Western Kentucky University

Architectural and Manufacturing Sciences Department
Master of Science in Technology Management

Thesis Writing Guide (AMS 599)

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Purpose

The purpose of the thesis is to provide students with experience in designing, conducting and writing a research study. The thesis is self-referential in nature and consequently somewhat redundant. Students are expected to write about their research and articulate the process they used to arrive at all decisions and defend their decisions. For example, students should describe the procedures taken and the rationale.

Proposal

The first procedure related to the writing of the thesis is the development of a proposal. *The proposal is generally considered as the first three chapters of the thesis*. Proposal variations occur; however, due to the selection of a research methodology. Students are encouraged to provide their committees with as much of the first three chapters as possible so that their committees can help them. A student should not proceed with the thesis until the proposal has been approved by the committee.

Thesis Elements

The following provides information to assist students who are writing a thesis. For each of the elements listed, a short summary describes the element, explains its purpose, and identifies quality indicators, common errors with questions that help guide the development of each element. Students can use the following traditional format as a thesis blueprint. The standard writing style for the MSTM thesis is the Publication Manual of the American Psychological Association (APA). Acceptable deviations or modifications for theses are noted within each section.

Title

What. Contains key words or phrases to give a clear and concise description of the scope and nature of the study.

Why. The title guides the research and reflects the purpose of the study. It also serves as the identifier for others to identify/find your study.

Quality indicators. The title should include key research factors (variables), type of participants, or the methodology. Key words allow bibliographers to index the study in proper categories within databases.

Common errors. Title is trendy/journalistic but does not address research elements. Excess, empty words: a study of, research into…

Guiding questions. Does the title reflect the nature of the study? How descriptive is the title?

Abstract

What. Summary of the study with particular attention to method, results, and conclusions. Note the 500 word length limit.

Why. The abstract is entered into the Dissertation Abstracts International compendium. The abstract may be all that most people read about the thesis. The abstract informs other researchers whether or not they should obtain a complete copy of the document.

Quality indicators. Accurately describes the purpose of the research, the methodology, key findings, and conclusions.

Common errors. The need for the study is emphasized, but the researcher's conclusions and recommendations are omitted.

Guiding questions. Would someone reading the abstract learn how the research contributes and builds upon the knowledge in the field?

Table of Contents

What. Is an outline of the entire document. Lists headings at an appropriate level with respective page numbers.

Why. The table of contents helps the researcher organize the thesis and ensures that the correct APA headings have been used throughout the document. The different levels of headings make the thesis more easily read, reflect the relationship of topics and sections to one another, and promote internal consistency within the document.

Quality indicators. Sub-headings are indented. The headings in the table of contents are worded exactly the same as those in the text. There is redundancy in the use of headings and consistency in the labeling of headings across chapters.

Guiding questions. Do the heading levels correctly show the relationship of sections to one another so that subheadings are sub-topics within a larger content area? Are heading levels consistent throughout so that, for example, the heading levels used in the table of contents coincide with those in the chapters?

Chapter 1-Introduction

The introduction is divided into the following sub-sections or sub-headings:

Background/Overview

What. The introduction is a broad overview of background information including an outline of the theoretical framework.

Why. Places the study in a context (i.e., historical, technical, social, or economic) and lays the theoretical foundation for the study.

Quality indicators. Provides a contextual and theoretical overview in a summary format.

Common errors. Does not place the study in larger theoretical, social, technical context, only summarizes Chapter 2. Does not link research to theory.

Guiding questions. Is the information provided adequate, giving readers enough information so that they can understand the context and general background of the study? Is a theoretical framework for understanding this study presented?

Statement of the Research Problem

What. Clearly describes the problem to be researched.

Why. Defines and guides the research study.

Quality indicators. Succinctly articulates purpose of the study. Purpose is consistent with the title and is a logical conclusion to the need for the study section.

Common errors. Problem statement is not consistent with the rest of the thesis. Consistency and some redundancy is expected.

Guiding questions. Is the purpose of this study clearly stated?

Need or Significance

What. Defines the problem in terms of issues or concerns relating to practices and/or gaps in existing research. Indicates how the study contributes to the discipline, and what knowledge and practices are to be gained by the completion of this study. May use conflict in findings of related research as justification for the study and/or cite literature calling for an investigation of the problem.

Why. This section is the "sales pitch" addressing direct and indirect benefits of the study. Justifies and convinces the reader that the study is needed.

Quality indicators. Factual statements are supported by citations from the literature. Addresses several areas of need including how the thesis adds to the body of knowledge.

Common errors. Not complete, does not describe all potential contributions to the field. Need is based upon opinion and not upon existing research and theory.

Guiding questions. Who (what individuals or groups) can use this information to change or improve the present situation? How will the study contribute to the fundamental knowledge of the profession? Can the results can be generalized beyond the bounds of study?

Research Questions or Hypotheses

What. Research questions or hypotheses are generated from observations, theory, prior research, and/or experience. If a study is not experimental, objectives or research questions are generally used. If the study is experimental, hypotheses are generally used. In some research designs, questions are identified following preliminary data collection such as interviews and observations.

Why. Indicates the data to be collected and analyzed.

Quality Indicators. Consistent with the study purpose and with data collection and analysis. Questions should be broad enough to allow research exploration and specific enough to focus the study making it manageable.

Common errors. Too many questions or hypotheses. Double barreled questions. Scope of the research questions are too broad for the purposes of a thesis.

Guiding questions. Are these hypotheses or questions consistent with the rest of the thesis? Do research objectives reflect issues reported in the literature as needing to be addressed? Are they testable/answerable with the methods and analysis planned?

Assumptions, Limitations, and Delimitations

What. An assumption is a proposition that is taken for granted, that is, as if it were known to be true. List all conditions believed to be true regarding the study. Examples might include assumed access to populations or proprietary information. Assumptions are items that you expect will hold true now, and throughout the duration of the study.

Delimitations are restrictions/boundaries that researchers impose prior to the inception of the study to narrow the scope of a study. For example, the study might be delimited to a survey of female engineering managers.

Limitations are natural conditions that restrict the scope of the study or may affect the outcome. An example of a limitation is that a seasonal variation that might only allow the researcher to collect data during a certain time of the year, or that selected participants might not answer truthfully or at all due to the sensitivity of the subject or question.

Why. Assumptions are included to bound the study within a reasonable range of effort and give the reader a sense of what has already been established as fact. Delimitations and limitations are discussed to analyze possible threats to the study's validity and to acknowledge existing flaws to the research design.

Quality Indicators. Clear concise descriptions that indicate how the assumptions, limitations, and delimitations affect the generalization of the study's findings.

Common errors. Confuse delimitations with limitations. Assumptions are too broad to be useful. Assumptions and limitations do not reflect their effect on the study's application.

Guiding questions. In focusing the study, how do the assumptions, limitations, and delimitations affect the generalization of the study's findings? What design factors might other researchers question as affecting the scope of the study's validity?

Definition of Terms

What. A list of definitions for terms and concepts in alphanumeric order that have significant meaning for the study.

Why. Provides readers with a quick reference. Provides clarity for terms that have multiple meanings/interpretations.

Quality Indicators. Define terms in the context where they will be used. Provide operational definitions as well as constitutive definitions. Constructed in list form, like a dictionary. Citations from literature where the definition was taken are provided, if applicable.

Common errors. Too many definitions (e.g., definition of terms widely understood or not used within the text). No references to literature from which the definition was obtained.

Guiding questions. Are all ambiguous terms and terminology that may not be familiar to readers defined?

Chapter 2–Review of Literature

What. A thorough synthesis and analysis of literature related to the study. The review of literature consists of two phases:

1. Problem exploration-definition stage
    - Conducted before proposal preparation to identify problem
    - Provides dimensions and limits of the problem area
    - Defines extent to which solution or answer is already known
    - Helps discern "What do we know the least about?"
    - Identifies possible procedures (design, instruments, analyses) for conducting the study

2. Synthesis stage
    - What is missing from the literature?
    - What did you learn from putting the literature review together?
    - What are the theories supported by the literature?
    - What questions does the literature review suggest/generate?

The timing of when this section is written depends upon the research questions. Sometimes a researcher will initially write a limited review of literature addressing a broad scope of knowledge. Later the researcher produces a thorough version of the chapter after the focus of the research has been refined as a result of data collection.

Why. Increases the likelihood that the study enhances the knowledge base, allows the researcher to acquire a thorough knowledge of the area and thus better design the study. Places the study in its context within the literature/field.

Quality Indicators. Databases and key descriptors identified so that future researchers can replicate the work and know the parameters of the search. The literature review generally moves from broad topics to specific ones, ending with a paragraph on how the literature documents the need for the study. Organizes the literature reviewed around theories, historical events, or your study's objectives so that it flows from topic to topic. Provides transition sentences between sections to facilitate reading and summarize all the information at the end of the chapter. Uses accurate and verified APA style citations. The review of literature should be an original work, free of plagiarism.

Common errors. Poor organization. Uses many quotes instead of a synthesis of several authors and researchers. No analysis of the quality of the research and no distinction between theoretical and empirical works. Incomplete review (e.g., related fields are not addressed) particularly when there are few articles that directly address the topic. Omits literature that conflicts with the premise of the study or with the researcher's biases. Uses

few articles or texts. Overuses old and secondary references. There is no summary at the end of the chapter emphasizing the key points.

Guiding questions. Would someone outside of this field, reading this chapter, understand it? Have all key resources (i.e., books, articles, theses, journals, etc.,) relevant to understanding this topic been found?

Chapter 3—Methodology

This chapter describes the plan for conducting the study. It explains what the researcher must do to collect data. Researchers must provide accurate, detailed descriptions of how the research was conducted to ensure the study can be replicated (redone) by others. Clear explanations of each step and justifications enable readers to reproduce the exact conditions of the original study. The methodology indicates that the researcher has carefully considered decisions regarding research procedures. It demonstrates the use of accepted research practices reported in research texts and articles.

Research Design

What. Describes the overall approach (e.g., quantitative, qualitative) to be used in collecting data and the specific methods used. The rationale for using this approach is also presented.

Why. This is the roadmap for conducting the study. Having a plan for the research helps the research process flow smoothly and ensures that meaningful information will be obtained. It also decreases the chances the research process has to be aborted due to lack of available data or lack of participants.

Quality Indicators. The unique strengths of the research related to this specific study should be highlighted. The procedures outlined should answer questions or test hypotheses as efficiently, economically and validly as possible. Schematic (graphic) diagrams often aid in understanding the design.

Common errors. No justification for the method selection provided. Limited planning, which may later result in significant changes to the thesis.

Guiding questions. How will the use of this research design address the problem? Is the rationale for using this design clear? Will this information aid in the replication of the study? Are the participants (or archived data files) accessible?

Participants and Data Sets

What. Describes and defines the overall population (i.e., total set) of participants or document data sets which the research is addressing. The group or sample that is to be included in the study is described along with an explanation about the criterion for selection. Included are the size of the sample and justification for inclusion in the study. In qualitative studies, the rationale is equally important and must be justified.

Why. The interpretation and validity of data depend upon the quality of the selection procedures and sample/participant descriptions. Poor selection and description decrease the usefulness of the information obtained in the study.

Quality Indicators. Participants/sample data are representative of the larger population of interest. The characteristics of non-responders are described.

Common errors. Selection criterion not clearly delineated and/or followed.

Guiding questions. What information do the selected participants/data provide to the study? How are the participants/data similar or different from the overall population addressed in the problem statements? Are there common characteristics of non-responders that must be discussed?

Data Collection, Instruments, and Procedure

What. The procedures used for collecting the data are described in detail. This section may include information about how data are collected (e.g., observation, interview, survey, test); instruments to be used and their reliability and validity; interventions employed; possible threats to internal and external validity, and measures taken to prevent their occurrence (also known as "trustworthiness"). If possible, researchers should pilot or field-test their efforts in to ensure that the procedures for collecting information are feasible.

Why. The credibility and soundness of the research are ensured through well-constructed procedures.

Quality Indicators. The method used provides the data needed to address the research questions/test the hypotheses. Clear concise descriptions of the data collection procedure are provided. A pilot or field test has occurred and is described.

Common errors. The data collection procedure is not linked to the research questions in chapter one. For example, far more data are being collected than are needed or necessary questions are not addressed. Procedures not described in enough detail. Justification for use of the procedure with reference citations are not offered. Lack of organization in addressing topics. The information obtained cannot be analyzed so that meaningful data are produced.

Guiding questions. Could anyone reading this understand the steps taken to collect data? Have alternative methods for collecting the data been considered? Are there good rationales for why other methods of data collection will not suffice? Is it possible to pilot the procedures?

Data Analysis

What. This is a description of how the data will be organized to produce meaningful information in relation to the research questions and/or hypotheses. In quantitative research this step typically involves statistical techniques selected in accordance with the research design.

Likewise, qualitative research data organization conforms to the specific qualitative approach used (i.e., phenomenology, ethnography, case study, etc.). Before conceptualizing data analysis procedures, researchers should document their biases and assumptions related to potential findings. This activity is referred to as "coming clean" because the subjective basis for the study is identified.

Why. Identifying researcher biases brings further credibility to one's findings. Selecting statistical procedures in the case of quantitative designs and coding methods in terms of qualitative studies prior to writing the thesis ensures that research objectives are met and that hard work has not been wasted because the data cannot be organized in a useful fashion. Prior consideration also helps researchers identify if they require additional information and support in using the technique they have selected. Clarity regarding analysis procedures facilitates the discussion about research findings.

Quality indicators. The data analysis procedure is clearly described in terms of how this procedure organizes data. The anticipated outcome of the analysis is consistent with the problem statement, research questions/hypotheses. For each method used, present evidence indicating that the basic assumptions underlying use have been met.

Common errors. Method of analysis is not aligned with the research methodology selected. Researcher biases not identified. Researcher does not clearly understand the analysis procedure used and reasons for the use of these

Guiding questions. Why were these methods of analysis employed?

Chapter 4—Results or Findings

What. This is the outcome of the study. It is the information that has resulted from data collection and analysis. Generally, descriptive data are presented first and then findings organized around the research questions are reported. Supplemental analyses may be added for questions or responses that emerge during data collection or analysis.

Why. The foundation for interpreting information, drawing conclusions, and making recommendations related to the research presented in this chapter.

Quality Indicators. Use of tables and figures to graphically display findings. Findings are organized to parallel the research questions and hypotheses.

Common errors. Findings are not organized to be consistent with the research questions and are difficult to follow. Research questions are not repeated, rendering the reader unclear about to what the information reported refers. Tables and figures used are not summarized or referred to in the text. Summary statements or a summary table not provided at the end of the chapter.

Guiding questions. How are the findings organized? Are graphic displays of data discussed and summarized in the text?

Chapter 5—Conclusion

What. This is a key section of the thesis--the "so what?" Given the previous information, the researcher is now free to explore and speculate about the findings. The voice of the researcher is heard in this chapter. This chapter consists of a summary of the entire study particularly findings, interpretation of the data, conclusions drawn from the information, implications and recommendations for practice/application. This chapter culminates in a

statement regarding the needs for future research that includes ideas about new research questions and potential methodologies.

Why. This chapter allows the researcher to reflect upon the findings and determine what the contribution of this study is to both knowledge and practice. Demonstrates the researcher's ability to reflect and draw meaningful conclusions about findings. Information about future research is included to assist other researchers in identifying potential studies and in an effort to promote cohesive research investigations into the topic.

Quality Indicators. Does not over-generalize findings. Links information from the study to the literature review. Articulates the study's relevance.

Common errors. Researcher is either too literal and refuses to interpret--only restating findings or is too liberal in applying findings to a myriad of problems beyond the bounds of the study. Does not reference the literature when discussing how this study confirms or contradicts previous literature.

Guiding questions. What does this study contribute to the knowledge base? What would improve the study? What are the surprises from the data? How does the literature agree or disagree with the data collected? Now that this study has been completed what should future research examine?

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(Adapted for thesis writing from am academic document by Lehmann, Gloeckner, Davies, Morgan, Anderson, & Ginsberg, 2000)

WWHAM

WWHAM is an acronym for the five necessary parts of any thesis. Specifically, a thesis must address: What is going to be done; Why this is going to be done; How the thesis will be carried out; Analysis of data; and, Meaning. Each of these will now be discussed more fully.

What

A thesis must begin with some discussion as to what you will do. This generally involves some background information highlighting the need and importance/significance of the problem to be studied. The reader needs to be told right at the outset exactly what the problem is that will be addressed and the conceptual basis for this selection. For many theses, this discussion is the *Introduction* chapter, although it is possible to combine the *what* discussion with other necessary parts of the presentation.

Why

In planning and carrying out a thesis, certain choices must be made. First, the topic itself must be selected. Then, the variables to be studied and methods and design must be determined. Such decisions should be grounded in the general literature in the particular field of study. Thus, the *why* section develops theoretical/conceptual support for the topic and substantiation for the specific decisions concerning variables of interest, methods, etc. Commonly contained in a section of the thesis called, *Review of Literature*, students must analytically review relevant sources in developing the defense of the study.

How

The *how* section provides the road map for carrying out the study and analyzing the data collected. Commonly placed in a *Methodology* chapter, this section explains what the researcher will do in order to conduct the research. As repeatability is a canon of good science, this section must present enough detail so that another researcher could hypothetically duplicate the entire study. Several broad features of this component of a thesis should include attention to issues such as explicitness, reproducibility, error minimization, generalization to a greater population, validity, and reliability. However, some research studies will focus on other issues in this presentation.

Nonetheless, the thesis must include a clear discussion of how the study will be done, specifically how data will be collected and analyzed to answer the research questions, with the understanding that varying methodologies allow for the use of a number of different techniques in conducting the thesis research.

Analysis

Once data are collected, some analysis must take place. Data can be numbers, quantitative in orientation, or words, qualitative in orientation. In quantitative a thesis, this would be the presentation of the statistical analyses. This information is presented in a chapter called *Findings*. Whatever the nature of the data, the thesis must include some in-depth analyses, where the data are presented and described.

Meaning

Probably the most important part of the thesis is the set of conclusions drawn. Here, the interpretation is presented in the *Conclusions* section and is intertwined with the review of literature, which was the basis for the study. In this way, the meaning of the research can be determined (conclusions drawn), and recommendations for further research and, perhaps, implications for practice suggested. The *meaning* section is a key component of the thesis as it presents the major contributions of the study.

(Adapted from *A Conceptual Approach to Doctoral Dissertations* by Rick Ginsberg, Colorado State University, 2000)