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informatics

Lecture 5
Project Design

Slides taken from and occasionally modified from
https://simon.peytonjones.org/great-grant-proposal/

Informatics Project Proposal 20 (IPP20)
2025/2026

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Content

- How to design a strong project (beyond the template)
- Essential components: aims, objectives, research questions, success criteria
- What makes proposals convincing
- Examples of strong proposal elements

Reminder: Template Already Covered

- Today → *How to think*, not *how to fill sections*
- We focus on clarity, feasibility, alignment, and persuasion

A Proposal Is a Sales Pitch

- You must convince both experts and non-experts
- Readers skim: clarity and structure matter
- Strong proposals articulate

problem → importance → idea → approach→ plan → success

Audience

- Your proposal will be read **carefully** by one or two **experts**. (your supervisor/s). You must convince them.

- But it will **certainly** be read **superficially** by **non-experts**… and *they* will be decision makers/ markers. You absolutely must convince them too.

- Some influential readers (external examiners, auditors) will give you one minute max.

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Common Reasons Proposals Fail

- No clear problem
- No explanation of *why it matters*
- Buzzwords instead of substance
- Vague aims and unmeasurable objectives
- No evidence the project is feasible

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The Vague Proposal

1. I want to work on better type systems for functional programming languages
2. **Let me do my M.Sc. Project**

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The Vague Proposal

1. I want to work on better type systems for functional programming languages
2. **Let me do my M.Sc. Project**

You absolutely must identify the problem you are going to tackle

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The Vague Proposal

So what? Why should I care?

1. I want to work on better type systems for functional programming languages
2. **Let me do my MSc Project**

You absolutely must identify the problem you are going to tackle

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Identifying the Problem and its Importance

- What **is** the problem?

- Is it an **interesting** problem? That is, is it research at all?

- Is it an **important** problem? That is, would anyone care if you solved it? (this is known as **impact**)

- Having a "customer" helps

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Why is Impact Important?

If we perceive our role aright, we then see more clearly the proper criterion for success: a toolmaker succeeds as, and only as, the *users of their tool succeeds* with their aid. However, shining the blade, however jewelled the hilt, however perfect the heft, **a sword is tested only by cutting**. That swordsmith is successful whose clients die of old age.

Fred Brooks “The Computer Scientist as Toolsmith”, Comm ACM 39(5), March 1996

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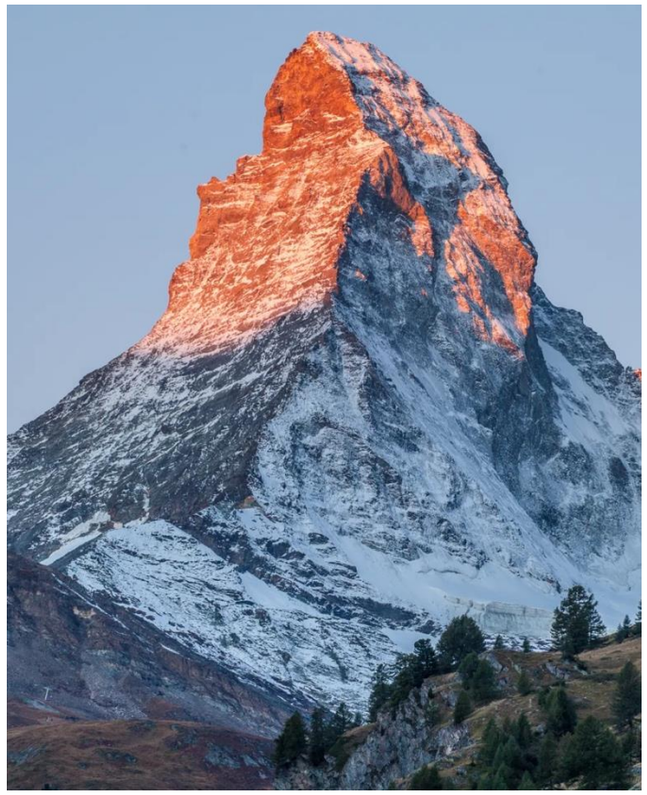
The Aspirational Proposal

1. I want to solve the problem of avoiding deadlocks and race conditions in concurrent and distributed programs
2. **Let me do my MSc Project**



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The Aspirational Proposal

1. I want to solve the problem of avoiding deadlocks and race conditions in concurrent and distributed programs
2. **Let me do my MSc Project**

It is easy to identify an impressive mountain

But that is not enough: you must convince your reader that you stand a good chance of climbing part of the mountain

Lots of dead bodies

Identify **Your** Contribution

- **Wider context**: Explain the path to the big goal

- **Specific Objectives:** Explain your role in solving **one of those steps**

- **Why you and why now?**

Your Idea

- Identify a promising pathway up the mountain: give real technical "**content**", so an expert reader could (without reading your doubtless-excellent CV etc) have some idea of what the idea is
- Offer objective **evidence** that it's a **promising** idea:
  - Literature?
  - Preliminary or prior work in area
  - Prototypes
  - Applications
- Many, many proposals are buzz-word-compliant, but lack almost all technical content. **Reject**!

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The I'll-work-on-it Proposal

1. Here is a (well-formulated, important) problem
2. Here is a promising idea (…evidence)
3. I have the skills to deliver (…evidence)
4. I have a sound plan

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The key question
How would an unbiased observer know if your research had succeeded?
i.e., aims & objectives

Suspicious Phrases

- “Gain insight into…”
- “Develop the theory of…”
- “Study…”
- “Produce a database of...”

The trouble with all of these is that there is no way to distinguish abject failure from stunning success.

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Good Phrases

- “I will build an analyser that will analyse a 200k line python program quicker than package X”

- “I will build a prototype walkabout information-access system, and try it out with three consultants in hospital Y”

The most convincing success criteria involve identifiable “customers”

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Aims

- Broad intention / big picture goal
- Must address an **important** and **interesting** problem
- Should be realistic in scope for an MSc project

Example:

To investigate whether deep learning models can reliably interpret children's facial expressions as indicators of metacognitive monitoring performance* during learning activities.

* It's your brain's ability to notice whether your thinking is on track. How well you know what you know.

Objectives

- Specific, actionable, measurable
- Describe what success looks like
- Avoid vague verbs: “study,” “explore,” “gain insight into…”

Examples:

Objective 1:
To collect and preprocess a dataset of children’s facial expression recordings linked to their learning tasks and metacognitive monitoring assessments.

Objective 2:
To design and implement deep learning models capable of extracting facial features and estimating metacognitive monitoring performance (MMP).

Research Questions

- Should be answerable within project constraints
- Must align with aims and objectives
- Guide your methodology

Examples:

RQ1: In what ways do estimations derived from facial expression interpretation differ in precision and timeliness from conventional methods of assessing MMP?

RQ2: Which facial features or expression patterns are most predictive of variations in metacognitive monitoring performance?

Success Criteria (Critical)

- How will we know if you succeeded?
- Define measurable outcomes
- Link directly to objectives

Good vs Bad Success Criteria

- **Bad:** "Improve model performance”
- **Good:** "Increase F1 score by ≥5% on dataset X compared to baseline Y"

Align Aims, Objectives, Questions & Success Criteria

- Aim = What you want to achieve
- Objectives = Steps to get there
- Research questions = What you need to find out to achieve the objectives
- Success criteria = measurable proof
- All must connect coherently

Related Work/ Background

- **Goal 1**: demonstrate that you totally know the field. Appearing ignorant of relevant related work is certain death.
- **Goal 2**: a spring-board for describing your promising idea

- But that is all! **Do not spend too many words on comparative discussion**. The experts will know it; the non-experts won't care.

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Methodology and Work Plan

Work Package 2.1(a):
Use the Leo2 prover to build a detailed model of endomorphic defibrillators. Survey competing approaches. This work will take 3.5 weeks.

- Concentrate on (a) your idea, and (b) your aims/objectives/success criteria. We trust you to manage the minute details
- But if there is research risk in some aspect, you must describe those, and fall-back positions

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The Ideal Proposal

1. Here is a problem
2. It's an important problem (evidence…)
3. I have a promising idea (evidence…)
4. Here is what I hope to achieve, and how I'll know if we have succeeded.
5. Here is a credible plan of how I'm going to get from my idea to that destination

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The Ideal Proposal

Say all this as quickly as possible.
Assume that your readers will read no more

1. Here is a problem
2. It's an important problem (evidence…)
3. I have a promising idea (evidence…)
4. Here is what I hope to achieve, and how I'll know if we have succeeded.
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The Heilmeier Questions

- What are you trying to do (no jargon)?
- What is done today? Limits?
- What is new? Why will it work?
- Who cares?
- Risks?
- Time & cost?
- How do we check success?

The Most Important Thing

- Above all, convey your enthusiasm for your field.

> I have this amazing idea and I'm going to change the world. All I need is the chance to do it.

Attend Tutorials

- Most of the key elements of IPP are covered there
- Exchange ideas with classmates
- Get input from tutors

Talk to Your Supervisor

- Keep refining aims/objectives/questions
- Discuss specific methods and approaches
- Discuss evaluation

Rubric and Template

Read the Rubric

- Understand what you **must** include to pass IPP
- Understand how IPP is going to be marked.

Use the Template

- Stops you missing an essential section
- Means markers know where to find everything.

Help Each Other

Ask others to read your proposal critically
Revise, and ask someone else
Repeat. Repeat. Repeat.

- Cheap: what someone thinks after a 10-minute read is ***really really*** important
- Informative: after reading 20 proposals by others, you'll write better ones yourself. Much better. Much, much better.
- Effective: dramatic increases in quality. There is just no excuse for not doing this. And yet few people do that

Educate Your Proof Readers

- Give them a check-list of things to look for
- Strongly discourage them from correcting spelling and grammar, except just before submission
- Ask them to spend **30 minutes max** reading. A proposal MUST convince fast.
- Then get their feedback through a face-to-face **conversation**.
  - Friend: “I didn’t quite understand X”
  - You: “Oh ,I meant that Y and Z”
  - Friend: “Aha... why don’t you just write that down?”

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Peer Review: Your Secret Weapon

- Ask classmates to read your draft
- Give them a checklist
- Get fast, high-value feedback
- Don’t focus on grammar until the end

Rubric

	Assessment Item	FAIL / insufficient	PASS/fair	PASS/good	PASS/excellent
2	**Motivation**	No attempt is made at writing a motivation, or a cursory attempt is made that fails to convey why the project is important or relevant.	A brief relevant motivation statement is provided. It is technically correct but may be vague or lack depth. Shows minimal understanding of why the project matters.	As Fair, but the motivation is more detailed, clearly stated, and shows a stronger understanding of the project's relevance.	The motivation is thorough, compelling, and clearly demonstrates both the importance and relevance of the project.
3	**State-of-the-art**	No attempt is made at reviewing the literature, or a cursory attempt is made that fails to cover relevant sources. Does not demonstrate understanding of the field or link literature to the project. Strengths, weaknesses, or gaps in the literature are not identified.	A technically correct summary of essential literature is provided. Some aspects may be vague, incorrect, or limited in depth. There is some identification of strengths, weaknesses, or gaps, but links back to the project are weak or unclear. Sufficient understanding to start the project is demonstrated.	Literature review is more extensive and correct in detail. Strengths, weaknesses, and gaps are clearly identified and mostly linked to the project, showing critical engagement. There may be minor omissions, but overall demonstrates solid understanding and relevance.	Literature review is comprehensive and accurate. Strengths, weaknesses, and gaps are thoroughly identified and explicitly linked to the project, demonstrating critical analysis and deep understanding. Shows evidence of independent thought and synthesis beyond the initially provided sources.
4	**Method / Approach**	It is not clear to the reader what the research methodology to be used will be.	The methodology is described in sufficient detail to understand what the research approach will be and why it is relevant to the topic. It may be fairly high level and lack a wider appreciation of alternative methods. A basic evaluation plan is in place.	As fair but the evaluation criteria will be more convincing and the expected outcomes clearly defined.	As good but the methodology will be more robustly described with consideration of alternative approaches and a convincing argument provided for the best methods for the research.
5	**Research Plan**	The research plan does not contain the minimum pass/fair criteria.	The workplan contains a breakdown of the project into three or more tasks with an approximate timeline, at least one milestone and a Gannt chart. The plan will be broadly sound but may contain minor inconsistences. The risk analysis is present but might not be fully developed.	As fair but the workplan is more fully developed with no significant inconsistencies and the risk/mitigation plan, dependencies and needed resources are more mature	The implementation plan is comprehensive in every respect and is very convincing.
6	**Responsible Research**	The assessment of the ethical implications of the research is missing or is not sufficient.	Ethics at a minimum have been considered appropriately for the project. There may be a wider consideration of some other aspects of responsible research such as a data management plan or software license plan.	As fair but the wider aspects of responsible research have been comprehensively addressed with all relevant aspects described competently.	As good but the analysis of responsible research shows a more impressive depth of understanding with potentially new areas identified by the student.
7	**References**	Citations and/or references are incorrect or missing	Citations and literature are mostly cited correctly	Literature and citations are correct	n/a
8					
9	To pass, all 6 aspects should achieve a PASS/fair mark.				
10	A good or excellent in any section can compensate for a single fail/insufficient				

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IPP Checklist	Draft	Complete
I have a project title		
I acknowledge the University's guidance and policies on plagiarism / scholarship and realise the work I submit for IPP must be my own.		
I have clearly stated the problem that needs to be solved.		
I identified the aims and objectives of the project.		
I have a clear motivation statement that provides a reason why a reader might want to read the rest of my project proposal (including significance, feasibility and beneficiaries)		
I have a concise literature review that covers the essential background.		
I have described the approach/methods I want to use to address my research question.		
I have explained why I think the approach/method is appropriate		
I have outlined the approach I will use to evaluate my research findings		
I have summarized the expected outcomes of my project		
I have a narrative description of the high-level tasks.		
I have estimated the time each task will take and provided brief justification for why I think it will take this time and if there is uncertainty around the time a task might take, I have made this clear		
I have identified dependencies between tasks		
I have identified one or more milestones in the plan that I can use to check the schedule is on time or trigger corrective action if running late		
I have identified any resources that my project will need to access		
I have a combined the plan narrative into a graphical Gannt chart		

Summary

- Aims, objectives, research questions, and success criteria must align
- Strong proposals show problem, importance, idea, approach, feasibility, plan and measurable success
- Clarity beats complexity

Questions

Thank you!