Writing a great research proposal

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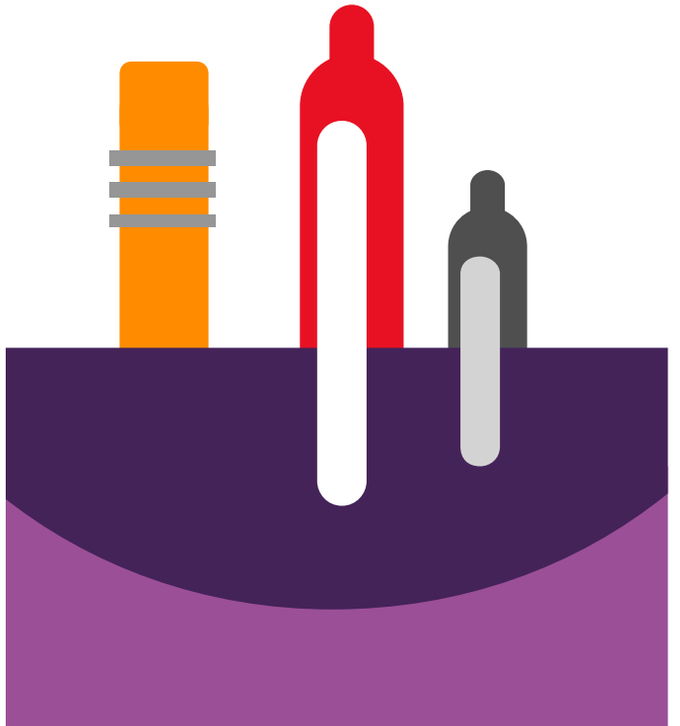
Writing a great proposal

- So What?
- Know the funding agency, and what they are looking for
- Executive summary



The state of play

- Even a strong proposal is in a lottery, but a weak one is certainly dead
- Many research proposals are weak
- Most weak proposals have readily-fixable flaws

Audience

- With luck, your proposal will be read carefully by one or two experts. You must convince them.
- But it will certainly be read superficially by non-experts… and they will be the panel members. You absolutely must convince them too.
- Some influential readers will give you one minute max.

The vague proposal

1. I want to work on better type systems for functional programming languages
2. Give me the money

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You absolutely must identify the problem you are going to tackle

Answer the “So what?” question

Identifying the problem

- 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? (EPSRC-speak: “impact”)
- Having a "customer" helps

Novelty is not enough

"But in design, in contrast with science, novelty in itself has no merit.

If we recognize our artefacts as tools, we test them by their usefulness and their costs, not their novelty."

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

A fractal subject

- Computer Science is a fractal subject
- Wherever you dig, the subject ramifies ahead of you
- Good things:
  - Less competition to be the first to publish; more collegial, collaborative
  - Easy to find your “own patch”
- Bad things
  - You can dig forever
  - Easy to be self-indulgent

Only by cutting

- 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 his tool succeed with his 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.

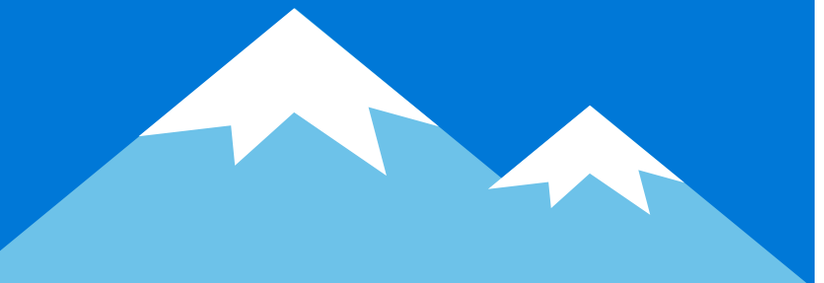
Fred Brooks “The Computer Scientist as Toolsmith”, Comm ACM 39(5), March 1996

The aspirational proposal

1. I want to solve the problem of avoiding deadlocks and race conditions in concurrent and distributed programs
2. Give me the money

- It is easy to identify an impressive mountain
- But that is not enough: you must convince your reader that you stand some chance of climbing the mountain

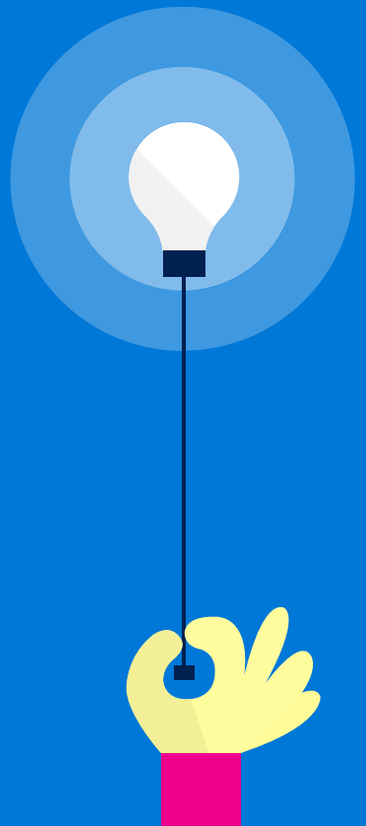
Climbing the mountain



Two sorts of evidence

- You must, must, must say what is the idea that you are bringing to the proposal. "Where's the beef?"
- Explain modestly but firmly why you are ideally equipped to carry out this work. (NB: not enough without (1))

Your idea



- Give real technical "meat", so an expert reader could (without reading your doubtless-excellent papers) have some idea of what the idea is
- Offer objective evidence that it's a promising idea:
  - Results of preliminary work
  - Prototypes
  - Publications
  - Applications
- Many, many grant proposals are buzz-word-compliant, but lack almost all technical content. Reject!

Blowing your own trumpet

- Most researchers are far too modest.
  - "It has been shown that …[4]", when [4] is your own work!
- Express value judgements: pretend that you are a well-informed but unbiased expert
- In particular, explain why you are well-positioned to carry out this research
- Use the first person: "I did this", "We did that".
- Do not rely only on the boring "track record" section

Blowing your own trumpet

Make strong, but defensible, statements

- "We were the first to …"
- "Our 1998 POPL paper has proved very influential…"
- "We are recognised as world leaders in functional programming / Haskell / Haskell's type system / functional dependencies in Haskell's type system / sub-variant X of variant Y of functional dependencies in Haskell's type system"

The I'll-work-on-it proposal

- Here is a (well-formulated, important) problem
- Here is a promising idea (…evidence)
- We're a great team (…evidence)
- We'll work on it
- Give us the money

The key question: How would a reviewer know if your research had succeeded?

ESPRC-speak "aims, objectives"

Suspicious phrases

- “Gain insight into…”
- “Develop the theory of…”
- “Study…”

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

Good phrases

- “We will build an analyser that will analyse our 200k line C program in reasonable time”
- “We will build a prototype walkabout information-access system, and try it out with three consultants in hospital Y”

The most convincing success criteria involve those “customers” again

Related work

- 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.

Methodology and work plan

Work Package 2.1(a): Use the Leo2 prover to build a detailed model of endomorphic defibrilators. Survey competing approaches. This work will be done by the PhD student, in collaboration with the RA. 3.5 months.

Methodology and work plan

- Usually vastly over-stressed in my view.
- Concentrate on (a) your idea, and (b) your aims/objectives/success criteria. I trust you to manage the details
- But if there is research risk in some aspect, do describe that, and fall-back positions

The ideal proposal

Say all this in a 1-page Executive Summary

1. Here is a problem
2. It's an important problem (evidence…)
3. We have a promising idea (evidence…)
4. We are a world-class team (evidence…)
5. Here is what we hope to achieve, and how we'll know if we have succeeded.
6. Here is a plan of how we're going to get from our idea to that destination
7. Give us the money. Please.

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 a little crumb of your money.

Help each other

Ask others to read your proposal critically

Revise, and ask someone else

Repeat. Repeat. Repeat.

Help each other

- 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
- Effective: dramatic increases in quality. There is just no excuse for not doing this

Educate your readers

- Give them a check-list of things to look for (e.g. 4 slides ago)
- Strongly discourage them from correcting spelling and grammar, except just before submission
- Ask them to spend 30 minutes max reading. A proposal MUST deliver the payload fast. [This also makes it easier to get reviewers.]

Attitude

- To every unfair, unjustified, and ill-informed criticism from your reader, respond *"That's very interesting… here is what I intended to say… how could I rephrase it so that you would have understood that"?*
- Better get criticised by your friendly colleagues than by panel member at the meeting.
- Much easier do face to face than by email

Nominated reviewers

- If the agency wants you to nominate referees
  - Ask them first
  - Including a draft of the proposal
- It's only politeness to do so
- They may give you useful feedback
- Negative reviews from nominated proposers make you look like a wally

Know your funding agency

- Most funding agencies have web pages giving advice about proposals: read them
- Read the call for proposals
- TALK to the funding agency. On the phone.

Good news!

- The general standard (of proposals, not of the underlying research) is low
- So it is not hard to shine

(Although, sadly, that still does not guarantee a grant.)

www.microsoft.com/research/people/simonpj