

Thesis-Proposal Outline/Template

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1 Overview

This document provides a description of the parts of a thesis outline – and an example of such an outline. It also indicates which parts should be completed (and *how* they should be completed) for a thesis-*proposal*.

The main sections of the thesis are as follows.¹

- Introduction: Research Problem/Question Area
- Survey: State of the Art
- Research Problem/Question
- Method
- Results
- Analysis & Discussion
- Conclusions

Roughly, the thesis model described here is something like this:

Introduction (Human Concern & Research Issue) What people *want*: “there is something humans would like to improve/understand.” Some current *limitation* that motivates a specific research agenda: “*BUT*, there is some difficulty – or something we don’t understand.”

Survey (Research context) How others have tried to address the limitation: “here is what other researchers have tried – and status of their efforts.”

Research Problem/Question (Proposed contribution) What the current authors propose to try: “in order to succeed where there are still some difficulties, here is *what* we are going to try.”

Method (support for contribution) How the current authors will determine if their proposal will work: “here is *how* we ...”

Results (of tests, studies, reasoning, etc.) What happened: “here are the (‘uninterpreted’) results.”

¹Note that, in different disciplines, the sections may have different names – and the sequencing of and boundaries between sections may be slightly different.

Analysis & Discussion (of tests, studies, reasoning, etc.) What the results seem to *mean*: “and, here is an analysis & interpretation of the results.”

Conclusion Putting it all in context: “here is how our research reported here fits into the larger research context – and some promising Next Steps.”

There are several different models of “what constitutes a research contribution.” One set of issues is related to *solving a problem* (“engineering/design”) – versus *answering a question* (“science”). Another set of issues is related to distinctions of *quantitative* versus *qualitative* methods/results. And yet another issue is the question of “what constitutes a *contribution*?”

Quantitative versus *Qualitative*. It is common to read research papers or theses in which the authors claim they have done “qualitative research.” Unfortunately, depending on the papers, this can mean a) the use of qualitative methods, b) qualitative results, or c) various kinds of analysis of qualitative phenomena (“qualia”). One result of this confusion is that authors sometimes use the wrong methods for their research! For example, asking people to self-report (a common qualitative technique) on “which item they prefer” is still a study that is concerned with *quantitative results*. This means: if the researcher is really trying to figure out “which item they prefer”, the details of what people self-report can, at best, be distracting – and at worst, be irrelevant. Contrast this with research that aims to understand *why* most people prefer some item.

A *contribution* is something that helps researchers/developers “make progress” in their overall efforts to improve (or understand) some phenomenon. This contribution can be in the form of a new or improved solution – or in demonstrating *the limitations* of existing/proposed solutions.

What are some possible types of thesis contributions?

- A new theory
- A new model
- A new tool. This can be an analytical tool, a physical device, or a new method/technique.
- New “support.” This can take several forms. It could be new support for an existing theory or model, it can be support for a new model or theory or tool, or it could be new “anti-support” (that is, evidence that something already-accepted may be wrong).
- New *use*. This can be the application of an existing tool or method or theory in a situation, context, or domain where it has never been used before. (As long as it can be shown that this new use is interesting and important.)
- A special note about “comparison studies.” A contribution can also be the result of, say, a “comparison of two methods.” But, be careful: such a comparison is only a contribution if the results of such a comparison are clearly relevant to some class of professionals in your field *and* one of the following is true

– such a comparison has never been done (or done well)

– such a comparison would provide new results²

A warning about choosing a thesis or research focus. Publishable research cannot be only a “description of some work that was done.” It also cannot be “a description of some things I learned that were new only to me – but not new to other professionals.” So, proposing to “explore an issue” is *only* reasonable if a) no one has “explored it”, and b) we can reasonably expect that the results of such exploration will be interesting and useful to people in our profession.

Finally, as you read through this document, keep the following in mind. Scientific and technical publications are not written as “detective stories.” In other words, *they should not be structured to “keep the reader in suspense.”* If anything, they are the opposite: in the Introduction, the entire “plot” – *including* the “surprise ending” – is briefly outlined; the remainder of the document simply provides more detail.

2 Template

Introduction: Problem/Question Area Readers want to know what larger concern exists in the world that is still not solved or answered.

Therefore, briefly describe some larger concern that people have – and then indicate some aspect of this concern that still needs to be solved (or question that needs to be answered).

This section answers the question: *what is the problem/question area where this thesis-work proposes to make a contribution?*

Survey: State of the Art The previous section ended by stating an important problem that needs to be solved – or question that needs to be answered.

Now the readers want to know how much progress *other people* have made on solving the problem or answering the question. In other words, readers want to have a fairly clear idea about the current *state of the art* (“what has already been done”) as they read a thesis. This will help them understand how the author’s thesis-work proposes to make an original contribution to solving the problem or answering the question.³

Therefore, describe briefly the major attempts to address the problem area described in the Introduction – and their current status.

Note: in science and engineering, we are usually more concerned with *the current status of work* than with the *researchers themselves* or the *history* of progress. Therefore, structure this section according to the three main current *approaches* to the problem or question (rather than structuring it by *people/projects* or by *time*).

²Be careful here! See note below on “rolling the dice.”

³Warning! In recent years, many authors seem to be treating this section as an unmotivated requirement to simply name some “related work.” That is, the authors simply itemize “a bunch of work that seems like their work.” This is often a sign that the author’s a) do not have a clear idea about which problem or question they are trying to address, and b) do not know what attempts have been made to address those problems or questions (or the status of those attempts). *Do not fall into this trap!*

1. The Foo Approach [reference 1, reference 2, reference 3],
2. The Bar Approach [reference 4, reference 5, reference 6]
3. The Baz Approach [reference 7, reference 8, reference 9].

Note: this is *not* the place to talk about your solution. Also, although this section should inform readers about the *status* of the current research, it should not include extended criticisms of the research. (If your Research Problem/Question is based on a criticism of existing work, state the criticism there – i.e., in the next section.)

This section answers the question: *what are the major types of attempt to deal with this problem area?*

Research Problem/Question Now that readers understand what kind of work is being done in the problem area, they want to know what kind of contribution you believe you can make to the current effort. In particular, you are expected to identify a) some aspect of the existing research that requires more work, and b) what you plan to do about it.

Therefore:

1. Tell readers *what* (not *how*) you intend to contribute
2. Show that it is not yet done by anyone else (by reference to the work you described in the Survey)
3. Convince the reader that your particular contribution will be important to the overall work on the problem

In this Section the author makes a clear “promise” to the reader. And careful readers will be checking the Results and Discussion sections to see if the document delivers on the promise. In particular, it is very helpful for thesis-authors to write with a clear idea of what they would like the reader to be able to *do* as a result of reading the document. Should the reader be able to design better programs or know which models of interaction to use/avoid or create better user studies or ...?

Choosing a Thesis Focus When choosing a thesis-topic it is very important to *minimize risk*. One way to do this is to *choose a problem or question so that the results are a significant contribution no matter what happens*. For example: trying a plausible, new technique to solve an existing problem; even if the technique does not work, the knowledge that it does not work is a publishable contribution.⁴ Similarly, studying some significant phenomenon that has not yet been studied. Do *not* “roll the dice” with a thesis-topic! Example of “rolling the dice”: “I believe that my *lucky shirt* will make me invincible to bullets.” Yes, if the empirical results of testing this hypothesis support it, then this is some kind of suprising and original result. However, it is not very likely – and, if the experiments fail, no one will be surprised (ie, that expected result is *not* publishable). (This general model should even help in more subtle cases. For example, it *can* be a Good Thing to try and reproduce the work of others if a) that work is promising, and b) there is little or no other confirmation about it. Etc.)

⁴This strategy will also make it easier to describe meaningful “expected results” in a thesis-proposal. See below.

This section answers the question: *what is the author’s proposal for an original contribution to the current work on the larger problem/question area?*

Method Readers now want to know *how* the author intends to make the proposed contribution – and they want to trust the author’s choice and execution of this *how*.⁵

Therefore:

1. Provide readers with a brief description of your protocol (“what recipe you followed”) to get your results.
2. Provide readers with a brief statement of how you motivate the choice of method

This section answers the question: *what was the protocol – and why?*

Results Having read the proposed protocol, the reader now wants to know what actually happened during the study. Therefore, provide a description of “what happened.”

For a thesis-*proposal*, it is not usually possible to yet describe “what happened” (unless the author already has some partial results). However, the author can still give a good, solid indication of compelling *possible results*. For example, “we will be attempting to solve the Foo Problem by using the Bar Technique, which has never been attempted before. We believe that the Bar Technique can be successful because of reasons X, Y, and Z. And if it turns out that the Bar Technique does not solve the problem, our analysis should be able to indicate some of the reasons why this otherwise promising technique does not work. Etc.” Note that the request to describe *possible results* is *not* an invitation to speculate wildly about how this work will “solve all known problems” and “bring peace on earth.”

Note: to distinguish between “method” and “results” it is helpful to think about what someone would need to know to replicate the author’s research. The parts that could be repeated are “method” – the possible differences are the “results.”

Warning! For research that reports on “building/implementing something to see if it solves a particular problem”, the “implementation itself” is not a Result! The results are what happens when you *test* “what you have built” relative to the problem you are trying to solve. The “implementation itself” is also *not* a *contribution*; a contribution is based on *analysis* (see below).

This section answers the question: *what happened?*

Analysis & Discussion Now that readers know “what protocol was followed” & “what happened” – they are very interested in “what it all means.” What is the *significance* of the results? Therefore, provide an *analysis* and *interpretation* of the results.

This section answers the question: *why and how do the results matter?*

⁵If your research focus involves the development of a *new method*, be careful not to confuse this “method” (ie, the *result* of your research) with the *method(s)* you need to use to determine the effectiveness of the method you create.

Conclusion Now that readers know the details of the work, they would like a summary that puts the results and insights into the context of other work on the problem or question. Therefore, authors should highlight:

- The major contribution(s) to work on the problem area
- Significant questions for Future Research

Note: this is where authors *deliver* on the promise of the thesis.

This section answers the question: *what are the major insights?*

Variations & Special Circumstances The template above for research papers is just one possible form. An alternative form is one that a) emphasizes the original contribution *early* in the paper, and then b) does the survey at the end (as a way of contextualizing the contribution). Note a couple of points. First, even in the template above, the Conclusion should contextualize the author's results by comparing them to the work of others (though, perhaps not in the same detail as the alternate form). Second, the alternate format presents a challenge for the writer who wants to help the reader know "what is original" before providing details of the work.

3 Example Outline

Introduction: Problem Area People suffering from psychiatric disabilities often experience difficulties handling their daily life, especially social situations. It may be possible to develop effective computer-based treatment for the support and rehabilitation of people with serious, long-term disabilities.

Survey: State of the Art There are several approaches to developing computer-based systems to assist people with psychological disabilities. There are AI (“artificial intelligence”) systems that help with diagnosis [reference], as well as others that perform counselling [reference]. There are also less “intelligent” software systems, where, for example, users navigate menu-systems or multiple-choice scenarios [reference]. Finally, there is research into the use of computer technology as mediating systems – such as chat, video-conferencing, and VR – for therapists to interact in real-time with patients [reference].

Thesis Problem/Question It is important to see whether software-based systems can help people who have trouble with everyday activities. However, very little of the existing research has looked at how software-based systems can help users with severe psychological disabilities, such as schizophrenia, participate in “everyday activities.”

The main focus of this thesis is to explore whether this specific user group has particular needs – and if so, what they are – in the development and use of computer-based therapy. In particular, the thesis reports on a study to understand some of the design implications that arise for people with debilitating psychosis who use scenario-based software with fixed choices to prepare for everyday situations.

Method In order to explore the thesis problem, a scenario was built using a program called the Social Simulator. The scenario was “the first social gathering for coffee at a new job.” The scenario-based system allowed users to make certain pre-defined choices at different stages of the social gathering.

This program was then used as the basis for qualitative interviews with five people who have or had serious disabilities participating in “daily life.” All of the subjects had some degree of computer experience. A protocol (see Appendix A) was used for questioning, the sessions were video-taped, and logs were maintained of the software interactions.

Results In general, users were positive about the program; they found it easy to use – and reported that it was enjoyable. Observations also indicate that there were no major “usability” problems.

With regard to the usefulness of the program, the responses were mixed. Some users enjoyed the fact that the choices were pre-determined – others found it frustrating that there were situations where the choices available didn’t match their expectations. Furthermore, several of the users experienced the software as something “testing” (rather than helping) them.

Conclusion This particular user-group raises serious issues for the design and testing of software systems.

The testing resulted in some understanding of issues that can be useful to consider when designing software for this target group, as well as insights of what to think about when creating a study with participants suffering from psychiatric disabilities.

Since this user group is particularly concerned about “doing what normal people do,” special care must be taken when conducting the interviews. This concern also means that designs that they find comforting (such as pre-determined choices) may not be the most appropriate for their needs.

In particular the results of this study suggest that scenario programs with fixed choices may be more suitable for situations in which obvious choices are a central feature of the activity, rather than for more open-ended activities such conversations.