EEE6480

Research techniques & thesis preparation

MSc project EEE660X
(6600, 6601, 6602, 6603, 6604)
or COM6915

Project/time management

Content

1. Need for project and time management
2. Time management
3. Setting aims and objectives
4. Project management cycle
5. Milestones and deliverables
6. Gantt chart
7. Final thoughts

The need – project management

- Science/eng. is difficult to predict (e.g. "A significant discovery will be made in 15 months and 5 days time")
- Good planning gives framework from which to work and monitor progress
- Goals/plans encourage achievement in set time
- Usually an obvious aim.
- Estimate what/when needs to be done.
- Unexpected breakthrough – alter timeline/emphasis accordingly.

The need – time management

- **Poor time management (not lack of time) → unfulfilled objectives**

- Log all activities (daily, weekly), analyze time commitment and where wasted

- Note productivity rhythm - peaks and dips in energy (morning person or night owl?) – know when to take a break/change task.

  e.g. morning person – lab work am, routine work (literature searching/writing notes) pm

- Write to-do lists

Time management

- Get organised!
- Write a to-do list (breakdown large tasks into components)
  - essential if large no. of tasks or commitments, different sorts of tasks)
  - Cross off accomplished tasks as achieved
- Prioritise (A, B, C) and work through tiered task list in priority order (daily, weekly tasks)

- Multi-tasking?
  - Less efficient at any one task
  - Increase stress levels/reduce productivity

Time management

- Pareto principle:
  - 80% of tasks completed in 20% of time.
  - Remaining 20% takes 80% of time.
  - Identify the 20% that → 80% of results key to effective use of time.

- Spending time unsuccessfully
- Activities taking longer than expected
- Little output compared to effort made

Unproductive 80%

- Working on activities advancing overall goals
- Seeking help where necessary
- Feel sense of achievement
- May not like task but see bigger picture

Effective 20%

Setting project aims and objectives

- **Create an action plan:**
  1. Clarify aims and objectives -
     - Write down long term project goals/objectives
     - Break down project into manageable steps – reasonable and realistic goals (month, week)
     - How will you know when you've achieved your goal?
  2. List of actions - what to do to achieve goals. Any limitations/constraints?
  3. Prioritise list so most efficient first (help achieve goals).
  4. Organise actions into a plan (actions in a time frame)
  5. Monitor and measure progress (make adjustments)

SMART objectives

Specific

Measurable

Attainable

Realistic

Time-related

→ Plan = how you will achieve your SMART objectives.

Project management

- Don't overly complicate task list and interdependencies

- Need a cushion in case of disaster (snow, component failure, delivery time)

- Include regular planning and evaluation sessions (supervisor) - Update/edit plan.

- Keep eye on long term goals (even if following short term pattern), remain flexible. e.g.

Literature review

Task h	Task i	Task j	Task k

Start literature review

Project management

- Planning, organisation, managing resources to achieve successful completion of project objectives within project constraints (scope, time, budget)

- Use Gantt chart – bar chart illustrating project schedule (start, finish, interdependencies of tasks).

- Used in all research projects (requirement for grant proposals)

- Project management software (e.g. MS Project) or Excel OK here.

Project management
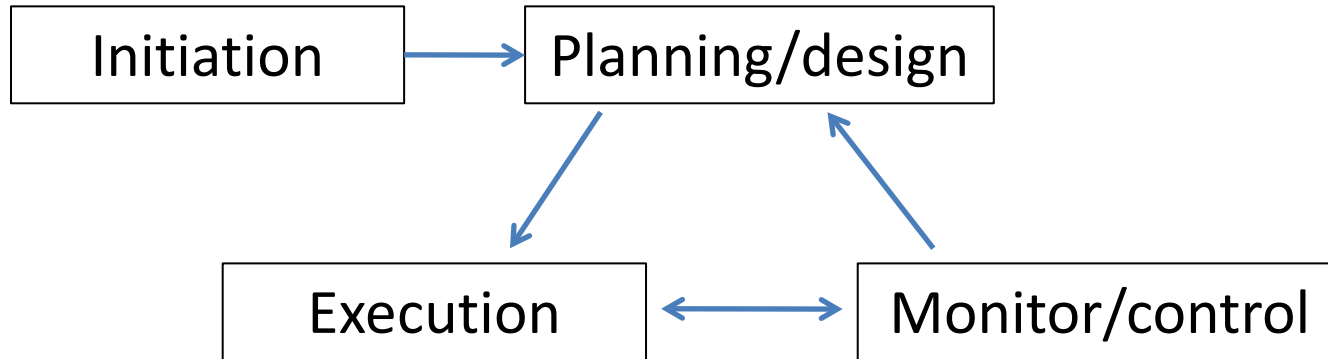
- Project cycle:

- Identify deliverables (outputs) and create work breakdown structure (WBS)
- Identify activities needed to complete these deliverables (resource requirements, time, cost)
- Develop schedule (+budget)
- Risk planning

Project management

- Project cycle:

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┌──────────────┐        ┌──────────────────┐
│  Initiation  │ ─────► │  Planning/design │
└──────────────┘        └──────────────────┘
                              │          ▲
                              ▼          │
        ┌──────────────┐        ┌──────────────────┐
        │  Execution   │ ◄────► │  Monitor/control │
        └──────────────┘        └──────────────────┘
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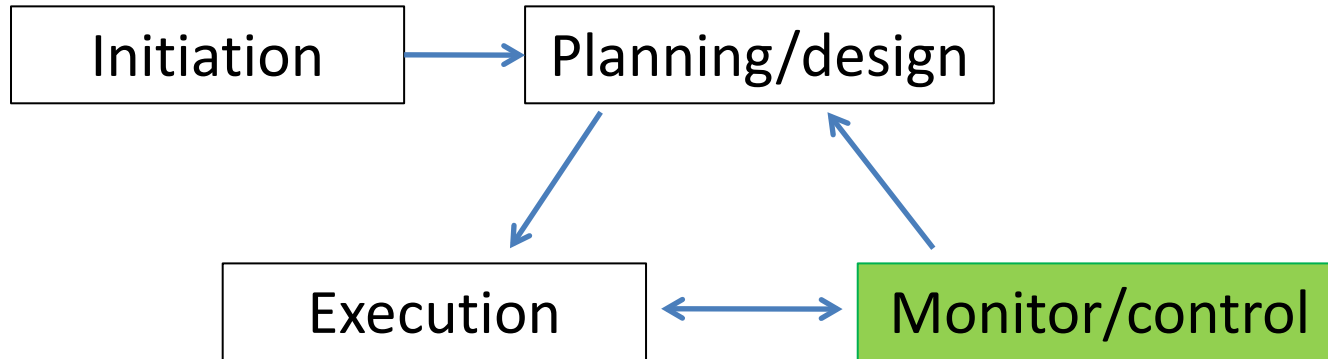
- Measure ongoing project activities
- Where we are (*measurement*),
- Where we should be (*evaluation*),
- How to get back on track (*correction*)?

Milestones and deliverables

- Achievable short term goals focus effort and structure work
- Displayed within Gantt chart
- **Deliverable**:
  - Project result delivered to customer at the end of a project task (e.g. prototype, feasibility study, subset of experiments/simulations)
  - Tangible and verifiable
- **Milestone**:
  - Significant end point of a distinct stage
  - Not tangible, perhaps a decision point or short report
  - Internal project result used to check progress

  Some deliverables will be key events → milestone

Gantt chart example

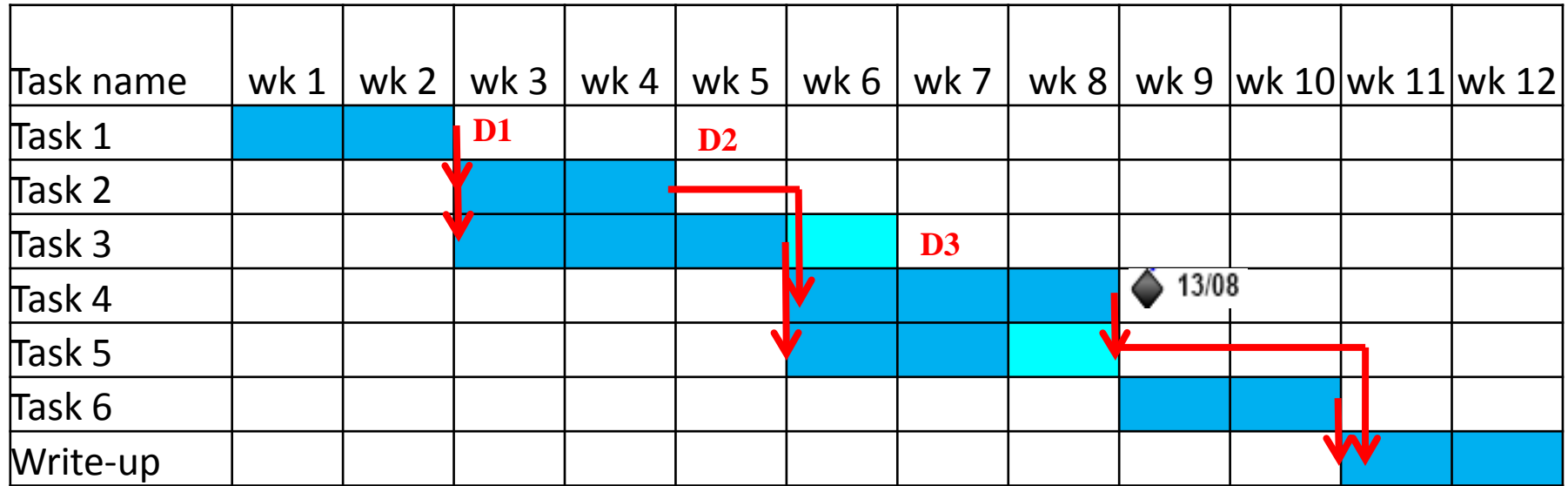|	Task Name	2012																				2013			
		May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
1	Simulations & Design of planars for growth run 1		D1																						
2	Epitaxial growth run 1																								
3	Electron beam lithography run 1																								
4	DFB grating coupling control						D2																		
5	Buried waveguide DFB fabrication optimisation						D3																		
6	J-G measurements						D4																		
7	Reflectivity characterisation - mask design/manuf.																								
8	Window characterisation - radius of curvature						D5																		
9	Window optimisation - use of tapers						D6																		
10	Lifetest								D7																
11	Feedback characterisation - mask design/manuf.																								
12	Feedback characterisation						D8																		
13	Review all results and fix designs for integration										17/02														
14	Publication and web updates																								
15	Epitaxial growth run 2																								
16	Electron beam lithography run 2																								
17	Mask design/manufacture for integrated devices																								
18	Integrated MOPA device																D9								
19	Preliminary lifetest of basic MOPA																	D11							
20	Wavelength agility																	D12							
21	Tapered MOPA																D10								
22	Optimisation/realisation of final design																								
23	Decision on final design																			10/12					
24	Packaging, beta testing and system integration																								
25	Publication																								
26	Prepare follow-on collaborations / commercialisation																								

Project milestones = ◆ 13/08

Project deliverables = D1

Tasks = ▭ (blue arrows indicate dependencies)

More typical MSc project Gantt chart

Task name	wk 1	wk 2	wk 3	wk 4	wk 5	wk 6	wk 7	wk 8	wk 9	wk 10	wk 11	wk 12
Task 1			**D1**		**D2**							
Task 2												
Task 3						**D3**						
Task 4								13/08				
Task 5												
Task 6												
Write-up												

Baseline duration   Slack

- There may be interdependencies from one task to another
- Deliverable could be something that needs to be completed before moving to next stage
- Requires explanation (200 word in Interim report)

Task name	wk 1	wk 2	wk 3	wk 4	wk 5	wk 6	wk 7	wk 8	wk 9	wk 10	wk 11	wk 12
Task 1			D1									
Task 2					D2							
Task 3							D3					
Task 4									13/08			
Task 5												
Task 6												
Write-up												
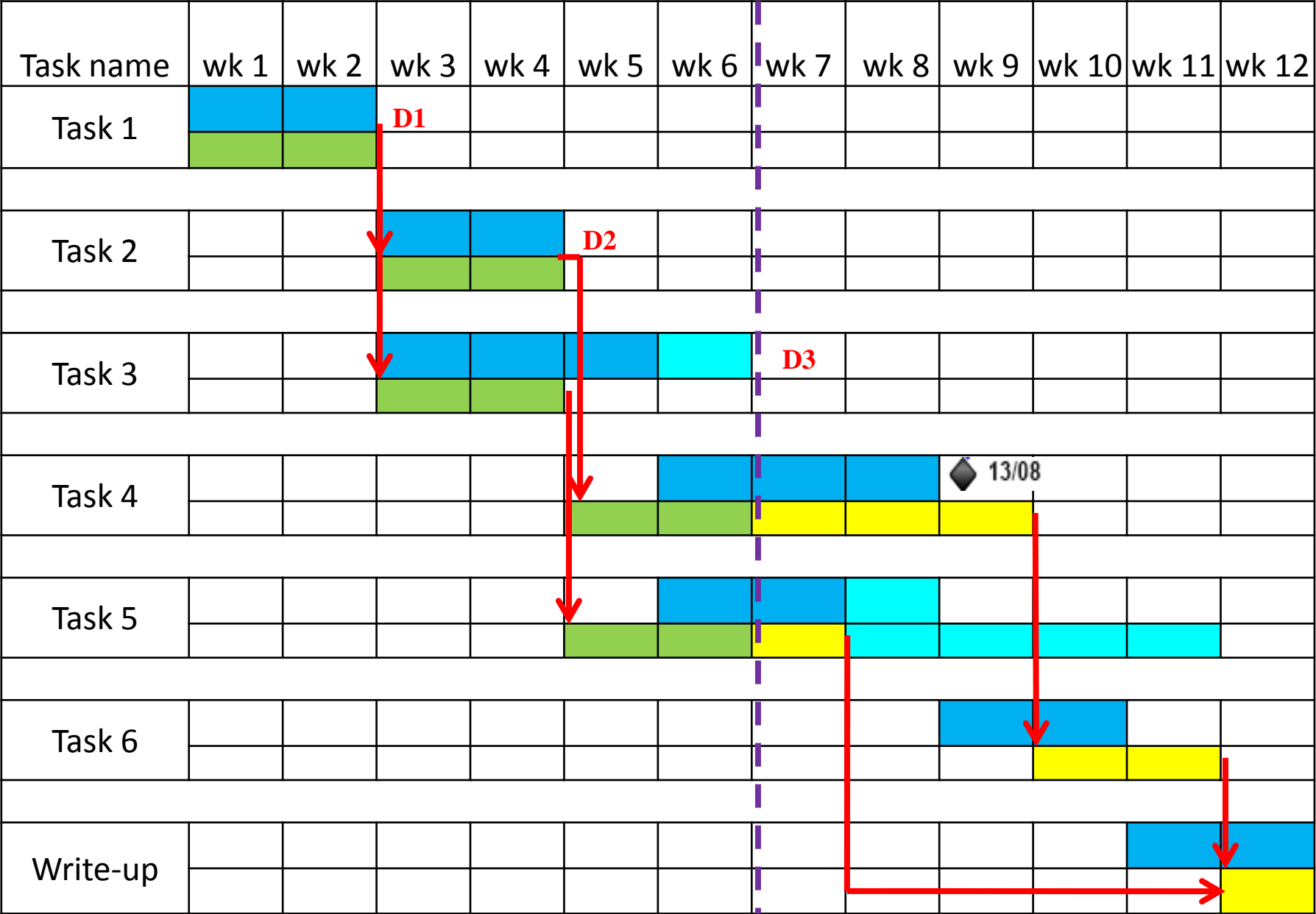
| Baseline duration | slack | Actual completed | Remaining duration |

Risk

- Impact on cost, schedule, quality
- Malfunction, change in technical requirements
- Can be
  - anticipated (e.g. slippage)
  - beyond anticipation (breakage)
- Recognise and manage potential and unforeseen trouble spots.
- List risks, chances of events occurring, when they may occur, contingency plans for each risk event.

Risk event
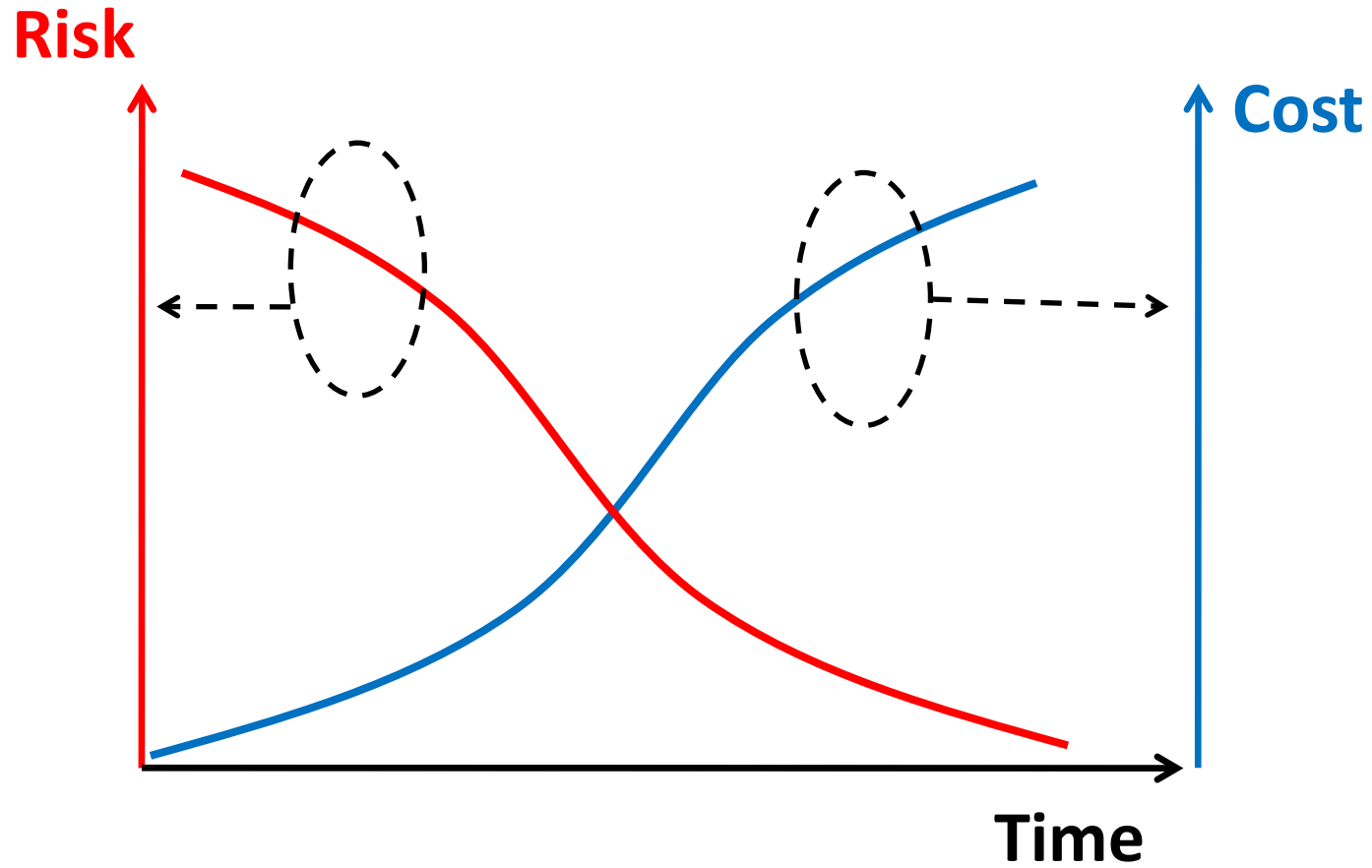
Risk Management

Risk ID – identify sources of risk

↓

Risk assessment – severity, likelihood, controllability

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Risk response – how to reduce possible damage, contingency plans

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Risk response control – implement risk strategy, monitor/adjust plan

Risk ID

- Design – does design depend on unrealistic or optimistic assumptions?

- Testing – will testing equipment be available when needed?

- Schedule – is schedule dependent on completion of other tasks?

- Development – is development process supported by a set of procedures, methods, tools?

Risk assessment

- Scenario analysis - evaluate (tabulate) for each task on a scale of 1 to 5.

  – Probability of event

  – Impact of event

  – Detection

  – When?

  FMEA – Failure mode and effects analysis

  Impact x probability x detection = Risk value

Risk mitigation

1) Reduce likelihood that event will occur.

2) Reduce impact that event would have on project.

Final thoughts

- Supervisor
  - will give scientific/technical guidance, advice on planning, read/comment on work
  - will not tell you exactly what to do, exactly what to read, micro-manage your project

- Include write-up time in Gantt chart
  - but how long?
  - base it on how long it takes interim report write up and scale accordingly
  - Good scientific writing / good figures take a long time
  - Useful to factor in feedback