5 A Research Proposal

This chapter covers:

- Types of proposals:
  - As an assignment at the start of graduate work
  - To a funding body
  - To a commercial organisation
- Writing for the non-expert reader
- Writing for the commercial sector
- Checklists

This chapter is written as a short basic guide. There is a wealth of online information, particularly for grants aimed at European Union (EU) organisations, and US organisations such as National Institutes of Health (NIH), National Science Foundation (NSF), Defense Advanced Research Projects Agency (DARPA) and others.

Types and Purpose of Proposals

1. **As a possible assignment at the start of postgraduate work.**
   Purpose: So that your supervisor can see that you have a clear idea of previous work in the area, the research problem and the procedures you will use to tackle it.
2. **Together with the supervisor, as a proposal to a funding body or an outside organisation to persuade them to fund your research.**
   Purpose: To convince the funding or commercial organisation that your work will be of value to them and to persuade them to fund it. In some cases, this can occur after you have already been working on the research topic for some time.

How to Write It

As an assignment at the start of your postgraduate work

You need to clearly explain the following:

1. The objectives of your proposed research
2. Previous work in the area
3. How you are proposing to tackle it

Writing for Science and Engineering.
DOI: http://dx.doi.org/10.1016/B978-0-08-098285-4.00005-4

4. The time frame for each stage
5. Facilities, resources, laboratory equipment and technical help needed

A possible structure

Summary	See Chapter 3: *An Abstract, a Summary, an Executive Summary,* page 53
Research Objectives	See **Objectives**, Chapter 2: *The Core Chapter*, page 30
Literature Survey or ***Background*** Supervisors will realise that at this early stage, you will not have come to grips with very much of the literature. But they will expect a clear explanation of the general framework of the research that has been done in your area, together with appropriate specific work.	See Chapter 4: *A Literature Review*, page 63 and **Background**, Chapter 2: *The Core Chapter*, page 30
Materials and Methods or ***Procedures*** This will need a description of the expected stages of the research and an outline of the techniques you expect to use during each one. It may be effective to describe each expected stage and its procedures under an appropriate series of headings. **Tense of the Verb** Use the **future** form. Note: A *Materials and Methods* or *Procedures* section in other types of papers uses the past tense: **The bacteria <u>were cultured</u> on both solid and liquid media (*past tense*).** In a research proposal: **The bacteria <u>will be cultured</u> on both solid and liquid media (*future tense*).** **For tightly defined topics** (such as those for some master's level theses or smaller projects, e.g. diploma projects): You and your supervisor may already know almost exactly how you are going to tackle the project. It will be relatively straightforward to explain this. **For those topics that are less well defined** (such as Ph.D. projects and projects where you will follow research leads and possibly construct equipment or devise methods of which you may not have any clear idea at present): State clearly how you propose to tackle the first stages of the project. Then follow with a reasoned description of the framework that the research is likely to follow and the possible procedures that may be needed. *Example:* **The initial stage of this study will be made up of…This will be followed by…If it is found that…, the next stage will consist of…**	See **Methods**, Chapter 2: *The Core Chapter*, page 36 and **Methods**, Chapter 6: *A Journal Paper*, page 83

If needed: ***Schedule of Tasks*** or ***Time Management*** or ***Expected Time Frame***	See *Schedule of Tasks/ Time Management*, Chapter 2: *The Core Chapter*, page 33
Resources The facilities, resources (including interactions with other organisations), laboratory equipment and technical help needed.	See *Requirements*, Chapter 2: *The Core Chapter*, page 35

A Proposal to a Funding Body or to a Commercial Organisation

General criteria by which an application for financial support is judged:

1. The validity of the central concept.
2. The soundness of the experimental design.
3. The significance of the research.
4. The relevance to the funding organisation's programme.
5. Your competence and that of the other personnel who will be involved.
6. The adequacy of the research facilities.
7. The appropriateness of the budget. (Remember that too modest a budget proposal can be as damaging as an overblown one; it shows your poor judgement.)
8. If appropriate: the validity of the evaluation mechanism. The more novel the project, the more it will need an effective programme for evaluating it.

A proposal to a funding organisation

Application forms are usually provided; therefore, the recommended sequence of sections is automatically determined.

Otherwise, the standard *TAIMRAD* structure of a journal paper is acceptable (*Title, Abstract, Introduction, Materials and Methods, Expected Results, and Discussion*), with emphasis on the **significance of the proposed work with respect to the concerns of the funding body**.

In addition to the above:

- Evidence of your ability to carry out the work (your position, publications, honours and awards)
- Facilities available to you (including interactions with other organisations)
- Cost estimates

There are a few fundamental guidelines to remember:

1. **Follow the instructions immaculately.**
   Read them thoroughly a number of times, and keep referring to them while you write the application.
2. **Don't exceed the stipulated total length.**
   Don't be tempted to think that exceeding the word limit is justified in your case because the proposed work is so important or too complex to fit into it. Moreover, don't consider

reducing the font size or line spacing to fit more in. You need to compete on the same basis as other applicants, and deviations from the rules will only irritate the assessors.

3. **Design your application with both specialists and non-specialists on the committee in mind.**
   Embedding your detail within a framework of cleverly designed headings, subheadings and listed points will make it much more easily accessible to all your assessors, both specialist and non-specialist. It is a much greater achievement to be able to design a readily navigable document with a clear logical pathway – the red thread – through it, than to bombard your assessors with solid detail.
4. **Don't skimp on research design and methods: get expert help on study design.**
   This material will be assessed very critically by your specialist assessors. Make sure that you describe not only your methods but also the design of your experimental work, i.e. why you choose to tackle it this way.

Assessment by the funding organisation of your proposal

Most funding organisations will probably judge you on the following seven points:

1. **What you want to do**: a listed series of objectives.
2. **Why you want to do this research**: the context of the work and the gap in the knowledge that you're aiming to fill.
3. **What you have done already**: your preliminary results described so that they are relevant to your stated objectives.
4. **How you are going to do it**: you research design and methodology.
5. **Possible conclusions** to be drawn from your proposed work.
6. **What your results will be useful for**: the possible applications of your proposed work in relation to the funding body's interests.
7. **Your track record, of you as a person or as a team.**

Assessment criteria: what you need to cover

1. **Rationale for research**
   Why should the research be done?
   What will it address?
   How does it fit into the research landscape?
   Include statement of purpose/research aims, hypothesis, new knowledge, Technical advance, innovation
2. **Research design and methods**
   Scientific protocol, sample recruitment and characteristics
   Feasibility
   Study methodology
   Validity of the data (make sure results would be significant)
   Timelines
3. **Anticipated outcomes/impact on the goals**
   How will the research contribute to one of the goals?
   How will it address the problem or contribute new knowledge?
   How will knowledge be transferred to end users?
4. **Track record of the research team**
   Describe relevant track record to show the team can deliver the proposed outcomes
   Highlight key skills for expertise
   Justify staff roles

A research proposal to a commercial organisation

There are two aspects that will influence the way you write your proposal:

1. The main concerns of the organisation's personnel will be their business plan and whether your work will contribute to the company's competitiveness and profitability. They may have little or no interest in the academic implications of your proposed work.

Some large companies are wealthy enough to be able to fund "blue-skies" research, knowing that they will eventually be able to use the intellectual information to contribute to their wealth. However, many companies have to concentrate on their immediate or mid-term plan; they will therefore be more receptive to projects that will require minimum additional development and/or commercialisation costs and will provide quick returns to the company.

2. Your report will need to be understood by people with no expertise in your particular field.

There may be no one who is familiar with the basic knowledge and terminology of your subject. Even in companies that have the expertise, your report may be passed on to people such as financial personnel.

Your report should therefore:

- Sell your research to the organisation, without misrepresenting, exaggerating or appearing pushy.
- Emphasise the potential advantages of your research to the organisation's profitability.
- Assure the organisation that they will have full and uninterrupted access to your progress at all times.
- Use a *Glossary of Terms* to clearly explain terminology that may not be familiar to the organisation.
- Be written in language that does not need expert knowledge to be understood. But it shouldn't be oversimplified.
- Be very concise, well presented and clearly worded, without elaborate justifications or full descriptions of complicated techniques.
- Be easy to navigate through, with a clearly defined pathway that enables a non-expert to understand the material. See **The Importance of Overview Information: Building a Navigational Route through Your Document**, Chapter 1: *Structuring a Document*: *Using the Headings Skeleton*, page 11.

Questions to ask yourself

While you are putting together the proposal, you need to ask yourself:

- What is the commercial significance of my proposed research?
- What questions will they expect to be answered?
- How can I write this so that it will be understood by a person without specialist knowledge in my field?

Depending on the type of organisation, you may need to avoid the classic, scientific *TAIMRAD* format of *Title, Abstract, Introduction, Materials and Methods, Results and Discussion,* and aim instead for a structure that is more suited to a commercial organisation.

Suggested structure for a proposal to a commercial organisation

You may not need all of the following sections.

Cover Page Includes the name of the organisation to which the proposal is being submitted and title of proposal: **Proposal to** (*description of what you propose to do*)	See **Title Page**, Chapter 2: *The Core Chapter*, page 21
Executive Summary (on a separate page following the cover page) A summary written in non-specialist language outlining what you propose to do and how it would benefit the company.	See **Executive Summary**, Chapter 3: *An Abstract, a Summary, an Executive Summary*, page 53
Research Objectives Clearly and briefly describe the aim of the research. In presenting the focus from the company's point of view, do not try to anticipate your results. Just say what you are aiming to do At the end of this section state that: • **Results will be presented in the form of a report to be used by (*name of the organisation*).** • **The research personnel will be available for discussion on any part of the document for a mutually agreed upon period of time after completion of the report.** • **Submission of the final report will be approximately (*x months*) after the start of the project.**	See **Objectives**, Chapter 2: *The Core Chapter*, page 30
Present the expected stages of the work in sequence At the end of each stage, use a subheading ***Outcomes***; in this section, say what you expect the outcome of each stage of the work to be. This does not mean anticipating the results; it means stating that at this point, you will be able to say, for example, which one of the several growth media is the most efficient at promoting cell growth.	
Schedule of Tasks or ***Time Management*** or ***Expected Time Frame*** State your expected time schedule of the following: **1.** The various tasks (possibly with a Gantt chart, *see Figure xx*, page xx) **2.** The reports that you will write for the organisation, e.g.: • Preliminary report: 3 months • Interim report: 6 months • Final report: 9 months	See **Schedule of Tasks/ Time Management**, Chapter 2: *The Core Chapter*, page 33

Expected contents of the final report **1. State what you expect the final report to contain.** ***For example:*** • **The report will present the results of (…), together with analysis and discussion appropriate for consultancy purposes.** • **The report will discuss (*the various aspects of the experimental work*).** • **The report will discuss the design, operating and maintenance strategies of (*equipment that you may be developing*).** You may also need to state that: **2. The report will be finalised in consultation with members of (*name of the organisation*). This ensures that the organisation knows that they will be involved in the final version of the report.** **3. Discussion of the results and oral presentation of the work will be available on request. This ensures that the organisation knows that they have full and uninterrupted access to your progress at all times.**	
Requirements A description of what you expect to need, other than money, from your funding organisation during your research.	See **Requirements,** Chapter 2: *The Core Chapter*, page 35
Costs A description of the money you expect to need from your funding organisation during your research. This should be discussed and agreed on with your supervisor/immediate superior/university commercialisation division before submission of the proposal to the potential funding organisation.	See **Costs**, Chapter 2: *The Core Chapter*, page 36
Ownership/Confidentiality An agreement between you and the commercial organisation funding you that gives you some right of publication of your results, while assuring the organisation that you will not divulge commercially sensitive information.	See **Ownership/ Confidentiality**, Chapter 2: *The Core Chapter*, page 35
Evidence of your ability to carry out the work Your position, publications, honours, awards.	

Checklist for a Research Proposal at the Start of Academic Work

Does the proposal contain the following:

☐ A clear explanation of the general framework of the previous research in your area, together with appropriate specific work
☐ A clear statement of your objectives

- ☐ The expected stages of the research and the expected methodology for each one
- ☐ A description of the time frame for each stage
- ☐ Facilities, resources, laboratory equipment and technical help needed

Checklist for a Proposal to a Funding Body or a Commercial Organisation

- ☐ Does the title give immediate access to the main point of the proposal?
- ☐ Does the *Executive Summary* or *Abstract* give an accurate and informative overview of the whole document, without being vague?
- ☐ Are your research objectives clear?
- ☐ Does the *Introduction* briefly identify the following:
  - ☐ The critical problems *and*
  - ☐ Your main purpose
- ☐ Do you show all of the facilities and resources needed for the project?
- ☐ Do you describe the expected stages of the research and the expected outcome of each?
- ☐ Do you describe your qualifications and those of other personnel for carrying out this work?
- ☐ Do you show the expected time frame for completion of the following:
  - ☐ The next stage
  - ☐ The whole project (if necessary)
- ☐ Do you itemise the costs as accurately as possible?
  - ☐ Have you underbudgeted?
  - ☐ Is your budget overblown?
- ☐ **For a funding organisation:**
  - ☐ Do you show the relevance to its overall programme?
  - ☐ Have you explained the rationale for research?
  - ☐ Have you adequately described your research design and methods?
  - ☐ Have you given the anticipated outcomes/impact on the goals?
  - ☐ Have you given details of the track record of the research team?
- ☐ **For a commercial organisation:**
  - ☐ Do you emphasise the potential advantages to the organisation's commercial activities?
  - ☐ Do you show that you are going to fill a need for the organisation?
  - ☐ Does it assure them that they will have full and uninterrupted access to your progress at all times?
  - ☐ Is it written in terms that can be understood by a person without specialist knowledge in your field?
  - ☐ Do you clearly show what is expected from the organisation?
  - ☐ Are ownership and confidentiality issues adequately addressed?