hard-to-quantify benefits
  o Rough estimates of resource requirements and timetable
  o Technical approach may not pan out
  o Organizational changes may be required
  o Opportunity costs
• Rely on judgement of experienced people
  o Early mistakes are the most costly
• Need to advocate to build support
Example: US government agency

Poll: Which methodology is most appropriate for a large, complex project with incomplete requirements?

Things to consider in a feasibility study

- Scope
- Approach
- Methodology
- Resources
- Schedule
- Risks
- Alternatives

Scope clarification

- Define the boundaries of the system
  - List of included features
  - List of excluded features
  - List of dependencies
  - List of current systems being replaced
- Confusion over scope often leads to client dissatisfaction
- Should also review existing systems (including competitors’)

Technical approach

- Proposed system must be technically feasible
  - Estimates of scale (number of users, volume of data, rate of transactions)
  - Identify features that require research (no standard solution) or new team expertise (domain-specific knowledge, advanced techniques)
- Analyze a viable design to estimate resources, schedule
Tentative system architecture (data storage, UI context, deployment infra)
- Approach used by final product may be very different

Estimation

Essential skill for efficient planning

Breakout: Fermi problems
Tip: first identify dimensions of answer (dimensional analysis)
- What is the sustained half-duplex bandwidth between Ithaca and NY Tech of a UPS truck full of hard drives?
- How many Raspberry Pi computers would be required to serve as a distributed cache for a global reverse phone book?

Estimation for scheduling
- Estimating task duration is very difficult, but can be improved with feedback
  - Estimate effort of task before starting
  - Keep a log of time spent on each task (design, documentation, implementation, testing, review)
  - Compare log to estimate when closing out tasks
  - Keep a log of time spent on other aspects of project (meetings, training, reports, reviews)
- Do not evaluate effort until task is 100% complete
  - Large gap between "almost done" and "done"
    - Documentation
    - Tests
    - Cleanup
    - Review
  - Beware Parkinson's Law: "Work expands to fill the time available"
- Don't neglect startup time
Agile velocity

Dartmouth example: projects consistently took 30-40% longer even when requirements were well understood.

- Additional tasks discovered
- Some tasks must be iterated
- Personnel have other commitments
- Schedule conflicts

Decouple effort from time

- Estimate effort required for task in relative units (e.g. "story points")
- Tally the effort units completed by the whole team in one sprint: velocity
- Use velocity to select appropriate number of tasks for future sprints; forecast milestones accordingly

Milestones and deliverables

Deliverable

- Work product provided to the client
  - Mock-up
  - Demonstration
  - Prototype
  - Report
  - Presentation
  - Documentation
  - Code
- Release of a system or subsystem to customers and users

Milestone

- Completion of a predetermined set of activities
  - Delivery of a deliverable
  - Completion of a process step
  - End of a sprint
  - Reaching a testing target
- An internal goalpost, useful for monitoring progress against the schedule
- Provides visibility

Outline plan
- Your first report requires an outline plan
  - Preliminary timetable
  - Process steps (or sprints)
  - Milestones (including deliverables)
  - Decision points
  - Interactions with and dependencies on external parties
- Plan should be reviewed, refined, revised regularly

Scheduling activities
Inputs:
- Duration
- Dependencies
- Resources

Activity networks
Critical path analysis

Gantt charts

Risk management
- Identify risks
  - Brainstorm what could go wrong
- Analyze risks
  - Determine likelihood and consequence
  - Prioritize based on "risk"
• Plan
  o Avoidance: reduce likelihood
  o Mitigation: reduce consequence
  o Contingency: "Plan B"

• Monitor
  o Update risks regularly

CS 5150 project plans
• Feasibility studies and project plans should be written
  o Well-written, well-presented – review entire document
  o Short enough that everybody reads it
  o Long enough that no important topics are skipped
  o A report that is not read and understood is not useful

• Keep in mind:
  o Team availability, team skills
  o Time constraints
  o Equipment and software
  o Start-up time
  o Client availability
  o Scope (not vague, not too ambitious)