Capstone Design

Engineering Project Management Tools and Effective Teaming

Scope of Engineering Project Management Tools

- Basic purpose:
  - Assign and manage project resources
  - Simplify management of complex projects
- Example resources
  - People
  - Time
  - Money
  - Other resources (software, hardware, etc.)
Project management software

- Covers many types of software, including:
  - Scheduling
  - Cost control and budget management
  - Resource allocation
  - Collaboration software
  - Communication
  - Quality management
  - Documentation or administration systems
- Used to deal with the complexity of large projects

Tasks of project management software

- Scheduling
  - One of the most common tasks is to schedule a series of events
  - The complexity of this task can vary considerably depending on how the tool is used
  - Some common challenges include:
    - Events which depend on one another in different ways or dependencies
    - Scheduling people to work on, and resources required by, the various tasks commonly termed resource scheduling
    - Dealing with uncertainties in the estimates of the duration of each task
    - Arranging tasks to meet various deadlines
    - Juggling multiple projects simultaneously to meet a variety of requirements
Tasks of project management software

• **Calculating critical path**
  – In many complex schedules, there will be a critical path, or series of events that depend on each other, and whose durations directly determine the length of the whole project
  – Some software applications can highlight these tasks, which are often a good candidate for any optimization effort
    • What task(s) should I focus on to improve the overall process the most?

• **Providing information**
  – Project planning software needs to provide a lot of information to various people, to justify the time spent using it
  – Typical requirements might include:
    • Tasks lists for people, and allocation schedules for resources
    • Overview information on how long tasks will take to complete
    • Early warning of any risks to the project
    • Information on workload
    • Historical information on how projects have progressed, and in particular, how actual and planned performance are related
Approaches to project management software

- **Desktop**
  - Most responsive and graphically-intense style of interface
  - May have the ability to collaborate with other users or store data in a central database
  - Can be shared between users if it's on a networked drive
- **Web-based**
  - Can be accessed from any type of computer without installing software
  - Naturally multi-user
  - Only one software version and installation to maintain
- **Personal/Single user**
- **Collaborative**
  - Support multiple users modifying different sections of the plan at once
- **Integrated**
  - Combines project management or project planning, with other company needs
  - Projects can have bug tracking issues assigned to each project
  - List of project customers becomes a customer relationship management module
  - Each person has their own task lists, calendars, etc. associated with their projects

Applications of Project Management Software

- **Project management**
  - Overall project requirements, tasks, timelines, etc.
- **Collaborative software**
  - Useful when multiple people work (simultaneously) on a project
  - “Google Groups” used by some teams successfully in the past
- **Issue tracking system**
  - Locating/documenting problems in a design
- **Version control software**
  - Useful in tracking changes in project components (software especially) where a collaborative system is used for the project
Problems/Concerns with Project Management Software

- Focuses on the planning phase
  - Not enough functionality for project tracking, control and plan-adjustment
- No clear distinction between the planning phase and post planning phase
  - Leads to confusion when the software does not behave as expected
- Offer complicated features to meet needs of management professionals
  - Must be understood in order to effectively use the product
  - Learning curve
- May achieve better results using simpler technique
  - Pen and paper
- Not useful if only a single small project is involved
  - Incurs a larger time-overhead than is worthwhile
- Possible excessive dependency on first paper print-out of a project plan

Requirements for projects in this course

- Implement some type of version control system for hardware/software developed
  - May be a simple as required documentation of changes made to code at the beginning of a file (or a separate change log)
    - Should include name and date/time and a brief summary of changes made/features added
  - More elaborate schemes possible, but likely not necessary due to the limited scope of the project
- Use of Microsoft Project to manage project tasks, timelines, milestones, etc.
Teams

- A structure for solving a problem by a group effort
  - Useful when problems are too difficult
    - Too difficult for an individual
  - Useful when problems are multi-perspective
    - Too many points of view for an individual
- Teaming is a tool
  - When used correctly -- good results
  - When used incorrectly -- bad results

Team Roles -- One Version

- Leader
  - Guides the team through the problem solving process
  - Prepares for each meeting
  - Provides structure and guidance to allow maximum participation
- Recorder
  - Writes down all the ideas and material generated during the meeting
  - Maintains and distributes written material
Team Roles -- One Version – Cont.

• **Encourager**
  – Makes sure that everyone gets positive recognition for contributions

• **Gatekeeper**
  – Make sure that all members are participating

• **Devil’s Advocate**
  – Makes sure that opposing ideas are brought up and discussed

• **Timer**
  – Makes sure that team stays on time budget for various tasks

Team Roles – For 3 and 4 member teams

• **Coordinator**
  – Guides the team, prepares for meetings, provides structure, strives for consensus

• **Recorder**
  – Writes down the ideas, maintain and distributes written material

• **Gatekeeper**
  – Keeps the team on the subject

• **Timer**
  – Makes sure the team stays on schedule

• **With 3 members combine gatekeeper & timer**
Stages Of Team Development

- **Forming**
  - Tentative interactions, concern over ambiguity, self-disclosure

- **Storming**
  - Criticism of ideas, poor attendance, hostility, polarization, coalition forming

- **Norming**
  - Agreement on procedures, reduction in role ambiguity, increased “we-feeling”

- **Performing**
  - Decision making, problem solving, mutual cooperation

Team Members Responsibilities

- **Invest appropriate time in project**
- **Commit to the project and stay fully involved**
- **Participate equally in**
  - Defining problems
  - Investigating problems
  - Defining solutions
  - Documenting solutions
Strategies For Team Operation

- Assign team roles
  - Follow through on responsibilities
  - Rotate roles
- Be a good listener
- Be positive, supportive, & cooperative
  - Limit critical or negative comments
- Be brief and concise in discussions
  - Avoid lengthy comments and stories
- Stay focused

Listening Skills

- Stop talking
  - Engage in one conversation at a time
  - Empathize with the person speaking
- Ask questions
  - Don’t interrupt
- Show interest
- Concentrate on what’s being said
  - Don’t jump to conclusions
  - Control anger
  - Listen for what is not said -- ask questions
- React to ideas and not to the speaker
- Share the responsibility for communication
Listening Techniques

• Critical listening
  – Separate fact from opinion

• Sympathetic Listening
  – Don’t talk -- Listen
  – Don’t give advice -- Listen
  – Don’t judge -- Listen

• Creative listening
  – Exercise an open mind
  – Supplement your ideas with another person’s ideas

Communication Roadblocks

• Directing
• Interrupting
• Judging
• Name calling
• Moralizing
• Persuading
• Ridiculing
• Warning
**Code of Cooperation – One Version**

- Share responsibility for the team’s progress and success
- Attend all sessions and be on time
- Be an active listener
- Show respect for the contribution of others
- Criticize ideas not persons
- Resolve conflicts constructively
- Pay attention -- avoid disruptive behavior
- Avoid disruptive side conversations
- Participate but do not dominate
- Be succinct -- avoid long anecdotes and examples

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**Guidelines For Productive Meetings**

- **Use an agenda**
  - List items, presenters, time allotments, item types
- **Have a facilitator – coordinator**
  - Keeps meeting focused and moving along
  - Pushes toward conclusion
  - Makes sure that all participate
  - Makes sure that no one dominates
- **Take minutes**
- **Draft next agenda**
- **Evaluate meeting**