

## Thesis Proposal Template/Outline

### Abstract

The main purpose of a thesis proposal is to demonstrate that the author:

- has studied and knows *the current status of work in the field*
- has understood some *current limitations of work in the field*
- has a plausible proposal for *contributing something original* to the field

The content, structure, and organization of a thesis proposal also provide the basis for the final thesis document itself.

This document provides a description of a thesis outline. It highlights the *structure* of such a document – and the *function* of the different document elements (and their relationship to other elements). It also indicates which parts should be completed (and *how* they should be completed) for a thesis-*proposal*. Finally, this document includes a template with “checklists” for each section.

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## Overview

Roughly, the thesis model described here has the following elements, structure, and organization.<sup>1</sup>

### 1. Introduction (*Human Concern & Research Issue*)

What people *want to improve or understand*: “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.”

### 2. Survey: State of the Art

*How and what others have tried* to address the limitation: “here is what other researchers have tried – and status of their efforts.”

### 3. 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.”

### 4. Method (*recipe for making contribution*)

*How* the current authors will try to make their contribution: “here is a summary of *how* we intend to prepare, test, and evaluate ...”

#### (a) System Description

In order to test some hypothesis or solve some problem, it may be necessary to build something; this section includes a description of the proposed implementation.

#### (b) Study/Test: Description

*The detailed description of the actual study/test to be conducted to evaluate the hypothesis or proposed solution.* If the thesis involves:

- a scientific *hypothesis*, this is a description of the *actual study* done to test the hypothesis
- a design/engineering *proposal*, this is where one describes the *actual testing* of the proposed solution
- a way to understand/improve some complex social process via *detailed documentation*, this is where one describes the *actual case* (“case study”)

#### (c) Study/Test: Results

*What happened* as a result of the study/tests: “here are the (‘uninterpreted’) results” of the primary study or testing.

#### (d) Study/Test: Analysis & Evaluation (*of study/test results*)

What the results seem to *mean*: “and, here is an analysis & interpretation of the study/test results.”

### 5. Conclusion & Discussion (*putting it all in context*)

What the results seem to *mean in the larger context*: “here is how the research reported here relates to the question we were trying to answer (or the problem we were trying to solve); here is how our contribution fits into the larger research context; and here are some important and promising Next Steps that are evident as a result of our work.”

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

## Thesis Concerns

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:

- the use of qualitative methods/techniques,
- qualitative phenomena (“qualia”) (studied by a variety of means)
- qualitative results (obtained by a variety of means)

One result of this confusion is that authors sometimes run the risk of choosing *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 to such a study. 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*
- New *data*. For example, one can repeat the experiments of others and arrive at different results (indeed, such effort is an important part of scientific praxis). Or, one can describe some new phenomena – reveal new insights about known/existing phenomena. Within HCI, this can even include research around different kinds of computer-related *praxis*. That is, studying how people use certain kinds of tools – or even doing a *case study* around the development or adoption of some new technologies.

Warning! a *Case Study* is *more* than just “here is some stuff that happened when Group X decided to start using Program Foo.” It is a careful, detailed, and structured account that gives some group of readers important insights. It is like a “written documentary” of some specific experience (or *case*) of the author. Some potential readers include: product developers, managers, and HCI professionals who focus on evaluation.

- 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 results<sup>2</sup>

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.

Note that good scientific and technical documents 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.

Finally, a warning about style and formatting. In real life, most reviewers will *immediately reject* any documents that do not follow the published style and formatting guidelines – and any documents that are “sloppy” about margins, pagination, and the like. It is usually obvious within less than one minute if this is the case.

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<sup>2</sup>Be careful here! See note below on “rolling the dice.”

## Annotated Thesis Outline

**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).

### WARNING!

This is *not the place* to include references to the *author's* (proposed) answer/solution; method; implementation; study/tests; results; research analysis; or conclusions<sup>3</sup>

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.<sup>4</sup>

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*).

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:

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<sup>3</sup>When the author has nearly finished the very final version of a research document, it can be appropriate to add one or two sentences that summarize the document as a whole. But, in general, authors should *not* include such descriptions until the final version is completed and approved.

<sup>4</sup>Warning! 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. 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.

It is very good practice for this section of the thesis to include a sentence of the following form:

*“The main contribution of this thesis is that it demonstrates [something].”*

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 ...?

OBS! It should be made *very clear* for the reader of the thesis that the proposed contribution is, in fact, a contribution. In other words, the *contribution statement* should *explicitly* refer back to the thesis Survey.

*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.<sup>5</sup> 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 surprising and original result. However, it is not very likely – and, if the experiments fail, no one will be surprised (i.e., 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.)

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*.<sup>6</sup>

Therefore:

1. Provide readers with a brief *summary* of the protocol (“what recipe you will use”) you plan to follow to get and evaluate 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?*

**System Description** Readers now want to know if anything was actually built as part of the researcher. And if it was built, professionals in the field want enough details about the implementation to be able to replicate it if necessary.

Therefore:

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<sup>5</sup>This strategy will also make it easier to describe meaningful “expected results” in a thesis-proposal. See below.

<sup>6</sup>If your research focus involves the development of a *new method*, be careful not to confuse this “method” (i.e., the *result* of your research) with the *method(s)* you need to use to determine the effectiveness of the method you create.

1. Provide readers with a description of the system
2. Make sure there is enough detail for a professional to be able to create an equivalent implementation

This section answers the question: *what, if anything, was built in order to test the hypothesis or solve the problem?*

**Test/Study: Description** Readers now want to know if anything was actually built as part of the researcher. And if it was built, professionals in the field want enough details about the implementation to be able to replicate it if necessary.

Therefore:

1. Provide readers with a description of the study/test
2. Be sure to include information about *how* different choices were made (number and type of end-users, design and administration of questionnaires, etc.)
3. Make sure there is enough detail for a professional to be able to recreate a similar study/test

This section answers the question: *how was the test/study designed and executed?*

**Test/Study: Results** Having read the details of the study/test, the reader now wants to know what actually happened during the study/testing. Therefore, provide a description of “what happened.”

Note: up until this point in the document, *everything else* is a description of what “anyone else could do.” In this sense, it is like a recipe: someone else could choose a similar recipe for similar reasons. However, starting with this section, there is the potential for *differences*: other researchers could follow the same method but arrive at different results – or even perhaps have different interpretations of the results.

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* – and it is not the *contribution*!

The *results* are what happens when you *test* “what you have built” relative to the problem you are trying to solve. The *contribution* is the *significance* of those results relative to some desired understanding or improvement – and it is based on *analysis* and *evaluation* (see below).

This section answers the question: *what happened?*

**Test/Study: Analysis & Evaluation** 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.

Warning! this section should *not* focus on “how users *evaluated* the system (you built). It should focus on: *your* (the author’s) evaluation of your hypothesis or proposed solution – based on results of test/study.

This section answers the question: *what do the results of the study/tests mean?*

**Conclusion & Discussion** 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 remaining questions/problems 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?*

## Special Concerns

**Special Considerations: Case Study** A *case study* is a particular kind of research that raises some specific issues of its own.

One of the main goals of a Case Study is to provide *more detail* about some issue or problem. In other words, many kinds of activities are so complex that we cannot learn very much about them by reading “summary evaluations” or “brief rules of best practices.” However, *detailed case descriptions* can give readers new insights about particular kinds of problems and solutions.

For example, there are many difficulties associated with *managing projects*. Of course, there have been many studies of this phenomenon – and many suggestions for ways to improve the process, to avoid certain kinds of mistakes or complications, and so on. However, providing readers with a detailed description about a *particular case* of managing a project can also be very useful. It can convey many subtle aspects of the process, the problems, and the solutions. In this sense, it is similar to a *documentary film*: a case-study needs a lot of detailed examples.

A case-study, then, involves:

- A detailed description of a specific case – such as managing a *specific* project or designing a *particular* Web-site
- Using this *specific case* as a way to illustrate and support more *general* issues, insights, and claims

Notice that this involves “using the *particular case* to illustrate, explain, or investigate the *general insights and claims*.”

The standard thesis structure is still relevant for case-studies. The main difference is that it is not as easy to separate the description of the *study/test* and the description of the *study/test results*. However, just as a good documentary film involves *filming*, *selecting*, and *editing* the appropriate material in the appropriate way, authors should still expect to spend considerable time and effort *collecting*, *recording*, *describing*, and *structuring* the details of the actual case-study.

Note also that authors of case-studies should be very careful to motivate the choice of a case-study as their method. In particular, they should indicate *what they expect to reveal* with a case-study that is *not already well-known or well-understood in the existing literature*.



**Creating a Mini-Outline** A formal thesis-proposal typically ranges in length from 10–20 pages. Nonetheless, it should be possible to create a short document from the *first two paragraphs of every major section* – and for that brief, 2-page summary document to present a coherent and compelling *extended abstract* of the thesis as a whole. Since thesis-documents tend to be long and complex, this is also an *excellent* way for writers to occasionally check the status of their writing and confirm for themselves that the document is well structured.

Note also that the first two paragraphs of each chapter of a thesis document can and should help *orient the reader*. One way to do this is for the first paragraph to be a *content summary* of the chapter – and for the second paragraph to be a *structural summary* of the chapter.

**Variations on Document Structure** The model described here 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.

**Research Without Preconceptions** Certain kinds of research do not easily fit into the “classical” science/engineering model described here. Certain kinds of research in the human sciences, such as anthropology, sociology, and psychology, for example, tend to begin *without* a clear hypothesis. This choice is made intentionally by researchers who do not want to “pre-judge” what are the interesting or important phenomena.

*Warning!* This approach to research can be *very risky* if an *original contribution* is important (see “rolling the dice”). It is usually much easier to justify if the phenomena are new or have not been well-studied. So, for example, in the early days of anthropology, it was reasonable for researchers to simply travel to some new culture “without hypotheses” – and document “what they saw.” This approach is *much less viable* if the phenomena are already well-studied.<sup>7</sup>

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<sup>7</sup>The larger debate of whether it is even possible to “observe and report without hypotheses and pre-conceptions” is beyond the scope of this document.

## Thesis Outline Template & Checklist

This template can be used to develop a thesis outline. It also provides brief *checklists* for each section; a *positive checklist* for things that *should* be present in the section – and, if appropriate, a *negative checklist* for things that should *not* be included in the section.

Note that the final section includes a “style” checklist.

### Introduction: Problem/Question Area

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

Positive checklist – does the section:

- Describe some concern – some *question* that people would like to have answered or *problem* that people would like to have solved – that is interesting and important for some large number of people?
- Describe some major challenge to achieving the understanding or solution?
- Clearly state the main *concern* and the main *challenge* within three paragraphs?
- End with a specific sentence of the form, “We will now review the work that others have done to try and answer/solve the question/problem of [some specific question or problem].”

Negative checklist – does the section:

- Include references to the *author’s* (proposed) answer/solution; method; implementation; study/tests; results; research analysis; or conclusions?

### Survey: State of the Art

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

Positive checklist – does the section:

- Begin with two summary paragraphs: one for the section *content* and the other for the section *structure*?
- Describe briefly three major *approaches* to address the problem area described in the Introduction – and the current status of work for those three approaches?
- Structure the remainder of the Survey in terms of *approaches* (with references to appropriate research)?
- Include *enough* references of *suitable quality*?
- Include only references that are clearly *relevant* to the question/problem area?
- Provide readers with enough of a summary of the relevant work so that they *know what has been attempted* by others and *how well those attempts have worked*?

Negative checklist – does the section:

- Read like a “laundry list” of researchers, systems, or projects?
- Include references to the *author’s* (proposed) answer or solution
- Include the author’s *opinions* or extended *criticisms* about the research of others, its importance, etc.

## Research Problem/Question

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?*

Positive checklist – does the section:

- Begin with two summary paragraphs: one for the section *content* and the other for the section *structure*?
- Identify some specific aspect of the existing research that requires more work? Does it do so by *explicitly* referencing work described in the previous section (Survey)?
- Tell readers *what* the author proposes as a contribution to the field?
- Include a sentence of the form “*The main contribution of this thesis is that it demonstrates [something].*”?
- Propose a contribution that is sufficiently:
  1. *clear* and *specific*
  2. *interesting*
  3. *important*
  4. *original*
  5. *do-able* (in terms of *scope* and *time*)
- Propose a research problem/question such that *the results are a significant contribution no matter what happens?*
- Indicate clearly *what kind of readers* might be interested in the results of the proposed research – and *how those readers might be able to use* the results of the proposed research?

Negative checklist – does the section:

- Tell readers *how* the author proposes to make a contribution to the field?

## Method

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

Positive checklist – does the section:

- Summarize the proposed research protocol (“what will be done”)?
- Motivate the proposed research protocol (“why it will be done this way”)?
- Provide sufficient motivation that readers find the proposed method *appropriate* and *sufficient* for the stated research question/problem?

## Implementation or System Description

Positive checklist – does the section:

- Begin with two summary paragraphs: one for the section *content* and the other for the section *structure*?
- Include an implementation summary that is sufficiently detailed that an expert in the field could be reasonably expected to replicate the implementation?

Negative checklist – does the section:

- Include irrelevant details about the “history” and *process* of choosing implementation tools, different versions of the system during its development, etc.?

## Test/Study

This section answers the question: *how will the test/study of the proposed answer/solution be designed and executed?*

Positive checklist – does the section:

- Begin with two summary paragraphs: one for the section *content* and the other for the section *structure*?
- Describe a study/test protocol that is designed to confirm/disconfirm a hypothesis or proposed solution? (Alternative, for Case Study: does the section describe a clear set of issues/topics that are the intended focus of the study?)
- Include a study/test protocol is sufficiently detailed that an expert in the field could be reasonably expected to replicate the study/test?
- If the results will be *quantitative*, is the study/test structure sufficiently *rigorous* to support them?
- If the results will be *qualitative*, is the study/test structure sufficiently *descriptive* (and *documented*) to support them?
- If the study is a case-study, does it include details of the “history” and *process* of choosing implementation tools, making decisions, dealing with setbacks, and the like?

## Test/Study Results

This section answers the question: *what happened during the study/tests?*

Positive checklist – does the section:

- Begin with two summary paragraphs: one for the section *content* and the other for the section *structure*?
- Indicate possible “negative” and “positive” results of the study/test?
- Make a convincing case that there will still be a significant contribution even if the results of the study/test are “negative”?

Negative checklist – does the section:

- Speculate wildly about how this work will “solve all known problems” and “bring peace on earth”?

## Analysis & Evaluation

This section answers the question: *what do the results of the study/tests mean?*

Positive checklist – does the section:

- Begin with two summary paragraphs: one for the section *content* and the other for the section *structure*?

Negative checklist – does the section:

- Include information about “how users *evaluated* the system”?

## Conclusion & Discussion

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

Positive checklist – does the section:

- Begin with two summary paragraphs: one for the section *content* and the other for the section *structure*?
- Situate the research and the results within the context of the larger research on the question/problem?
- Summarize the major contribution(s) of the reported research to work on the problem/question?
- Indicate any significant limitations about the reported results?
- Summarize some significant questions/problems for Future Research (based on the reported research)?

## References

Positive checklist – does the section:

- Include a *sufficient number* of *quality* references?
- Use the correct *formatting*?

Negative checklist – does the section:

- Include references that contain *URLs*?

## Style

Positive checklist – does the document:

- Meet minimum requirements for spelling and grammar?
- Make statements with *reasonable caution* – phrases such as *some*, *many*, *suggests*, *perhaps*, *indicates*, and *seems to be*.

Negative checklist – does the document:

- Include “too strong” language – unsupportable strong assertions or claims, with phrases such as *must*, *always*, *never*, *every*, or *all*?