Proposal Writing Tactics

Ken Stevens

Senior Projects
Proposal Writing Tactics

- Topics
  - Motivational nugget
  - Purpose of a Proposal
  - Tactics for writing a good proposal
Personal Benefits of Writing

Some simple facts

- we hold written documents to a higher standard than either thoughts or speech
  - good writing won’t make up for bad ideas
  - writing down an idea will often force you to make it better
    - bad organization is easier to see
    - holes in the argument become more apparent
  - often writing down a bad idea will make it go away
  - a clear and complete presentation exposes weaknesses
- writing often occurs over a longer period of time and is state preserving
  - unlike thoughts which morph
  - or speech which is even more ephemeral
  - good writing often evolves
    - one of the points of this lecture is to think about it as a process
Writing as Communication

- Nuances vary with document type
  - notion of permanence
    - research papers, specifications, standards
    - historical documents
  - making things “official” and binding
    - laws
    - contracts
  - augments the human memory
    - record of decisions and reasons
    - clarifies what was planned
  - advertises intent

- Your project proposal
  - has aspects of all
    - records, clarifies, has permanence, and is in essence a contract for your grade
Writing Skills

- No silver bullet
  - writing well requires practice
  - writing well requires discipline

- Necessary and largely sufficient conditions
  - a good idea
  - a good story
    - it must be clear
    - it must be organized
  - a technically correct presentation
    - if you can’t write clearly and correctly no one will read or care
      - proposal failure since you didn’t sell your idea
    - this is true at each grain size
      - clauses, sentences, paragraphs, subsections, sections, . . .
      - they ALL have to make sense and be organized
Academic Research / Project Proposal

- Serves multiple purposes
  - solicit advice and interest from advisor
  - establish a contract with a sponsor/advisor/company
    - true for dissertation and external research proposals
  - review credibility before committing resources
    - both time and money
    - the biggest role for this particular course
  - BUT there is a personal benefit
  - help you thoroughly think through a problem before committing resources
    - saves both time and money
    - often the least recognized benefit
    - often the most important benefit
Tactics: From Ideas to Publication

1. Focus:
   • What is the key idea?

2. Pre-Proposal:
   • What is the key idea?
   • Why is it interesting?

3. Proposal:
   • What is the key idea?
   • Why is it interesting?
   • How will it be done?

4. Paper
   • What is the key idea?
   • Why is it interesting?
   • How will it be done?
   • How well did it work?
Statement of Focus

● Writing a good one is very hard
  ● need a single sentence that captures the essence of the idea
  ● need a clear hook to capture the reader’s attention & imagination
    ■ lead with the idea?
    ■ lead with the background?
    ■ lead with the relevance?
  ● no pat answer – try it multiple ways and see what works
    ■ ideas influence the organization
    ■ personal style also contributes
      ● bottom up or top down:
        in the beginning there was a hydrogen atom . . .

● You may need to
  ● consider several ideas
  ● write focus statements for each until a winner emerges
General Tactics

- The following tactics
  - attempt to cover both BS theses and Senior Project proposals
  - hence is a bit general and not particularly format specific

- The focus, pre-proposal, proposal steps
  - still apply
  - we’re now just going to discuss some more specific approaches
Proposal as Information

- Make sure the following questions are answered
  - what is the problem?
  - what existing work relates to this problem?
  - why is the problem significant?
  - what strategy is being proposed for attacking this problem?
    - what is the thesis that forms the core of this proposal?
    - what will be done to support the validity of this thesis?
  - why is this a good strategy
    - do preliminary results support this strategy?
  - what will be the original contribution of this work?

- Note:
  - project, thesis, or industry will interpret these criteria slightly differently
A Good Proposal Must Be:

- written concisely
- clear
- interesting and attract the audience attention
- informative and demonstrate your understanding of the proposed project and its issues
Elements of a Proposal

- Abstract
- Introduction
- Background
- Proposed Work
- Schedule
- Required Resources
- Summary
- Bibliography
Abstract

- A brief summary of the proposal
  - the nature of the problem
  - importance of the problem
  - objectives of the research of effort
  - outline methodologies to be used
  - the hoped for accomplishments

- A note on brevity
  - if you can’t write an abstract in a few sentences
  - you probably don’t really understand your idea very well
Introduction

- Content
  - a few paragraphs describing the problem and the proposed research

- Not a summary
  - don’t duplicate the abstract!

- You must convince the reader that
  - the problem is interesting
  - you have defined the problem sufficiently will that results are likely

- Opening paragraph
  - is the most important
  - it must capture the readers interest
    - without resorting to hyperbole
      - remember we’re engineers not sales people
    - without exaggerating or making unsupportable claims
      - they just start the bogon alarms in the reviewer’s mind
Introduction Presents the Thesis

- Focus on the idea and the problem
- Common errors
  - describe the problem and just say you’ll solve it
    - method and prior results missing
  - describe the technique without the problem
    - I’ll build a system to do $x$
  - note: for a project this may be okay
    - it is preferable to have a problem to solve that is what engineers do!
Goals and Objectives

- Often organized to correspond with milestones
  - emphasize what is to be accomplished
    - not how it will be done
    - often appears with other sections
    - part of the introduction for high level goals
    - part of the schedule for more detailed goals

- BEWARE
  - poorly defined objectives are a common trait for efforts that are doomed from the start
  - don’t spend time on the project/research until you are clear about the goals!
Background

- Review of previous work
  - related to your topic, work that you use, or alternate approaches
  - contrast and compare them with your work
  - organize into logical groups
  - need not be exhaustive but MUST be representative
  - work cited should be:
    - pertinent
    - correct
    - able to demonstrate your knowledge of the field

- Proper length
  - too short $\Rightarrow$ writer is either lazy or uninformed
  - too long $\Rightarrow$ writer may not understand the problem clearly
Proposed Work

- Various organizations work
  - specific aims
    - outline the activities
    - describe specific steps
    - emphasize how the goals will be achieved
  - Demonstrate
    - you have defined your problem well
    - you have a clear understanding of how to attack it
  - Rationale
    - why should this work be done at all
    - why should it be done the way it’s being proposed
      - important when several approaches are possible
  - Originality
    - what’s different about the proposed effort
      - required for Ph.D. dissertations
Proposed Work (cont’d)

- Plan of Work
  - steps of your intended solution
    - integrated with aims but more specific and more procedural
    - what will be done and how
  - appropriate level of detail
    - this is a tough one to decide
    - provide enough so your reader knows:
      - you have thought through your problem
      - you have already developed an approach which has a reasonable chance of success
    - excessive detail won’t be read
      - when the page budget is fixed you lose on this one
Proposed Work (cont’d)

- Preliminary results
  - best way to demonstrate credibility

- Downside
  - weakens creativity claims
  - is the proposal just an evolutionary work since the original part has already been done?

- Options
  - present preliminary work as seed work to provide proof of concept for the approach
  - preliminary work responsible for the development of the current thesis
Proposed Work (cont’d)

- Illustrations are very useful
  - provides succinct overview
    - problems, approach, sample results
  - shows how various tasks fit together
    - shows temporal dependencies
    - shows task parallelism
  - critical for multi-person projects
Three Levels of Detail

- Goals and Objectives
  - declarative and high level

- Specific Aims
  - declarative but specific
    - what needs to be done

- Plan of Work
  - procedural and with operational details
Schedule

● Shows work flow
  ◆ in a temporal sense
  ◆ often done graphically
    ■ GANT chart

● Demonstrates
  ◆ organization and understanding of project tasks

● Estimated start and completion dates
  ◆ good ones also include specific resource usage

● Realize
  ◆ scheduling things accurately requires LOTS of practice
  ◆ in academia we usually don’t do this well
    ■ so be conservative
Project Demonstration

- How will the work be evaluated
  - what constitutes success
  - what criteria or tests must be met
    - how do you test that they have been achieved
    - stay away from subjective measures
  - best is a scientific *metric*

- Note
  - very few proposals do a good job on this
  - distinguish yourself from the mutts and nail this one
Required Resources

- Proposals have a budget
  - the necessary resources need to be described and justified to make the budget acceptable
    - people, parts, space, test equipment, etc.
  - inherently more complicated in CE land due to electronics requirements
  - need to distinguish between standard resources that are available at your institution vs. project specific need that need to be acquired in order to make the project succeed.
Summary

● Makes sense for a proposal
  ● what will be the significant contribution of this work
    ■ significance of the research is the focus
    ■ emphasize original contribution
    ■ for Senior Projects
      ● also can emphasize the educational value
      ● e.g. you want to develop skills in doing X
    ■ make sure you don’t duplicate the abstract and introduction

● Probably doesn’t make sense for many projects
Bibliography

You should include an Acknowledgment section before the Bibliography if individuals provided direct support in terms of funding or technical help to complete the project.

The bibliography contains related work and indirect information you received through publications.

- Complete list
  - of references cited
    - web references are OK
    - published references are preferred