



**Western Kentucky University**

**School of Engineering and Applied Sciences  
Master of Science in Engineering Management**

**Thesis Writing Guide**

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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 content as possible on the first three chapters so the proposal approval process can move forward. The student should not proceed with survey data collection or experimentation for 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, identifies quality indicators, common errors, and lists 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 MSEM 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 the research elements. The title contains excess words, 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.* The abstract is a summary of the study with particular attention to method, results, and conclusions. It should be less than 350 words.

*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 they should read the complete thesis.

*Quality indicators.* The abstract 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.* The table of contents is an outline of the entire document. It lists the major headings of the thesis 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. Different levels of headings make the thesis easy to read, reflect the relationship of topics and sections to one another, and promote internal consistency within the document.

*Quality indicators.* The headings in the table of contents are worded 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.* The background/overview places the study in a context (i.e., historical, technical, social, or economic) and lays the theoretical foundation for the study.

*Quality indicators.* The background/overview provides a contextual and theoretical overview in a summary format.

*Common errors.* The background/overview does not place the study in larger theoretical, social, technical context; it only summarizes the review of literature. It does not link research to theory.

*Guiding questions.* Is the information provided adequate? Does it give the reader 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.* The statement of the problem clearly describes the problem to be researched.

*Why.* The statement of the problem defines and guides the research study.

*Quality indicators.* The statement of the problem succinctly articulates the problem or issue to be addressed. The statement is consistent with the title and is a logical outcome of the background for the study.

*Common errors.* Problem statement is not consistent with the topic of the thesis.

*Guiding questions.* Is the problem or issue clearly stated?

### **Need or Significance**

*What.* The need or significance of the study defines the problem in terms of issues or concerns relating to practices and/or deficiencies in existing research. It indicates how the study contributes to the discipline, and what knowledge and practices are to be gained by the completion of this study. It 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” that addresses the direct and indirect benefits of the study. It justifies and convinces the reader that the study is needed.

*Quality indicators.* Factual statements are supported by citations from the literature. It addresses the area of need including how the research adds to the body of knowledge.

*Common errors.* The need or significance is incomplete and does not describe all potential contributions to the field. The 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 be generalized beyond the bounds of study?

### **Purpose of the Study**

*What.* The purpose of the thesis is clearly described and the variables to be studied are defined. In addition, an overview of the research method or approach is presented

*Why.* The purpose of the study describes the intent, major idea, or objectives of the research.

*Quality indicators.* It succinctly articulates purpose of the study. The purpose is consistent with the title and is the logical conclusion to the need for the study.

*Common errors.* The purpose statement is confused with the problem or hypothesis.

*Guiding questions.* Is the purpose of the study indicated? Is what is to be accomplished clearly stated?

### **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.* Research questions and hypotheses narrow the purpose statement so that the proposed study becomes manageable. Research questions indicate what data is to be collected and analyzed. Hypotheses are predictions regarding the outcomes of the study.

*Quality Indicators.* The questions or hypotheses are 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. The hypotheses can be empirically tested.

*Common errors.* There are too many questions or hypotheses. The research questions or hypotheses are too broad for the purpose of the thesis. The hypothesis is developed based on some preconceived notion, rather than research or theory.

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

### **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.* There is confusion between delimitations with limitations. The 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.* The definition of terms is a list of words and concepts in alphanumeric order that have significant meaning for the study.

*Why.* It provides readers with a quick reference of frequently used phrases or terms used in the thesis. It provides operational definitions for terms that have multiple meanings or interpretations.

*Quality Indicators.* It defines the terms in the context where they will be used. It provides operational definitions as well as constitutive definitions. It is constructed in list form, like a dictionary. The citations from literature where the definition was taken are provided, if applicable.

*Common errors.* There are too many definitions (e.g., definition of terms widely understood or not used within the text). There are no references to literature for the definition.

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

## **Chapter 2—Review of Literature**

*What.* The review of literature is 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 or hypotheses. 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.

*Why.* The review of literature increases the likelihood that the study is framed from a sufficient knowledge base. It allows the researcher to acquire enough knowledge to design the study. It creates insight that the researcher can use to better design the study and frame the effort. It places the study in its context within field and provides the basis for theory testing.

*Quality Indicators.* Databases and key descriptors are identified so that future researchers can replicate the work and know the parameters of the research. 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. It organizes the literature reviewed around theories, historical events, or the study’s objectives and flows from topic to topic. It provides transition sentences between sections to facilitate reading and summarizes all information at the end of the chapter. It uses accurate and verified APA style citations. The review of literature should be an original work, free of plagiarism.

*Common errors.* The review literature is poorly organized. It uses many quotes instead of a synthesis of several authors and researchers. The work indicates little analysis of the quality of the published works cited and makes no distinction between theoretical and empirical works. The review of literature is incomplete (e.g., related fields are not addressed) particularly when there are few articles that directly address the topic. It omits literature that conflicts with the premise of the study or with the researcher’s biases. It uses few articles or texts or 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 cited?



### **Chapter 3—Methodology**

This chapter describes the plan for conducting the study. It explains what the researcher must do to collect data or conduct the experiment. Researchers must provide accurate, detailed descriptions of how the research will be/was conducted to ensure the study could be replicated by others. Clear explanations of each step and justifications enable readers to understand the exact conditions of the 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.* The research design 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 presented.

*Why.* The research design is the procedure for conducting the study. It is a plan for the research that helps it flow smoothly and ensures that meaningful information will be obtained. It also decreases the chances the research process must 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 enable the researcher to answer questions or test hypotheses as efficiently, economically, and validly as possible. Schematic (graphic) diagrams often aid in understanding the research design.

*Common errors.* No justification for the research design is provided. The design indicates limited planning, which may later result in significant changes to the thesis.

*Guiding questions.* Is the process clear? 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? Is the approach free of bias?

#### **Participants and Data Sets**

*What.* This describes and defines the overall population (i.e., total set) of participants or document data sets that 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. The rationale for participant selection 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? Is the selection process for participants grounded in the scientific approach?

### **Data Collection and Instrumentation**

*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 bias (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 instruments and data collection procedures.

*Quality Indicators.* The method used provides the data needed to address the research questions or 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 procedures are not linked to the research questions or do not provide an answer to the hypotheses. For example, far more data are being collected than are needed or necessary. The research questions are not addressed. Procedures not described in enough detail. Justification for use of the procedure with reference citations is not offered. There is a 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? Has the instrumentation for the study been verified?

### **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 identifying a statistical technique in accordance with the research design.

Likewise, qualitative research data organization conforms to the specific qualitative approach being proposed (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 work has not been wasted because the data cannot be analyzed. 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, the researcher presents evidence indicating that the basic assumptions underlying use have been met.

*Common errors.* Method of analysis is not aligned with the research design 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?

### **Threats to Validity**

*What.* Threats to validity raise questions about the researcher's ability to successfully conduct the study with the required level of rigor and accomplish the purpose of the study. These threats must be addressed and mitigated, if possible.

*Why.* Identifying threats to validity and providing countermeasures increases the researcher's credibility and enhances the value of the research. If threats to validity are not identified, the entire thesis may be deemed unreliable or worthless.

*Quality indicators.* Both internal and external threats to the study's validity are identified with appropriate countermeasures. If countermeasures cannot be taken to address all threats, they are acknowledged as limiting the generalizability of the research. The researcher cites published works that discuss threats to validity.

*Guiding questions.* Have threats to the validity of the study been identified? Are the threats to validity addressed with some type of plan or are they acknowledged as limiting the application of the research?

## **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 the 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 results are the foundation for interpreting information, drawing conclusions, and making recommendations related to the research.

*Quality Indicators.* The results use descriptive language, tables, and figures to present and 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 or hypotheses and are difficult to follow. Research questions are not repeated, rendering the reader unclear as to what the reported information refers. Tables and figures used are not summarized or referred to in the text. Summary statements or summary tables are 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. It answers the “so what?” question of the research. Given the results and findings, the researcher is now free to explore and speculate about their meaning. The voice of the researcher is heard in this chapter. This chapter consists of a summary of the entire study, the findings, the interpretation of the data, any conclusions drawn from the information, and the implications for future practice/application. The chapter culminates in a statement regarding the needs for future research that includes ideas about new research questions or potential methodologies.

*Why.* This chapter allows the researcher to reflect upon the findings and determine the contribution of the study to knowledge and practice. It demonstrates the researcher’s ability to reflect and draw meaningful conclusions about the findings. Information about future research is included to assist other researchers in identifying potential studies and promotes further research investigations into the topic.

*Quality Indicators.* The conclusion does not over-generalize findings. It links information from the findings to the literature review. It articulates the study’s relevance regarding the literature.

*Common errors.* The conclusion is either too broad 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. The conclusion 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 an 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 the following:

- What is going to be done
- Why this is going to be done
- How the thesis will be carried out
- Analysis of data
- 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 at the outset exactly the problem to be addressed and the conceptual basis for this selection. This information is included in the *Introduction* chapter, although it is possible to combine this discussion with other parts of the thesis.

### ***Why***

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

### ***How***

The *how* section provides the procedure for carrying out the study. It specifies how the data will be collected and analyzed. Commonly placed in a *Methodology* chapter, it should explain what the researcher would do to conduct the study. 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 methodology include attention to issues such as explicitness, reproducibility, error minimization, process control, generalization, validity, and reliability. However, some research studies will focus on other issues.

Nonetheless, the thesis must include a clear discussion of how the study will be done and specifically how the data will be collected and analyzed to answer the research questions. The techniques used in conducting the thesis research allow varying methodologies based on the method of inquiry and the selected research design.

### ***Analysis***

Once data are collected, some analysis must take place. Data can be numbers (quantitative) or words (qualitative). In a quantitative thesis, this would be the presentation of the statistical analyses. This information is presented in a chapter called *Results* or *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. The interpretation of data is presented in the *Conclusions* section and is intertwined with the review of literature, which is the theoretical basis for the study. In this way, the meaning of the research can be determined (conclusions drawn), implications for practice suggested, and perhaps, recommendations for further research. 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)