Proposal Writing: Why this, why now, why me?

Mariesa L. Crow
crow@mst.edu

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The Heilmeier Catechism

(George Heilmeier DARPA Director 1975)

- What are we trying to do?
- How is it done today? Who does it?
- What are the limitations of the present approaches?
- What is new about our approach? Why do we think we can be successful at this time?
- If we succeed, what difference do we think it will make?
- How long do we think it will take? What are our success benchmarks?

Attributes of a Successful Proposal

- Clear, concise project objectives
- Strong motivation (need for research)
- Thorough analysis of the state-of-the-art (background)
- Clear research progression with definable milestones
- Adequate resources (laboratory, team expertise)

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Introduction and Overview

- Provide reviewers with an outline of your proposed project which you will fill in later
- After the first 2 - 3 pages
  - Reviewer should be intrigued and excited
  - Should have a basic understanding of your project and why it's **significant**
  - Should be convinced that this research is a great idea
  - Will just be looking for details to confirm you can do what you say you'll do

Project Objectives

- Single most important part
- Focus reviewers' interest
- A clear concise statement of intended contribution to field
- Significance of contribution

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Mousetraps

- What are we trying to do?
- What is special about our approach?
- Why?
- How?
- Who?

Common mistakes

- Many reviewers will subconsciously make recommendation within the first few pages of proposal
- Objectives not clearly stated - force the reviewers to infer objectives
- Objectives are buried within the text of the proposal - the importance and relevance may be missed

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Suggestions

- Boldface or *italicize* important aspects (use judiciously)
- Use bullets to stress main themes and/or objectives

Motivation

- Clearly state: Why is there a need for this research? What is the existing problem? Why is the topic timely?
- Must convince the reviewers that this is a worthy research project - reviewers will not recommend funding for problems that are merely "interesting" - there must be a need and application
- Cause and effect - what is causing the problem? And what is the effect on the industry?

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The Background Section

- What is the current state of knowledge and how does this relate to your project?
- What are the holes in knowledge and how will your research fill them?
- Cite important work but don't provide a comprehensive literature review covering the entire history of the subject
- Keep relating discussion to your project
- Typical length: 3 – 4 pages

Background

- Not just a “literature survey”
- Describe (tactfully) the merits of existing methods
  - advantages
  - disadvantages
- What does the proposed method offer that is lacking in other approaches?
- Describe any previous work that supports the proposed project, including:
  - promising results
  - preliminary development of proposed research directions

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Project Description

- Flexible Structure
- Typical Outline
  - Introduction, overview, objectives
  - Background
  - Preliminary Results
  - Experimental Plan
  - Broader Impacts
  - Timeline

Project
Description

Do I Need Preliminary Data?

- Expectations vary by discipline
- How risky is your research idea?
  - Do you need preliminary data to demonstrate feasibility?
- How strong is your track record?
  - Do you need to demonstrate your mastery of the methodology?
- Are there potential showstoppers that could be explored with some preliminary experiments/calculations?

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Preliminary Data

- Sometimes folded in with Background, but be careful!
- Summarize up front the significance of your data as it relates to your project. Beware getting bogged down in too many details
- Be clear who did the work – beware passive voice and the royal “we”

Research Plan

- How will you accomplish your goals, step by step?
- Need enough details to convince reviewers you have a well-developed plan that is likely to succeed
- But don't drown reviewers in non-essential details
- More details needed for the first 2 or 3 years
- Discuss how you will deal with any potential showstoppers

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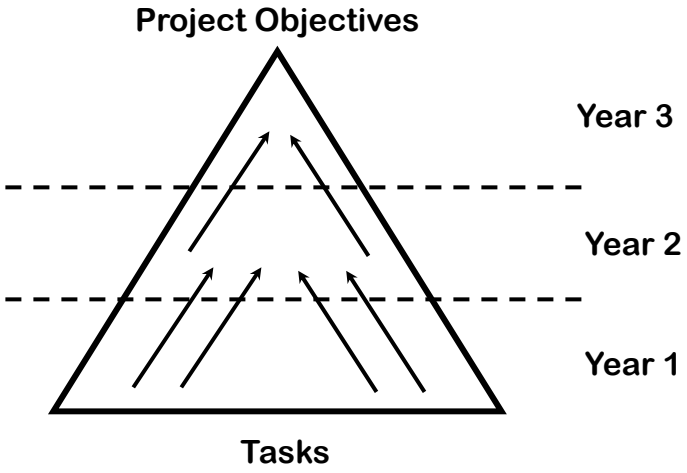
Research Plan

Give a concise overview before launching into details.

- What are the objectives?
- What are the required tasks?
- What will be your overall approach?
- What are the roles of your collaborators?

Research Progression



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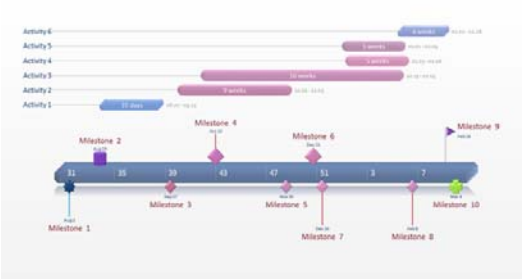
Activity

- Sketch a flow chart of your research plan including all major tasks and subtasks
- Indicate critical or high-risk tasks
- Show special resources or collaborators if applicable



Resources

- Describe any unique experiences the investigators have
- Useful laboratories and equipment
- Industrial partnerships
- Access to data

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Other suggestions

- Talk to the program manager in advance of submission
- Obtain (if possible) copies of successful proposals to the same initiative
- Have others read and give comments
  - editorial
  - technical
- Fill out forms in advance
- Resubmit and learn from reviewers' comments

Persevere Intelligently

- Plan on rejection
  - Funding rates typically 20% or lower
  - Even the best researchers are declined more than they are funded
  - Agencies expect you to revise and resubmit
- Learn from declined proposals
- Pursuing grants is like honing in on a target

Analyzing the Reviews

- Did the reviewers have particular concerns that you can address?
- Were the reviewers confused or unclear about your project?
- Were the reviewers unimpressed by the significance or novelty of your research idea?
- Were the reviewers generally favorable, with no clear issues brought up?
- Did the project topic not fit the program?
- Be careful about chasing one comment by one reviewer – look at the Panel Summary