How to Write a Successful Scientific Research Proposal

Hossam Haick
The Department of Chemical Engineering and Russell Berrie Nanotechnology Institute, Technion – Israel Institute of Technology, Haifa 3200003, Israel.
Email: hhossam@technion.ac.il
Motivation for Research Proposal!

– A **scientific project proposal** is a request for financial support to execute a scientific idea and/or project, through the following components:
  - **Funding equipment** and laboratory facilities
  - **Funding researchers** (pre- and post-graduate researchers)
  - Opening opportunities for **collaboration** with others

– A **scientific project proposal** is an important indicator of external approval of your activities and an important parameter for your promotion.
Which ideas can be targeted?

Research proposals might target either basic science or technological ideas or combination of both. This might include, but not confined, to:

- A **completely new, high-risk** basic idea that would revolutionize a specific field of research.
- A **better solution** to a **known problem** (improved methodology or detection approach for a given application)
- **Multidisciplinary ideas** (e.g., biology and solid-state physics)
- etc.
Preliminary Work – **Call Assessment**

- **Suitability of the Call**
  - Does the research call match your research ideas and research scope?
  - **If not**, you can:
    - Adapt your ideas to fit an existing program
    - **OR**
      - Propose your own ideas to a program
      - Sometimes only in specific moments, e.g., public calls for ideas
Preliminary Work – **Call Assessment**

- **Eligibility**
  - Are you eligible to apply?
    - Age
      » Young researchers, experienced researchers
    - Theme
      » Starting grants, excellence grants, mobility grants, consortiums, etc...
Preliminary Work – **Partners**

- **Identify the need for external partners**
  - Based on your research idea and the expected implementation strategy

- **Contact potential partners**
  - Look for partners that have a **proven ability** to successfully implement specific part (niche) your proposed idea
  - State your **research idea** and its related components
  - Clarify the expected **contribution** form the partners
Tips Before we Start Writing!

- Part of the reviewers might not be experts in the proposed research field.
- Make the proposal accessible to a broad audience. However, make sure your idea is not too broad.
- Plan a research that has moderate-high chances to be implemented during your award.
- Prioritize your hypothesis and focus on the more convincing ones.
Structure of a Project Proposal

- **Typical structure**

  - **Summary**
    - Title, acronym
    - Project summary
    - List of participants

  - **Description of Work**
    - Background (or progress beyond the state of the art)
    - Statement of the targeted idea / problem
    - Objectives and justification
    - The suitability of the proposal to the call
    - Research plan (including methodology and preliminary results)
Structure of a Project Proposal

– Typical structure (cont.)

• Outputs
  – Publications, patents, prototypes, tools, ...

• Budget
  – Numbers, justification of resources, value for money

• Project management, monitoring and evaluation
  – Management structure, etc.

• Team background
  – Projects, publications, CVs

• Dissemination plan
  – Channels and the actions to publicly disseminate the project results
Details of Research Proposal

Title of the research proposal

**Good**

- Concise title that gives reviewer a general sense of what you are investigating.

**Bad**

- Too long and/or too short and/or too technical title might lose the main message of the proposal.
Details of Research Proposal

Co-applicants

**Good**
- Co-applicant can bring complementary skills for proper implementation of the general idea of the proposal.
- Co-applicant with strong track record could strengthen the application for junior investigators with a limited track record.

**Bad**
- Co-applicants that serve for “decoration” are considered a weakness.
- Co-applicant do most of the work proposed in the proposal.
Details of Research Proposal

Non-scientific summary

Good

- Written in lay-term (as much as possible)
- Avoid acronyms
- Justifies the project importance, compared to state-of-the-art
- Presents the impact this research will have on investigated field

Bad

- Using technical language
- Do not use acronyms (as best as you can) even if they are defined.
Details of Research Proposal

Summary of the research proposal

Good

• Give a short but informative background to justify the research hypothesis and objectives.
• Clearly state the hypothesis.
• State the objectives and/or aims of this proposal.
• State the impact, significance and innovation in this proposal.
• Define acronyms as much as possible.

Bad

• Technical and condensed phrasing of the project.
• No clear statement of what is the purpose of this study.
Details of Research Proposal

Background

**Good**

- Background has to go from broad to specific information.
- Compose the background in a way that it make preparation for the motivation and objectives of your proposal.
- The background has to briefly discuss preliminary data. This is an indication of “feasibility”.

**Bad**

- Do not expand background to unnecessary information that does not support your idea and/or hypothesis.
- No preliminary data indicates the applicant might not be able to do the proposed work.
Details of Research Proposal

Goals and/or objectives of research

**Good**
- Contain direct-to-the-point information on the need, hypothesis, and objectives of the research.
- Should state the innovation of this proposal, compared to the state-of-the-art.
- It should **demonstrate** the significance and impact of the expected project.

**Bad**
- Too short might be linked with missing important information that are need for critical understanding of the project.
- Too long might be screen the main message / target of the project.
Details of Research Proposal

Rationale and hypothesis

**Good**
- Make a clear differentiation between the rationale and hypothetic aspects of the proposal.
- Clearly state the hypothesis on which the proposal is built.
- Justify the need and importance to investigate and/or use this hypothesis.

**Bad**
- Combining the “rationale” and “hypothesis” aspects together, in the same sentences. It could be confusing.
- Long hypothesis and/or related technical details makes it hard to understand the objectives of the research.
Details of Research Proposal

Research strategy: Approach

**Good**
- Describe the **overall** strategy, methodology, and analyses to be used in the project.
- Discuss any potential problems, alternative strategies, and benchmarks for success anticipated to achieve the aims.
- Define the project timeline (Gantt chart)

**Bad**
- Technical details or detailed explanations could disturb the focus of the proposal and the attention of the reviewer.
- Excess of independent techniques might be sometimes problematic.
Details of Research Proposal
Research strategy: Risk analysis & contingency plan

**Good**
- Add controls to the taken approaches.
- Make a declaration about the expected results of your project.
- Provide alternative approaches, as a way to handle possible pitfalls.
- In case there are no preliminary data, address the feasibility of the project via sources from the literature.

**Bad**
- Many specific aims is bad. If it is too ambitious, it will negatively impact on reviewers.
- Avoid too much details on experiments.
- Too much dependence between the various objectives might put the project in high risk.
Details of Research Proposal
Significance and impact

**Good**
- Provide claims to support the innovative aspects of the proposal.
- Present the impact for both the short-term and long-term.
- Present (as much as possible) wide range of fields / topics that might be impacted from the project, either directly or indirectly.

**Bad**
- No statement on the novelty of the project.
- Superficial.
Details of Research Proposal

Project management

– Describe the **project management, follow-up and relevant evaluation** mechanisms, such as project costs, quality of obtained results, schedule, etc. as well as related control mechanisms.
Details of Research Proposal

Budget

**Good**
- Give a detailed account of where and how you expect to allocate the budget.
- Allocate the budget according to the preferred guidelines of foundation.

**Bad**
- Do not spend all the budget on personnel, or, vice versa, on supplies.
Details of Research Proposal
All other operating grants

**Good**
- Declare all operating grants.
- Declare 0% or 100% overlap.
- In this granting environment it is reasonable to apply from multiple sources to get funding.

**Bad**
- Do not state 25-50% overlap with operating grant.
- The review committee going to treat this grant as 100% overlap.
Details of Research Proposal

Applicant’s CV details

**Good**

- List all awards especially awards directly related to your research.
- List all publications in the last five years.
  - *Abstracts are an easy way to show productivity.*
  - *Give impact factors for publications and citations if any.*
  - *Give ranking of journal in your field of research if possible.*

**Bad**

- No evidence of research activity or track record.
- All middle authors for publications.
General Tips for Successful Consortium Grants
What makes a good scientific proposal

- **Successful strategic approach**
  Relevance and applicability of the proposal to tackle the stated challenge via a robust and/or multidisciplinary, approach by integrating unique knowledge.
What makes a good scientific proposal

- **Governance**: Quality and relevance of the governance model for implementing the call’s strategy including the choice and suitability of the applicant Legal Entity and involvement offers’ top management in the proposer’s governance.
What makes a good scientific proposal

- **Impact and competiveness:** Short, mid and long-term potential impact on human capital, job creation, economic growth and its relevance in the context of the call’s strategy and the foundation’s Strategic Innovation Agenda.
What makes a good scientific proposal

° Added-Value, innovativeness and Synergies: Novelty of the scientific and/or strategic approach and competitive position; readiness to establish concrete synergies and complementarities with relevant global initiatives.
What makes a good scientific proposal

° **Leadership and operations**: Quality of the leadership team profiles and their executive power over all of the proposal’s strategy and S/T plan implementation. Effectiveness of the operational structure including quality and demonstration of how activities (education, research, and innovation) are integrated in the S/T-driven Knowledge Triangle.
What makes a good scientific proposal

° **Partnership**: The combined strength of the partners forming a diverse, balanced, collaborative and world-class partnership.
What makes a good scientific proposal

° **Business model and financial plan (optional):** Feasibility of the proposal’s business model and financial plan for achieving market targets and strategic milestones; financial plan for achieving return on investments and financial sustainability in the long-term with a progressive phasing out of the project’s funding; a plan for the management and exploitation of intellectual property supporting the project’s business model.
What makes a good scientific proposal

- **Communication, outreach and dissemination (optional):** Quality and relevance of the project communication strategy including the contribution to building the foundation identity; quality and relevance of the outreach and dissemination plans, including sharing good practices, within, between and beyond the project, across the participating partners, regions and institutions.
Details of Research Proposal

Dissemination

• The need
  – Channels and the actions to **publicly disseminate the project results**

• How?
  – **Project identity**
    • For all public communication
    **Internet**
      • Project homepage
  – **Scientific publications and events**
  – **Press releases**
    • Attained results
  – **Demo installations**
It's Possible