**Lectures and Seminars by Week**

1: Subject Outline + Processes for Project Management – Planning
2: Project Management Tool
3: Project Scheduling and Quality Assurance + quiz
5: Integrated and Collaborative projects + quiz
6: No lecture and no formal tutorials
7: Seminar – An invited speaker from industry
8: Subject Review
9: Exam

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**Tutorial Exercise: Schedule by week**

1. No tutorials – look at documents at ~cs3710
2. Initial Planning of your mini-project
3. Work on design for Planning Module of the PM Tool
4: Deliver design for Planning Module of the PM Tool
5. Work on design for Monitoring Module of PM Tool
6. No formal tutorial – revise plan for your mini-project
7. Deliver design for Monitoring Module of PM Tool
8. Deliver Project Review, Design change exercise
9. No tutorials

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**Tutorial Exercise - Notes**

- You must record the effort you expend on project management and design tasks
- You should enter this effort into your project plan using the “Track” function
- You should also enter the amount of effort still required to complete the tasks you have worked on
- If you are working in pairs on the design product, both of you should be actively involved in the same task at the same time
- Use any design tool, provided you can submit your design eg create gif, jpg or postscript files

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**Feedback: Project Estimates**

1. The number of people working on the project does not effect the total work done. It does affect the duration of the project and the rate of completion
2. Estimates of the Project Management effort
   - How do you get PM effort from historical data?
   - It should be a similar proportion of project PM effort as the proportion of the design phase duration to project duration
3. The estimated effort was much greater than you can spend on this course but you only had to 1/10 of the design work
4. Two similar entities cannot be counted as one
5. The entities are repeated through the diagram, so do not count them more than once. There are only 20

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**Feedback: Scheduling**

- What are parallel tasks and what are consecutive?
  - For instance learning MS Project and entering estimates cannot be done at the same time
  - Precedence and start and end time can be used to set the order of execution of tasks. This was not changed on many projects for tasks that could not be overlapping
  - PM and design tasks could be done on the same day, but at different times
  - In design the higher and lower levels cannot be done concurrently
    - they may be done alternately or consecutively
Feedback: Risk Analysis

1. Generally well done, eg considered client making requirements change
2. Risk analysis should not deal with issues relating to the implementation of the software, but to the achievement of the design phase.
   - eg Possible networking problems with the PM system is a feature to consider in the design, but not a risk in the design.
3. Understanding client (SIP) requirements seems to be the most stressful issue

Problems notified by Students

1. Tutorial questions need to be more specific
2. Real-life examples be given to illustrate various topics in lectures
3. More clarity be given to topics such as the calculation of function points
4. The website and its structure is a little confusing and somewhat misleading
5. The work requirements are unclear and information is spread out into too many different documents

Problems notified by Students

1. Unreasonably high expectancies regarding assumed knowledge
2. Lab facilities used were problematic: in particular, Microsoft Windows based applications on CSE Linux machines
3. The exam given in week 3 - after only two lectures – was confusing to students

Welcome to Real Life

You are in the middle of a realistic simulation

In a Real Project

- Your client can set fixed deadlines for you to meet
- Some of your client’s requests may seem vague and there is always a degree of mis-communication
- Your client expects you to have most of the answers
- Some of your client’s requirements may be unclear
- There may be documentation all over the place that you need to collate, cross-reference and understand
- You may not have all the skills/knowledge you need
- The technology platform you use in order to do your work may not be reliable

You need to Respond Differently

- This subject may be different from other CSE subjects
  - There are different challenges
  - There are many appropriate responses
  - You only need to be able to justify your response
  - Problem solving requires balancing numerous project attributes, some of which conflict with each other
- You need to dig for information
  - Define your problem
  - Research your problem
  - Ask for clarification
    - Client (Tutors & Lecturers)
    - Colleagues (Fellow students)
A Different Learning Style

- This course is designed as a third year course
- It requires more initiative by the learners
- It assumes knowledge
- We are teaching a subject that is not defined with clear questions and answers
- We need you to work out processes that suit your work methods and design approach
- We need you to ask us questions
- We cannot respond appropriately to comments such as 'MS Project does not work or I don't know what to do'
- Compare the project management process to debugging software
- Do you have a process for debugging?
- How did you develop it?

The Suggested Approach

- The Project Goals are your deliverables
- The project tasks are directed towards delivering the deliverables (and getting paid!)
- It is your responsibility to work out the required tasks
  - Eg: for Project Management:
    a) enter estimates
    b) enter actuals
    c) compare actuals to estimates

Design Steps

The Design process has some basic steps you can follow
1. Read and understand the business requirements
2. Context document gives you the context for Context Level DFD
3. E-R Diagram gives you the Data Store
4. Divide DFD level 0 into sub-systems
   - Each sub-system maintains each major data store
5. Look at the Use Case. What data store does it deal with?
6. Expand the Sub-system that manages that data store, following the Use Case

An Example of Learning QA

- We provided you with the aspects of quality the client is looking for
- If we had provided the measures and processes to measure, you might follow these without thinking
- With this subject design, you need to consider:
  - Why am I measuring these?
  - What do I want to measure?
  - How will I measure them?
- You can limit your QA to look at specific aspects of the design on which you want to concentrate, eg
  - Do the inputs and outputs mentioned in the description of the functional processes of the DFD actually exist in data flow diagram?
  - Is the functional description doing what the client asked?

About your Tutors

- The tutors are experts in their own area of software engineering
- There are many different areas
- This may be a problem for students who may get differing responses from different tutors
- If you do not ask, we will explain as we see it
  - Each tutor will see it differently depending on their area
- If you tell the tutor where you are coming from, we can explain it as you might see it

CS3710 Staff are also involved in a project

- Your are our client
- You need to make your expectations known
- You need to ask questions of us
- We have estimated, planned, analysed risks, set up quality assurance procedures
- But problems become apparent during any project
- We are attempting to respond appropriately
- As our client, we need to satisfy your requirements
SSR (or Student Stress Reduction)

- Consultation
  - Monday 12:00 - 2:00: Cat Kutay xtn 6800
   - Friday 10:00 - 12:00: Book by email to mberry@cse.unsw.edu.au
- Weekly subject bulletin
  - Reduction in frequency of emails to cs3710-list
  - Late submissions
    - Negotiate with your tutor over any penalty
  - Project Management Deliverable 1
    - Every one who submits gets full marks
  - Design Deliverables
    - Every one who submits a design gets at least half marks

Outline of this Lecture

1. Some Estimation Stories
2. Risk Management Process
3. Project Monitoring Process

Outline of this Lecture

Some Estimation Stories

Cases from industry

Shaving 10% off the Estimate

- I was the team leader for a new project, there were three other people in my team
- I had estimated the effort required to complete the project
- My manager told me to base the schedule on 90% of the estimated effort
- His argument was that it would keep the team under pressure

Some Estimation Stories

Shaving 10% off the Estimate

Was he right?

- For:
  - Work may expand the to fit the time available
  - Valid concern about over-engineering
- Against:
  - Ethical issue: is it fair to deliberately put people under pressure?
  - Practical issue: would the team members ever trust you (and your plans) again if they found out?
  - Quality issue: the team might cut corners to keep to the schedule

Estimation Confidence levels

- I had to produce a fixed-price quote to build a system in competition with 6 other companies
- I was given a Functional Specification and I produced a function point count
- I had data on 30+ previous projects
- I based my estimate on a target productivity rate of the mean plus 2 standard deviations
- We did not get the contract
What went wrong?

- Our quote was 50% of the next lowest quote
- The client said that clearly indicated that we did not understand the problem
- Other possibilities
  - The function point count was too low
  - The target productivity rate was too good
  - Past experience was a bad guide to the future
- The competitors were not confident in their estimates and had added a large margin for error

Project Risk Factors

- The company wanted to replace a current system that was large and business critical
- My partner and I spent 3 months outlining the functions in the replacement system
- We then produced an estimate of effort based on the outline functional specifications
- When we presented the estimate, our manager said: “It had better be right, or heads will roll!”

Our Response

- My partner retrieved the estimate & doubled it
- The manager threw us out of his office
- We went back to our desks and spent the rest of the day thinking about all the things that can go wrong on a project. We listed over 100.
- The lesson:
  - The quality of an estimate depends on the consequences if it is wrong
  - Every project is subject to many risks

Risk Management

The CMMI Reference Model

Reference

Capability Maturity Model® Integration (CMMI), Version 1.1, for Systems Engineering and Software Engineering (CMMI-SE/SW, V1.1) Continuous Representation. CMU/SEI-2002-TR-001, ESC-TR-2002-001

CMMI Project Management Process Areas

- Project Planning
- Project Monitoring and Control
- Measurement and Analysis
- Risk Management
- Integrated Project Management
- Configuration Management
- Product and Process Quality Assurance
- Decision Analysis and Resolution
- Supplier Agreement Management
- Data Management
- Quantitative Mgmt of Quality and Process
- Organizational Training
- Organizational Process Focus
- Organizational Process Definition
- Organizational Process Performance
- Causal Analysis and Resolution
- Org Process Technology Innovation
- Process Innovation Deployment
A CMMI Process Area Definition

- Purpose
- Introductory Notes
- Related Process Areas
- Specific Goals
- Generic Goals – what you need to achieve to be assessed at a particular capability maturity level
- Practice-to-Goal Relationship Table
- Specific Practices by Goal
- Generic Practices by Goal – what you need to do for a particular capability maturity level

The Project Planning Process Area

You carried out some of the tasks in this process area in the first tutorial

SG 1 Establish Estimates

- SP 1.1-1 Estimate the Scope of the Project
- SP 1.2-1 Establish Estimates of Work Product and Task Attributes
- SP 1.3-1 Define Project Life Cycle
- SP 1.4-1 Determine Estimates of Effort and Cost

SG 2 Develop a Project Plan

- SP 2.1-1 Establish the Budget and Schedule
- SP 2.2-1 Identify Project Risks
- SP 2.3-1 Plan for Project Data Management
- SP 2.4-1 Plan for Project Resources
- SP 2.5-1 Plan for Needed Knowledge and Skills
- SP 2.6-1 Plan Stakeholder Involvement
- SP 2.7-1 Establish the Project Plan

SG 3 Obtain Commitment to the Plan

- SP 3.1-1 Review Plans that Affect the Project
- SP 3.2-1 Reconcile Work and Resource Levels
- SP 3.3-1 Obtain Plan Commitment

SP 2.2-1 Identify Project Risks

1. Identify risks
2. Document the risks
3. Review and obtain agreement with relevant stakeholders on the completeness and correctness of the documented risks
4. Revise the risks as appropriate
The Risks are Identified – Now What?

You use a process to Manage the Project Risks
Eg. CMMI Risk Management Process Area

Risk Management - Purpose

- The purpose of Risk Management is:
  - to identify potential problems before they occur,
  - so that risk-handling activities may be planned and invoked as needed across the life of the product or project
  - to mitigate adverse impacts on achieving objectives

Introductory Notes

- A continuous, forward-looking process
  - Never stops during the project
- Anticipate and mitigate the risks that have critical impact on the project
  - Need to establish what is “critical”
- Collaboration and involvement of relevant stakeholders
  - Not enough to use a check list

Three activities of Risk Management

- Defining a risk management strategy
  - Often established at corporate level
- Identifying and analyzing risks
  - Project Planning: SP 2.2-1 Identify Project Risks
  - Project Monitoring and Control: SP 1.3-1 Monitor Project Risks
- Handling identified risks
  - Need to be handled at the appropriate level of management

Evolving Process Capability

- Organizations may initially focus simply on risk identification for awareness, and react to the realization of these risks as they occur
- The Risk Management process area describes an increase in process capability maturity:
  - From risk identification only
  - To systematically planning, anticipating, and mitigating risks in order to proactively minimize their impact on the project

Specific Goals of Risk Management

SG 1 Prepare for Risk Management [PA148.IG101]
Preparation for risk management is conducted.

SG 2 Identify and Analyze Risks [PA148.IG102]
Risks are identified and analyzed to determine their relative importance.

SG 3 Mitigate Risks [PA148.IG103]
Risks are handled and mitigated, where appropriate, to reduce adverse impacts on achieving objectives.
## SG 1 Prepare for Risk Management

<table>
<thead>
<tr>
<th>SP 1.1-1</th>
<th>Determine Risk Sources and Categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 1.2-1</td>
<td>Define Risk Parameters</td>
</tr>
<tr>
<td>SP 1.3-1</td>
<td>Establish a Risk Management Strategy</td>
</tr>
</tbody>
</table>

## SG 2 Identify and Analyze Risks

<table>
<thead>
<tr>
<th>SP 2.1-1</th>
<th>Identify Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk identification activities should focus on the identification of risks, not placement of blame</td>
<td></td>
</tr>
<tr>
<td>SP 2.2-1</td>
<td>Evaluate, Categorize, and Prioritize Risks</td>
</tr>
<tr>
<td>Cost, schedule, and performance risks directly arising from the project and system</td>
<td></td>
</tr>
<tr>
<td>Other risks including: strikes, sources of supply, technology cycle time, competition</td>
<td></td>
</tr>
</tbody>
</table>

## SG 3 Mitigate Risks

<table>
<thead>
<tr>
<th>SP 3.1-1</th>
<th>Develop Risk Mitigation Plans</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 3.2-1</td>
<td>Implement Risk Mitigation Plans</td>
</tr>
</tbody>
</table>

## SP 1.1-1 Determine Risk Sources and Categories

- Classic sources of risk
  - Uncertain requirements
  - Unprecedented efforts—estimates unavailable
  - Infeasible design
  - Unavailable technology
  - Unrealistic schedule estimates or allocation
  - Inadequate staffing and skills
  - Cost or funding issues
  - Uncertain or inadequate subcontractor capability
  - Uncertain or inadequate vendor capability

## SP 1.2-1 Define Risk Parameters

- Risk parameters are used to:
  - Analyze and categorize risks
  - Control the risk management effort
  - Provide common and consistent criteria for comparing the various risks to be managed
- Parameters include:
  - Risk likelihood (i.e., probability of risk occurrence)
  - Risk consequence (i.e., impact and severity of risk occurrence)
  - Thresholds to trigger management activities

## SP 2.1-1 Identify Risks

- Examine each element of the project work breakdown structure to uncover risks
- Conduct a risk assessment using a risk taxonomy
- Interview subject matter experts.
- Review risk management efforts from similar products.
- Examine lessons-learned documents or databases.
- Examine design specifications and agreement requirements
**Risk Taxonomy**

- A taxonomy is a scheme that partitions a body of knowledge and defines the relationships among the pieces
- It is used for classifying and understanding the body of knowledge
- Examples:

**SP 2.2-1 Evaluate, Categorize, and Prioritize Risks**

- Evaluate and categorize each identified risk using the defined risk categories and parameters, and determine its relative priority
- Needed to assign relative importance to each identified risk
- Used in determining when appropriate management attention is required
- A standard scale is used to evaluate:
  - Likelihood: remote, unlikely, likely, highly likely
  - Consequence: negligible, marginal, significant, critical, catastrophic

**SP 3.1-1 Develop Risk Mitigation Plans**

- Plan contains:
  - Recommended course of action for each critical risk
  - Alternative courses of action, workarounds, and fallback positions
  - Risks are monitored and if they exceed the established thresholds, the risk mitigation plans are deployed

**Options for handling risks**

- Risk avoidance:
  - Changing or lowering requirements
  - While still meeting the user’s needs
- Risk control:
  - Taking active steps to minimize risks
- Risk transfer:
  - Reallocating design requirements to lower the risks
- Risk monitoring:
  - Watching and periodically reevaluating the risk for changes to the assigned risk parameters
- Risk acceptance:
  - Acknowledgment of risk but not taking any action

**Project Monitoring and Control**

- Keeping on schedule and within budget while maintaining work product quality

**Purpose**

- To understand the project’s performance
- So that:
  - Appropriate corrective actions can be taken when the project’s performance deviates significantly from the plan
  - The plan can be revised
The Baseline Project Plan

- A project’s documented plan is the basis for:
  - Monitoring activities,
  - Communicating status, and
  - Taking corrective action
- Project performance is primarily determined by comparing actual work product and task attributes, effort, cost, and schedule to the plan at prescribed milestones

When actual status deviates significantly from the expected values

- Corrective actions are required:
  - Re-plan using latest knowledge
  - Negotiate with client on commitments
  - Acquire additional resources
  - Reduce functionality
  - Reduce quality
  - Train staff
  - Improve process efficiency

SG 1 Monitor Project Against Plan

- SP 1.1-1 Monitor Project Planning Parameters
- SP 1.2-1 Monitor Commitments
- SP 1.3-1 Monitor Project Risks
- SP 1.4-1 Monitor Data Management
- SP 1.5-1 Monitor Stakeholder Involvement
- SP 1.6-1 Conduct Progress Reviews
- SP 1.7-1 Conduct Milestone Reviews

SP 1.1-1 Monitor Project Planning Parameters

- Monitor the actual values of the project planning parameters against the project plan
- Measure the actual values of the parameters on which the plan was based: eg
  - Size, complexity, functionality, product quality
  - Team skills
- Compare actual values to the estimates in the plan, and identify significant deviations
  - Baseline Plan
  - Document and report deviations from plan
  - Project Status Report

SP 1.2-1 Monitor Commitments

- Are you doing what you said you would do?
- Regularly review commitments
  - To clients and other stakeholders
  - To managers and project staff
  - Identify commitments that have not been satisfied or which are at significant risk of not being satisfied.
- Document the results of the commitment reviews

SP 1.5-1 Monitor Stakeholder Involvement

- Clients and Users play critical roles in Requirements Gathering, Reviews and Testing
- Also they have other (more immediate) jobs to do
  1. Periodically review the status of stakeholder involvement.
  2. Identify and document significant issues and their impacts.
  3. Document the results of the stakeholder involvement status reviews.
SP 1.6-1 Conduct Progress Reviews

- May be formal or informal
- Regularly communicate to relevant stakeholders
- Review the results of collecting and analyzing measures for controlling the project
  - Are you keeping your time logs accurately?
- Document change requests and problems identified in any of the work products and processes
  - System size could be growing and you may not realise it
- Document the results of the reviews
- Track change requests and problem reports to closure

SP 1.7-1 Conduct Milestone Reviews

- Formal reviews of project performance to date at meaningful and pre-planned points in the project
- Often linked to clients making payments and approving further expenditures
- Relevant stakeholders attend the review
  - Managers, staff members, clients, end users, suppliers
  - Other relevant stakeholders within the organization
    - Eg. Auditors, business managers, finance
- Identify and document significant issues and their impacts.
- Document the results of the review, action items, and decisions

SG 2 Manage Corrective Actions to Closure

- SP 2.1-1 Analyze Issues
  - Understand the issues and determine the corrective actions necessary to address the issues
- SP 2.2-1 Take Corrective Action
  - Negotiate with stakeholders
  - Take action on identified issues
- SP 2.3-1 Manage Corrective Action
  - Take corrective actions and verify effectiveness

COMP 3710 Software Project Management S2 2003
Lecture 4 – The End

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