Guide to Writing a Prospectus

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This brief guide is provided to aid you in writing the M.S. or Ph.D. prospectus required by the BYU Chemical Engineering Department. In addition, I recommend you carefully review the companion document *Guide to Writing a Scientific Paper*, which gives much additional advice.

1 What is a Prospectus?

The prospectus is a *research proposal*. It is written to gain approval to carry out the M.S. or Ph.D. project. In defining the scope of your project, the approved prospectus becomes a kind of contract between you and your committee so that you know when you are done. It is recognized that you may change directions along the way, but with the prospectus in hand you have a place to start and an idea where to stop.

Because the prospectus is written before most of the research work is done, you are trying to sell your ideas and plans. You must convince your graduate committee that

- Your project addresses an important problem in an appropriate way.
- You have adequate preparation and a plan to solve the problem in a reasonable amount of time.

The *audience* is your graduate committee, a small group of professors. They will understand general scientific and engineering concepts like process optimization, phase equilibria, kinetic vs. transport limitations, validation of numerical models, experimental design, and data analysis. However, not all committee members are experts in your subfield, and so will need to be given the appropriate background material to understand the terminology and theory specific to your project. They need to be told what is common knowledge in your subfield and what is new and innovative about your work.

2 Prospectus Content

Below is the general order of topics that I recommend, along with a suggested length for each item for a Ph.D. prospectus. The Ph.D. prospectus should contain 20-28 pages (not including bibliography); an M.S. prospectus should be half this length.

1. **Introduction (1.5 pages)**

   (a) Give a brief background of your field of work, identify a problem, and establish the problem's importance. This is your opportunity to generate interest in the audience about your project. Avoid using highly technical jargon at this point and don't make this part longer than 1 page.

   (b) State the scope of your project. Your objective must be narrow and specific: do not just say you will work on X or study subject Y. Instead give scientific hypotheses you will test or research questions you intend to answer, and outline the tools and methods you will use. What is the anticipated impact of your work, if successful, on your field?

   (c) Outline the topics that are covered in the remainder of the document, i.e. give a road map.

2. **Background (around 10 pages, with a subsection for each topic)**

   Do a more extensive background discussion on the problem, showing you have a good grasp of the field in which you are working. You are preparing your audience to understand the nature of the problem and appreciate the value of your proposed solution in item 4 below. Extensive experimental details or equations are not appropriate in a research-proposal type of document.

   This section includes your "literature review," though don't name it as such. In particular, describe where other's prior work overlaps with your proposed work, showing ideas you can gain from them or knowledge gaps that need to be filled. A Ph.D. prospectus should reference at least 30 prior works, and an M.S. about half that—some references are more important and will deserve individual and critical analysis, while other references can be lumped together as part of a discussion of related works that address a particular issue.

3. **Prior Results (around 2 pages)**

   Give prior results generated by you, showing a few quantitative or theoretical results to demonstrate you know how to get started and have been able to overcome a couple early hurdles. You do not need to show everything you have done—the purpose is to establish your credibility in carrying out the proposed research, not to provide the same level of detail that would be found in an academic publication. Frequently the best logical flow of material is to combine this section with item 2 above or item 4 below, so that there is not a separate Prior Results section.

4. **Work Plan (around 8 pages, with a subsection for each task)**

   List the tasks that are required to answer your hypotheses or questions, giving detail on the technical challenges you anticipate and how you plan to overcome those challenges. In doing so, make sure to

   - Provide the logic guiding your choice of tasks, so that the reader can see why the proposed activities are the best means of answering your questions.
   - Help the committee to distinguish your unique contribution to the field by explicitly identifying ideas that are new to your work as opposed to ideas that originated with others.
   - Make your plans specific. Figures and tables illustrating the proposed experimental design(s) are quite helpful. For instance, you can list parameters you will hold constant and parameters that will be changed (with a range of values) in your experiments or models.
   - Give alternative paths (i.e. backup plan) if your original research plan is not successful.
   - State how you will maintain laboratory safety.

5. **Time Line (0.5 page)**

   Give a time line or Gantt chart summarizing the tasks and steps that will lead to completion of dissertation or thesis, including the specific papers you plan to write and publish.

6. **Bibliography (2 or more pages)**

   Give a list of cited references, numbered in the order they first appeared in the main document. Use a consistent format taken from a scientific journal in your field.