Guide to Preparing and Writing Academic Thesis

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1.1. INTRODUCTION

Preparing and writing a university thesis is a crucial stage in a student's academic career in the postgraduate stages, as working on it requires a great deal of planning, organization, and deep research. A thesis is not just a presentation of ideas and information, but a scientific process that aims to explore a particular topic or research issue, analyze its data, and provide solutions or results that support the development of knowledge in that field.

Understanding the basic steps to follow in writing a thesis is critical to success. This includes defining the topic, formulating the research question, defining the objectives, choosing the appropriate methodology, analyzing the results, and finally presenting conclusions and recommendations. Each step requires precision, coordination, and attention to detail to ensure that the research is of high scientific quality.

This guide aims to provide clear and comprehensive steps to help you better understand how to prepare and write a thesis. It covers the most important steps, practices, and standards that must be taken into account from topic selection to writing references. The guide also presents effective methods for drafting, documenting, and organizing the thesis chapters.

We hope that this guide will contribute to improving the quality of writing university theses and ensuring their consistency with the best professional practices and standards in drafting and documenting scientific theses.

1.2. WHAT DOES THE GUIDE PROVIDE ME WITH?

- A description of the main stages to complete a thesis.
- A description of the structure of a scientific thesis, its organizational structure, and chapters.
- An explanation of the criteria used in judging the thesis and its various parts.
- Clarification of the standard scientific methods in writing and documenting a scientific thesis.
- Referring to scientific research ethics related to the preparation, documentation and publication of scientific theses.

1.3. THE DIFFERENCE BETWEEN A THESIS AND A RESEARCH PROJECT

The Department's master programs offer graduate students two tracks; the thesis track and the research project track. There are subtle differences between these two tracks that students need to recognize in order to accurately accomplish what is expected of them. The difference between a thesis and a postgraduate research project lies in the requirements and depth of the research. The differences can be summarized as follows:

- THESIS
  - A product of research, offered to complete the master's degree requirements. It is larger than the total hours of the program and the hours of the research project.
  - It requires original research and a scientific contribution that helps advance knowledge in the field.
  - They are more in-depth and based on advanced research methodologies.

- RESEARCH PROJECT
  - A research product submitted to fulfill the requirements of a course-based master degree with fewer course hours than a thesis.
  - It focuses more on practical applications and may be more akin to a field study or applied research report.
  - It is not required to make a new scientific contribution, but is centered around analyzing and interpreting an existing research topic.
  - It is worth mentioning here that this guide is suitable for both tracks since, as mentioned above, the guide explains the basic concepts whether the research contribution is original, just an application or research exploration of an existing phenomenon.

1.4. BASIC DEFINITIONS

In this guide, the following terms are defined as follows, unless stated otherwise:

- Thesis

An academic research report documenting scientific research submitted to complete the master's requirements in programs in a thesis track.

- Candidate/Student

Student enrolled in a graduate program.

- Supervisor

A faculty member who is nominated by the Graduate Studies Committee and approved by the Department Council to supervise theses of master programs' students.

2.1 Stages of Preparing, Executing and Writing an Academic Thesis

A thesis is an essential part of the requirements for obtaining an academic degree in graduate studies. Since a postgraduate degree is a research degree, the thesis aims to present integrated scientific research that contributes to the enrichment of knowledge in the field of specialization. The preparation, implementation, and writing of a university thesis requires adherence to a scientific research methodology including topic selection, implementation of research, data analysis, documentation and writing the results according to the approved academic standards. This guide aims to clarify the basic steps that must be followed to ensure the success of the thesis and achievement its scientific goals. Figure 1 shows the main three stages, and the following sections provide a detailed description of these stages.

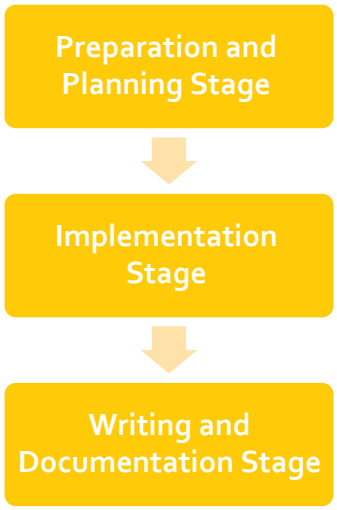

Figure 1: The main stages of thesis preparation and writing

2.1.1 Preparation and Planning Stage

This stage aims to determine the basics on which the research will be built, including selecting the research problem, preparing the research plan, and the necessary resources and tools. Proper planning at this stage is crucial to ensure that the research is conducted in an organized and effective manner. Figure 2 shows the inner processes within this stage.

Figure 2: The inner steps of the "Preparation and Planning" stage

1) *Topic Selection*

The selection of the research topic is the first and basic step in the preparation of a thesis, and the selection of the topic is an important and effective element in the success of the thesis to ensure the smooth progress of its stages; as the topic must be of scientific value, modern, and researchable within the available resources. The student begins this stage by identifying the general research area in which he/she wishes to write his/her thesis. The student can then search for new research topics in this area from several academic and practical sources, including:

- **Reviewing Literature**
  - Reading papers published in scientific journals and specialized conferences, especially review papers.
  - Looking for recommendations from researchers for future topics.
  - Analyzing Research Gaps in existing studies.
- **Following Industry Trends**
  - Following technological developments and scientific news.
  - Reviewing reports issued by international organizations and major corporations.
  - Studying the issues and challenges facing different industries.

- **Leveraging Practical Experiences.**
  - Identifying issues that professionals face in the work environment.
  - Proposing scientific solutions to real issues in organizations or companies.
- **Consulting Experts and Supervisors.**
  - Discussing research ideas with the academic supervisor or specialized professors.
  - Attending academic seminars and workshops to learn about important research issues.
- **Research Competitions and Projects**
  - Participating in research competitions offered by universities or scientific institutions.
  - Research projects funded by different research organizations.

It is useful to mention here the criteria against which the research topic is selected and evaluated, as a number of criteria must be met to ensure the relevance, usefulness, and study ability of the research. These criteria can be summarized as follows:

- Must be within the field of specialization
- Be novel or make a valuable scientific contribution
- Researchable with resources
- Suitable for the researcher's abilities and time

2) *Research Proposal Preparation*

The research plan/proposal is the preliminary document that sets the course of the thesis/research and tests the feasibility of the research before embarking on the research phases. The research plan outlines the main features of the research, from its title and objectives to the methodology and how the results of the study will be tested. This plan is an essential reference for the researcher and the academic supervisor to ensure that the idea is clear, feasible, and consistent with scientific standards. The plan includes several key elements that help organize the research systematically and ensure that the most important elements of the plan are in place to ensure its success. The plan should be presented to the academic supervisor for review and guidance. The following is a brief explanation of the most important elements of the plan:

- **Preliminary Title:**

The title represents the initial image of the content of the research to the reader, so it must be clear, accurate, and directly reflect the content of the study. As the research progresses, the title may need to be modified to reflect the content accurately. It is best to review the wording of the title after the objectives and the methodology have been finalized to ensure that it reflects the content of the research precisely. The quality of the title can then be checked according to the following criteria:

- The title should be informative about its subject matter.
- It must have a clear indication of the subject of the study.
- Be as short as possible.
- Be flexible so that the title can be modified if needed.
- A precise delimitation of the topic's scope and dimensions, establishing its conceptual boundaries to exclude extraneous or irrelevant considerations.
- The title must be distinctive to serve as a key to the thesis, helping it to be correctly classified and indexed in library lists.

- **Introduction: Background and Significance**

The introduction contains a brief overview of the research topic, which helps the reader to understand the general context of the study. It also explains the importance of the research, both scientifically and practically, by highlighting its impact and the contribution it makes to the field of specialization.

- **Research Problem and Objectives:**

The research question is the centerpiece of the study and reflects the originality and scientific value of the research, as well as the objectives and methodology of the research. A research issue is a scientific issue that needs to be analyzed and explained in order to fill a knowledge gap or solve a practical issue. The issue should be clear, specific, and researchable using appropriate scientific methodologies. This step requires reviewing the literature, identifying shortcomings in existing research, and then formulating a clear issue that is supported by evidence from reality, the labor market, or previous studies. In the light of the research issue, specific objectives are formulated, which helps guide the course of the study towards accurate and valuable results. It is worth noting that the research problem and objectives will be reformulated and more precisely defined in the later stages of the

research, but this initial step is important to define the main parameters and limits of the research.

- **Research Questions and/or Hypotheses:**

Research may require the formulation of research questions or hypotheses that help guide the study, analysis, and investigation. Research questions may be set to reflect research problems that the researcher seeks to answer; meanwhile testable scientific hypotheses may be developed to explain the phenomenon under investigation. This step is essential in exploratory research but is not mandatory in all types of research.

- **Literature Review and Theoretical Framework:**

The study relies on a review of previous literature and the theoretical basis of the research, where research and studies relevant to the research topic are reviewed. Concepts, theories, and/or conceptual models that form the scientific basis of the study are identified, which helps to contextualize the research within its proper scientific context. It is worth mentioning here the importance of selecting previous research and studies so that the plan ensures the originality of the research and that it has not been investigated before or addressed in the manner that the research proposes. The researcher should familiarize himself with the most important previous works and read them analytically and in-depth, enabling him to link the research topic to previous works and place it in a logical and convincing scientific context.

- **Research Methodology:**

Research methodology plays a key role in determining the methods that will be used to collect and analyze data. This includes choosing the appropriate research approach, whether quantitative, qualitative, or a combination of both, as well as determining the tools used, such as experiments or questionnaires. The methods used to analyze the data to reach accurate conclusions are also explained, such as qualitative methods in analyzing previous studies, statistical methods, or artificial intelligence algorithms, among others. The methodology, methods, and techniques used are carefully selected according to the nature of the research and its objectives. The methodology should include a clear explanation of how the results and outcomes of the research will be evaluated. Illustrations that summarize the research steps, intermediate and final outputs can be used here.

- **Expected Timeline for Completion:**

The expected timeline for the completion of the research is an important element in organizing research work. Thus, an accurate timeline is developed for the different stages of the research to ensure that the research process proceeds according to the specified time frame, making it easier to follow progress and avoid delays in the completion of the research. The tasks in the plan should be written based on the methodology chosen for the research.

3) *Preparation of Research Tools and Resources*

This step is one of the vital stages that ensures an organized work environment where the researcher can collect and analyze data using reliable and advanced sources, techniques, and tools, which ensures the accuracy and quality of the results. This step includes several aspects that can be summarized as follows:

- **Identification of Digital Resources**

Research in computing relies mainly on digital sources and repositories such as IEEE Xplore, ACM, and digital libraries with their research articles, technical reports, and electronic references. Sources may also include Open Data or datasets used to test or train models such as those used in Artificial Intelligence (AI) or Machine Learning (ML). At this stage, the researcher should categorize the sources into Books, Articles, and Technical Documents for easy reference.

- **Identification of Research Instruments and Tools**

The tools needed vary depending on the type of research. These tools may include specialized software for analysis, data aggregation tools, or even data management systems. If the research is about network systems, the researcher may need network measurement devices or network simulation tools, and if the research is about analyzing Big Data, the researcher may need analysis tools such as Hadoop, MATLAB, or Python. In Survey-based Research, questionnaires or interview tools are specified.

- **Technological Readiness**

In IT research, it is essential that the researcher has sufficient experience in using the software tools and technical systems that will be applied in the research. It must be ensured that the technological devices (such as servers, or cloud computing devices) are capable of handling the volume of data and calculations required by the research.

- **Validation of Tools and Resources**

The validity and accuracy of the digital sources that will be used must be verified, such as checking the reliability of scientific databases, especially if they are not well-known and reputable, as well as checking the novelty of technical reports. The researcher must also ensure that the software tools and techniques used are reliable and accurate. The software tools should be thoroughly tested to verify that they work properly with all the data that will be collected.

2.1.2 IMPLEMENTATION STAGE

After making the resources and research tools available and preparing the work environment, the researcher begins to carry out the research, and this stage occupies most of the time allocated to the research. The details of implementation vary according to the research methodology. However, it can be said that research commonly includes the following basic stages:

Figure 3: The inner steps of the "Implementation" stage

1) Data Collection and Organization

Data collection methods vary according to the nature of the research, and in a wide range of primary and secondary sources of data, we can cite examples and models of these data as follows: Main Concepts, Theoretical Frameworks, Conceptual Models, Previous Research and Related Works categorized by topics. Datasets that are collected from digital repositories or generated according to scenarios with predetermined performance criteria through simulators and Generation/Augmentation methods. Questionnaires are one of the most common methods of data collection in survey research. Questionnaires can be designed with closed or open-ended questions and aim to collect quantitative or qualitative data from a large group of participants. Online questionnaires are becoming more common due to their ease of distribution via the internet. After the data is collected, it is organized and categorized into relevant categories or groups. This categorization helps make it easier to be analyze later, especially if the data is large. For example, data can be categorized based on the type of topics for previous work and can be plotted in tables. In another example, the data can be organized according to the answers in questionnaires or the type of experimental groups in practical experiments, etc. At this stage, reference organization tools such as Endnote or Excel can be used where the user can categorize the data using tables and apply simple mathematical formulas.

2) Data Analysis

After collecting and organizing the data, the data are analyzed according to the nature and methodology of the research. This stage is also done in the light of the objectives and criteria of evaluating the research outputs and results. As a result of the diversity of computing research, the tools and methods of analysis are difficult to list, and the researcher at this stage must refer to what he learned in scientific research courses and references. However, some **examples** can be given here to illustrate what is required:

- Qualitative analysis and comparison of the data and contributions of previous research and works, in the light of various evaluation criteria, especially those by which the research results and outputs will be assessed. Here, the researcher must utilize his mental and cognitive energies to deeply familiarize himself with these works and analyze their details; similarities and differences, as well as the factors that contributed to shaping the results of the research negatively or positively. This in-depth analytical critical reading of previous works is an essential part of the researcher's work and contributions to the research, as he can draw important knowledge gaps and derive new solutions. This type of analysis is almost indispensable in any research, regardless of its topic.

- Big Data Analysis using AI and Machine Learning techniques. We use this type of analysis to analyze large amounts of data and if the study approach includes intelligent algorithms. Tools such as Hadoop, Spark, TensorFlow, and Keras can be used to process and analyze big data using advanced algorithms.
- Statistical Analysis In survey research, if the data collected is Quantitative, SPSS or R are used to analyze the data statistically. These tools help perform statistical tests such as analysis of variance (ANOVA) or correlation to examine relationships between variables. They can also be used to test research hypotheses and interpret results.

3) Interpreting and Discussing Findings and Proposing

At this important stage of the research, the researcher has to evaluate the results in the light of the evaluation criteria identified in the methodology. The extent to which the research objectives were achieved is analyzed, as well as the validity of the hypotheses that were tested during the research. After the data analysis is complete, the results are analyzed in reference to previous research and works. This comparison is necessary to reveal any findings that may support or contradict the research objectives and hypotheses. This analysis helps to improve the overall understanding of the topic and its findings, as well as contribute to building knowledge in the field, and may open the door to revisit or develop future work. Based on the findings, the researcher can make practical recommendations that can be applied to the field studied. For example, if the results indicate improvements in performance using a particular technique, the researcher may recommend applying this technique in future work environments or research.

Finally, collecting and analyzing data, and drawing conclusions are an essential part of any scientific research. Each stage requires specialized tools and techniques to ensure the accuracy and reliability of the results according to the research topic.

2.1.3 WRITING AND DOCUMENTATION STAGE

The writing and documentation stage in academic thesis preparation is one of the most critical phases in scientific research. During this phase, the collected and analyzed ideas and findings are transformed into a cohesive, structured scientific document. This stage requires great attention to accuracy and clarity, as the thesis must demonstrate the researcher's capacity for critical thinking and systematic organization of information. Although writing may occur throughout earlier research phases, revising and organizing

the thesis in its final form is essential for ensuring the quality and coherence of the research. The thesis should reflect the integrity and precision of the work and help other researchers understand its contributions.

Effective writing must be well-organized, where each chapter flows logically into the next, and each idea supports the next one. Clear expression and simple scientific language are essential to help readers grasp complex concepts. Furthermore, proper linguistic and grammatical editing must be maintained to ensure the thesis is free from errors.

Documentation is an integral part of the writing process. Researchers must cite every idea, quote, or reference used, applying standardized citation formats. Proper documentation includes author name, publication year, title, and sometimes page numbers, depending on the adopted citation style.

Given the importance of this stage and its influence on the evaluation and publication of the thesis, section 1.8 is dedicated to elaborating on its details.

2.2 Writing and Documenting the Academic Thesis

As introduced in Chapter One, the final writing of the thesis represents the concluding stage of the academic research process. Although preliminary writing may occur throughout the research, integrating the content into a final, cohesive document requires significant effort at the final stage.

Writing is both an academic and literary art form that plays a substantial role in making scientific contributions clear and accessible to the academic community. It also facilitates comprehension and evaluation by examiners.

Writing and documentation follow the established standards of each academic discipline. This guide has been developed based on widely accepted practices in computing and information technology disciplines. The chapter is structured into two main sections: the first addresses the organization and content of thesis chapters, and the second discusses academic writing and documentation standards.

2.2.1 Writing Thesis Chapters Systematically

This section outlines the content and structure of academic thesis chapters, based on flexible standards applicable to most research topics in computing and information

technology, referencing numerous local and international sources. Thesis chapters are generally structured as follows:

- Introduction
- Literature Review
- Methodology
- Results and Discussion
- Recommendations, Implications, and Conclusions

It should be noted here that the chapters may be more than what is mentioned here in case the scientific contribution is large and needs to be divided into more chapters or the research is of a special nature and this requires detailing the research methodology in several chapters, but the chapters of any thesis should not be less than the above. Figure 4 shows a list of the main chapters. Note that, chapter 3 -methodology- can be organized using more than one chapter if needed.

CHAPTER ONE: INTRODUCTION

This chapter offers a brief overview of the research topic. It guides the reader by explaining the context, objectives, significance, and motivation behind the study. It may also present hypotheses or research questions.

1) **Preface**

This part provides a general background on the topic to be studied. It should address the general context of the issue to be addressed. In the field of information technology, the introduction may include an overview of the evolution of technology, a specific issue in information systems applications, or challenges facing organizations in using a particular technology such as artificial intelligence or cloud computing.

Example: If the research is on "Analyzing the effectiveness of using AI to improve customer service in businesses," the introduction might touch on the importance of AI in business, and how the field has impacted improving efficiency in companies.

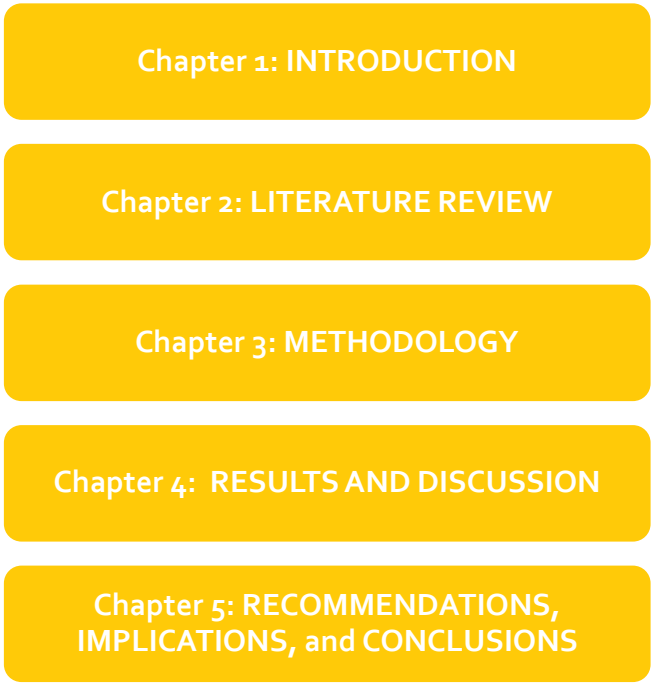

Figure 4: The main chapters of the thesis

2) Problem Statement:

In this part, the research question is precisely formulated based on what has been studied and analyzed in the literature review. The knowledge gap that this research will fill should be demonstrated. References should be documented in accordance with the standard methods adopted by the university. The issue should be formulated in a way that makes it clear that it is related to the title and context of the research.

Example: If the research is "Analyzing the effectiveness of algorithms in improving the performance of wireless networks", the research question will be the weakness of current algorithms in reducing network losses and improving the speed of data transfer.

chapter 1 Introduction	Preface
	Problem Statement
	Research Objectives
	Research Questions
	Research Hypothesis
	Research Scop
	Research Methodology
	Thesis Orgenization

Figure 5: The main content of chapter 1, "Introduction"

3) Research Objectives:

Here the objectives are written in clear, measurable, and precisely defined terms. They should also be realistic for the time frame available to conduct the research. Objectives are developed in the light of the research questions and based on what has been learned from previous studies. Avoid listing objectives in steps or stages that reflect the methodology rather than the objectives. Objectives should be formulated using verbs. Objectives can be formulated in the form of general objectives and then broken down into smaller objectives. The most important criteria for setting and formulating objectives can be summarized as follows:

- **Accuracy and clarity:** Objectives should be precise, realistic, and specific.
- **Measurable:** Objectives should be measurable and assessable so as to improve performance, increase efficiency, or solve a specific issue.
- **Relevance to the Problem:** Objectives should be closely related to the research question and contribute to solving it or clarifying aspects of it.
- **Distribution to different levels:** Objectives can be divided into major and minor goals.
- **Innovation:** Objectives should be geared towards providing innovative solutions or new discoveries in the field of research.

Examples:

- Studying the impact of applying artificial intelligence techniques on the speed and efficiency of data processing in database management systems.

- Analyzing the economic benefits of using AI to improve the performance of SMEs.
- Identifying the technical challenges associated with the application of AI in database systems.
- "Analyzing the effectiveness of algorithms in improving network performance" could include an objective such as "Determine the effect of X algorithm on the speed of a network connection".

4) Research Questions:

It is preferable to reflect the research objectives in the form of research questions that the researcher seeks to answer through the research, as this will better guide the researcher more accurately to the appropriate methodologies, methods, and tools. Thus, these questions should be related to the research objectives.

Example: If the topic is related to "network analysis", the search questions might be something like:

- What are the most effective algorithms for optimizing network performance?
- How do different algorithms affect the connection speed?

5) Research Hypothesis:

If the research is hypothesis-driven, the hypotheses are presented here. Hypotheses are tentative conceptualizations of what a study might find, and are tried or tested during the research. Hypotheses may not be required in all types of research (especially if the research is qualitative or exploratory.

Example: The research hypothesis might be: "X algorithms lead to a significant improvement in network performance compared to Y algorithms".

6) Study Scope:

This section defines the scope of the study, including clarification on what aspects will be addressed, as well as what will be excluded from the study. This section identifies the elements that may affect the scope of the research or the results of the study, such as temporal, geographical, methodological, or data limitations.

Example: If the research is about "the performance of Internet networks in specific environments," the boundaries may be limited to studying only Internet networks in large corporations, excluding networks in home environments.

7) Research Methodology:

In this part, the general approach that the researcher will use, such as quantitative, qualitative, or mixed methods research, and specific methodologies such as case studies, laboratory experiments, or data analysis, are identified and formulated. This is done in a brief manner as it will be detailed in the methodology chapter.

Example: Using a quantitative approach to analyze network speed using digital measurement tools (e.g., collecting data about network performance using specialized software).

8) Thesis Organization:

This part provides an index of the different parts of the thesis and explains how the it is organized in general. An overview of each chapter or section of it is given.

Example: Chapter one deals with the introduction of the research, Chapter two reviews the literature on previous research, Chapter three discusses the methodology used in the research, Chapter four deals with result analysis, and finally, Chapter five presents the conclusions and recommendations.

CHAPTER TWO: LITERATURE REVIEW

This chapter forms the theoretical framework of the research. It introduces the background of the research and the basic concepts/theories related to the research as well as previous studies and related works, this helps in building a knowledge background that supports the research topic and puts it in its proper scientific context. Figure 6 shows the main sections of this chapter.

This chapter reflects the researcher's analytical and critical capabilities. Literature is reviewed analytically and categorized thematically or chronologically. The chapter ends by summarizing major contributions, identifying the research gap, and proposing the research direction. Visual tools like tables or diagrams are recommended. Key **criteria** for literature review are as follows:

- **Comprehensiveness and Recency**: Cover relevant, up-to-date, and foundational studies.
- **Source Relevance**: Use credible, subject-specific references.
- **Critical Analysis**: Highlight strengths, weaknesses, and research gaps.
- **Logical Organization**: Organize by theme or timeline.
- **Diverse Literature**: Incorporate various source types and viewpoints.

- **Credibility**: Prefer peer-reviewed journals and conferences.
- **Objectivity**: Avoid bias; present all perspectives fairly.
- **Proper Citation**: Use accurate, consistent citation methods.

chapter 2 Literature Review	Background
	Related Works

Figure 6: The main content of chapter 2, "Literature Review"

CHAPTER THREE: METHODOLOGY

This chapter documents the research methodology and establishes it in a scientifically sound manner. It includes details about the research design, data collection methods, research tools, data analysis procedures, and any other details related to the methodology used. The researcher explains the general methodology chosen for the research, including general approaches (quantitative, qualitative, mixed), design-based research and development, experimental research, applied research, action research, and other methodologies. It also discusses detailed methods such as the waterfall methodology in systems development, the steps for data collection and analysis in data science, or the steps of machine learning (Waterfall model, Data Science Life Cycle, Machine Learning Methodology). The researcher must justify his/her choices here in a sound and convincing scientific manner, consistent with the research objectives and the nature of the topic.

Often, the researcher needs to combine more than one approach or method, or to allocate detailed steps in one of the main stages of the methodology according to a specific model. The decisive factor here is the research topic and its method. It is important that this is explained and documented clearly and justifiably.

These approaches and methods are then applied to the research, explained in detail and supported by illustrations that explain the stages of the methodology and its intermediate and final outputs clearly and accurately. This chapter generally includes how the data was collected and analyzed and the tools and methods used, such as questionnaires or software tools, and here the importance of documenting the tools used accurately to clarify how the results were reached. In the case of using specific algorithms, developing an algorithm, or devising a mathematical equation, this should be thoroughly explained and the algorithms and equations should be documented in standard ways, using figures and illustrations wherever possible. It should be noted here that this chapter contains the outputs of the two phases of the thesis mentioned in the first chapter of the guide, "Methodology and

Implementation." Should the research require a separate chapter for the implementation phase, this may be done, as mentioned at the beginning of this section.

Any **limitations** of the research, such as time, resources, or access to data, should be identified. This helps provide a realistic picture of the research methodology. The reliability of the data should be checked by selecting balanced data and testing the solutions with different sets of data. This also includes answering the question of whether the experiment can be replicated or the data collected in the same way to get the same results.

It is important to note the importance of **adhering to the standards of scientific documentation** of previous references and literature according to the approved system. This will be explained in a later paragraph.

CHAPTER FOUR: RESULTS AND DISCUSSION

This chapter presents and analyzes research findings. The results should be presented in an organized manner, using tables, graphs, or diagrams, with a clear explanation for each result. Each result should be documented and compared to the objectives or research questions, as well as the hypotheses initially proposed. This chapter also compares and discusses the results, linking them to the theoretical framework, and comparing them to previous studies.

1) Results:

In this section, the results obtained through the research, experiment, or study are presented. Data are presented objectively and accurately, often in the form of tables, graphs, or explanatory text. It is important that the results are organized and structured in a way that is easy for the reader to understand.

2) Discussion:

This section introduces interpretation and comparison with literature, assessment of implications, unexpected outcomes, and limitations; It addresses that based on findings in in the previous section.

The results are compared with previous studies or existing theories in the field. It details what these results mean in the context of the research problem and specific objectives. Any unexpected results and their interpretation are explained. The strengths and weaknesses of the results are analyzed, as well as the potential for error or bias in the data. This chapter

allows the researcher to relate the results to the original research questions and explain any hypotheses that have been supported or refuted.

The following is a summary of the most important **criteria** for formulating and discussing research results:

- **Clear presentation and explanation of results:**
  - Presenting the results in an organized manner (tables, graphs, or text) with a brief explanation of each result.
- **Connection to objectives and hypotheses:**
  - Interpreting the results objectively and linking them to the main objectives of the research.
  - Comparing the results to the proposed hypotheses.
- **Comparison with prior studies:**
  - Comparing the research results to previous studies to clarify the extent of agreement or contradiction.
- **Identify limitations:**
  - List any limitations that may have affected the results, such as the sample, tools, or research conditions.

CHAPTER FIVE: RECOMMENDATIONS, IMPLICATIONS, AND CONCLUSIONS

This chapter summarizes findings, provides practical recommendations, and outlines future research possibilities. Conclusions should be formulated in light of the initial objectives that were set at the beginning.

1) **Recommendations:**

In this part, the researcher makes recommendations based on the research findings. Recommendations can relate to practical guidance (e.g., recommendations for practitioners or policymakers) or suggestions for future research. These recommendations are important because they show how research findings can be used to improve practices or guide future research.

2) **Implications:**

This section deals with the practical or theoretical implications of the research findings. It is explained how the results can impact the academic field, industry, or society. The researcher demonstrates how the findings can be applied in real-world contexts or how they may influence the development of existing knowledge and theories.

3) Conclusions:

This section summarizes main points, reinforces objectives, and highlights key contributions.

We have completed the explanation and detailing of the research chapters. The next section will focus on writing the abstract, which—although placed at the beginning of the thesis—is typically written after completing all thesis chapters.

2.2.2 Writing the Abstract and Preliminary Pages of the Thesis

The abstract is composed upon the completion of the research and finalization of the thesis, despite its placement at the beginning of the document. It serves to summarize the entirety of the thesis, including the findings. Typically, in scientific disciplines, the abstract comprises between 150 and 300 words. It should not contain complex technical details or references. The language used must be simple and clear, focusing on the main points. The abstract should provide an overview of all major sections of the research (introduction—particularly the problem and objectives, methodology, results, and conclusions). The criteria for a well-crafted abstract can be summarized as follows:

- **Conciseness and Clarity**: The abstract should be succinct and clear, within 150–300 words.
- **Comprehensive Coverage**: It should include the problem, objectives, methodology, results, and conclusions.
- **Simplicity**: Use straightforward and easily understandable language.
- **Logical Sequence**: Present information in a logical order.
- **Focus on Main Ideas**: Avoid unnecessary details; do not include complex technical information or references.
- **Consistency with Research Content**: The abstract must accurately reflect the content of the research.

In addition to the main body of the thesis, which includes the primary chapters previously detailed, it is essential to outline the remaining components of the academic thesis. This will be clarified through the following table, which illustrates the arrangement of the thesis chapters and their contents, encompassing preliminary pages, the main body, and appendices. It is crucial to adhere to the formatting and editing guidelines as per the approved template. While the following table provides a summarized overview, the official thesis template contains detailed formatting and illustrative models that should be consulted.

	Title	Details
1	**Title Page**	The title is written at the top of the page, including: Kingdom of Saudi Arabia, Ministry of Higher Education, Qassim University, College, Department—each on a separate line. The university logo is placed on the right side.
2	**Basmala Page** **صفحة البسملة**	The phrase "In the Name of Allah" should be in a large, distinctive font.
3	**Discussion Committee's Recommendation and Signatures Page**	This page includes the decision and signatures of the discussion committee members.
4	**Acknowledgment Page**	This page is optional; acknowledgments can also be included at the end of the introduction.
5	**Abstract**	Length should be between 150–300 words.
6	**Table of Contents**	
7	**List of Tables**	
8	**List of Figures**	
9	**Main Text of the Research**	These are the research chapters as previously detailed.
10	**References**	According to the approved template.
11	**Research Appendices**	
12	**Arabic Title Page**	This page is placed at the end of the thesis, positioned as the first page from the right.

2.2.3 Adhering to Academic Writing Standards

Maintaining academic standards in writing is fundamental to ensuring the quality of the thesis and verifying its credibility and originality. The following outlines the recognized academic standards in thesis writing, including language usage and citation methods:

1) Using Formal Academic Language

Academic language is characterized by its formal and precise nature, aiming to convey complex ideas and concepts accurately, objectively, and concisely. The main features of academic language include:

- **Precision and Clarity**: Words are used accurately and specifically, avoiding ambiguity, generalizations, or unnecessary elaboration that may affect meaning.
- **Neutrality and Objectivity**: The language should be free from bias or personal opinions, avoiding emotional or subjective expressions.
- **Formal Style**: Colloquial or informal expressions are not used. Preferably, sentences are moderately long, logical, and coherent.

- **Avoidance of Personal Style**: Personal pronouns such as "I" or "we" are generally avoided in academic writing.
- **Structured Construction**: Sentences should be complete, presenting ideas in a logical sequence and avoiding abrupt transitions between thoughts.

2) CITING REFERENCES USING A STANDARD FORMAT

Scientific research relies on sources and references. Ethical research practices, along with copyright laws, require researchers to cite their sources. Proper citation not only acknowledges the original authors but also enhances the credibility of the research and allows readers to verify information. Various standardized citation styles exist; however, the citation style used in the thesis must align with the department's approved template. Below are common citation styles:

- *APA (AMERICAN PSYCHOLOGICAL ASSOCIATION) STYLE*

Widely used in social sciences and scientific fields, including information technology research.

- **Book**:
  - Last Name, First Initial. (Year). ***Title of book***. Publisher.
  - ***Example***: Smith, J. (2020). ***Introduction to Algorithms***. Tech Press.
- **Journal Article**:
  - Last Name, First Initial. (Year). Title of article. ***Journal Name***, Volume (Issue), Page range.
  - ***Example***: Brown, A. (2019). Enhancing network security with AI. ***Journal of Computer Science***, 45(2), 123–134.
- **Website**:
  - Author. (Year, Month Day). Title of webpage. ***Site Name***. URL
  - ***Example***: Patel, R. (2023, March 15). Cloud computing in healthcare. ***Tech World***. https://www.techworld.com/cloud-healthcare

- *IEEE (INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS) STYLE*

Commonly used in information technology and engineering research. References are numbered in the order they appear in the text.

- **Book**:
  - [1] J. Smith, ***Introduction to Data Structures***, 3rd ed. New York: Tech Press, 2018.
- **Journal Article**:
  - [2] A. Brown, "AI in network security," ***Journal of Computer Science***, vol. 45, no. 2, pp. 123–134, 2019.
- **Website**:
  - [3] R. Patel, "Cloud computing in healthcare," ***Tech World***, Mar. 15, 2023. [Online]. Available: https://www.techworld.com/cloud-healthcare. [Accessed: Mar. 20, 2023].

- *MLA (Modern Language Association) Style*

Primarily used in literature and humanities but applicable in information technology research with literary or humanistic aspects.

- **Book**:
  - Smith, John. ***Introduction to Algorithms***. Tech Press, 2020.
- **Journal Article**:
  - Brown, Andrew. "Enhancing Network Security with AI." ***Journal of Computer Science***, vol. 45, no. 2, 2019, pp. 123–134.
- **Website**:
  - Patel, Raj. "Cloud Computing in Healthcare." ***Tech World***, 15 Mar. 2023, https://www.techworld.com/cloud-healthcare.

- *Chicago Style*

This method is used across various disciplines, including Information Technology. It offers two options: the footnote referencing system or parenthetical citation. Examples of citation in the Chicago style include:

- **Book:**
  - Smith, John. Introduction to Algorithms. New York: Tech Press, 2020.
- **Journal article:**
  - Brown, Andrew. "AI in Network Security." Journal of Computer Science 45, no. 2 (2019): 123–134.
- **Website:**

- Patel, Raj. "Cloud Computing in Healthcare." Tech World, March 15, 2023. https://www.techworld.com/cloud-healthcare.

- *HARVARD STYLE*

This citation style is widely used in many countries, especially in academic and IT research. It involves including the author's name and year of publication directly in the text. Examples of citation in the Harvard style include:

- **Book:**
  - Smith, J., 2020. Introduction to Algorithms. New York: Tech Press.
- **Journal article:**
  - Brown, A., 2019. Enhancing network security with AI. Journal of Computer Science, 45(2), pp. 123–134.
- **Website:**
  - Patel, R., 2023. Cloud computing in healthcare. Tech World. Available at: https://www.techworld.com/cloud-healthcare [Accessed 20 Mar. 2023].

As demonstrated, citation styles vary. In the field of Information Technology, the IEEE style is widely used due to its prevalence in technical and engineering research. Nonetheless, the citation method must be selected in accordance with the university's requirements.

3) PLAGIARISM CHECK

Plagiarism refers to the use of ideas or text from other works without proper attribution, constituting a violation of intellectual property rights. It is considered a serious academic offense that undermines the credibility and originality of research and may lead to disciplinary action. Plagiarism can be detected by comparing submitted texts with content from academic databases, the internet, and previously published research.

The aim is to ensure the research is free of uncredited content and to uphold academic integrity. Tools such as Turnitin and iThenticate are commonly used for plagiarism detection. These tools analyze the text and provide a similarity index. The acceptable similarity percentage must not exceed 19%. If this threshold is exceeded, the thesis will not be accepted for defense. It is essential to use the plagiarism checker determined by the university.

- **What is considered plagiarism?**
  - Copying content from another source without citation.
  - Paraphrasing without crediting the original source.
  - Using ideas or data from another research without referencing them.
- **Objectives of plagiarism detection tools**
  - Ensure originality: Plagiarism checks confirm that the research is based on the author's own ideas and does not include undocumented quotations.
  - Improve research quality: By ensuring every quote or idea is properly cited, the credibility of the research is strengthened.
  - Uphold academic integrity: These tools demonstrate the researcher's respect for original sources and previous contributions.
- **Guidelines to avoid plagiarism**
  - Use quotations: When directly quoting another source, use quotation marks ("") and cite appropriately.
  - Paraphrase responsibly: Rewrite the information in your own words and cite the original source.
  - Accurate referencing: Each source should be properly cited with all necessary details, including author name, year, title, page number, etc.

In conclusion, adherence to academic standards contributes to ensuring the integrity and originality of academic research, enhances its credibility, and helps maintain academic integrity.

Finally, we hope that this guide serves as a helpful resource for students throughout their research journey, supporting them in composing a comprehensive and academically sound thesis that contributes meaningful value to their field of study.


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كلية الحاسب