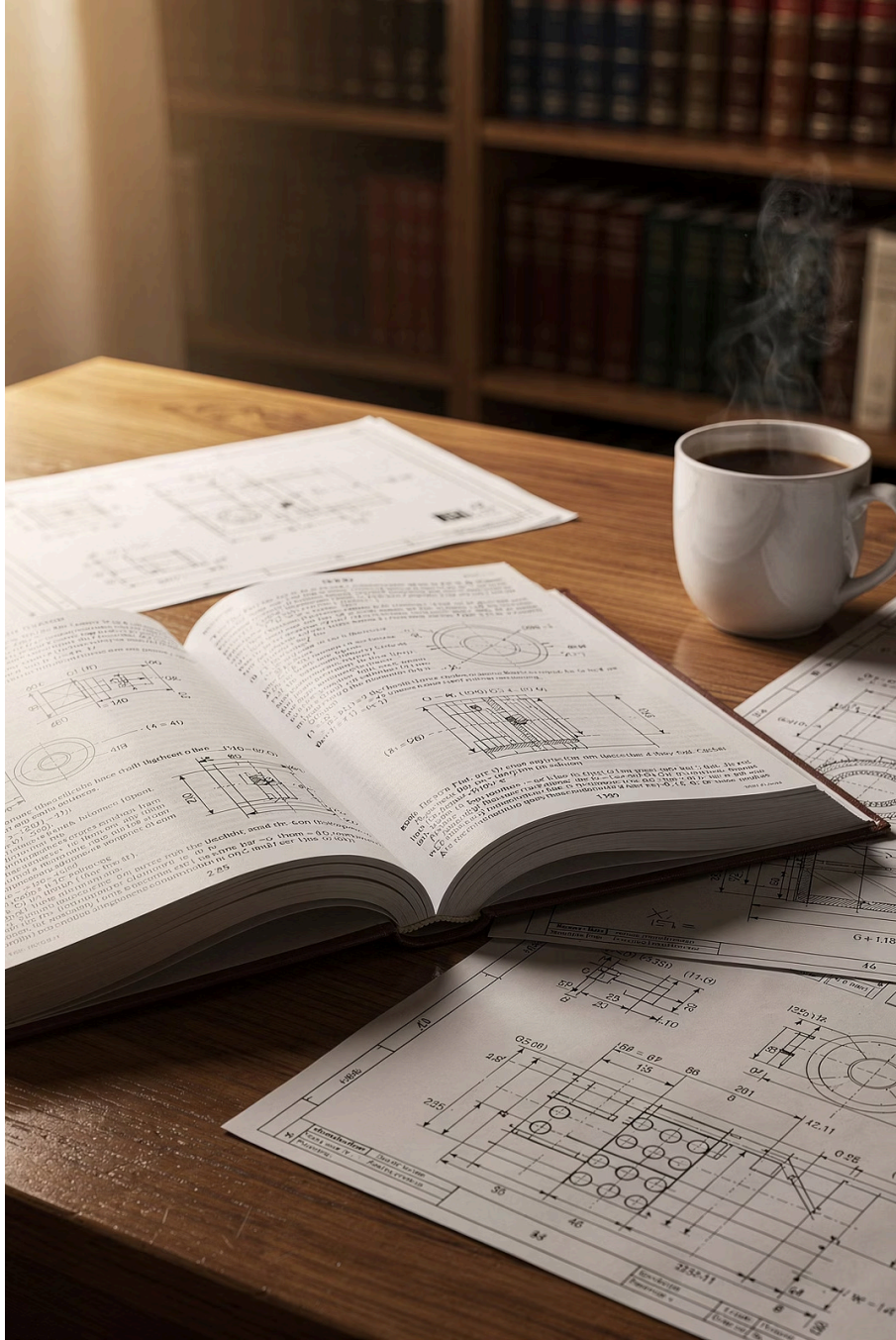
Writing Guide for Chapter 2: Literature Review

A comprehensive guide for civil engineering students in structuring and writing Chapter 2 (Literature Review) for a Final Year Project (FYP). This document guides you from the general introduction all the way to the chapter summary in a systematic and academic manner.

FINAL YEAR PROJECT (FYP) CIVIL ENGINEERING



What Is the Purpose of Chapter 2?

Chapter 2 is the core of a research project. It is not merely a list of references, but an academic argument that shows the writer understands the field of study in depth.

Discussing Theory

Explains the main theories and concepts that form the foundation of your study.

Highlighting Standards

Refers to relevant standards, codes of practice, and industry guidelines.

Analyzing Previous Studies

Discusses prior research and identifies gaps in the body of knowledge.

Supporting Methodology

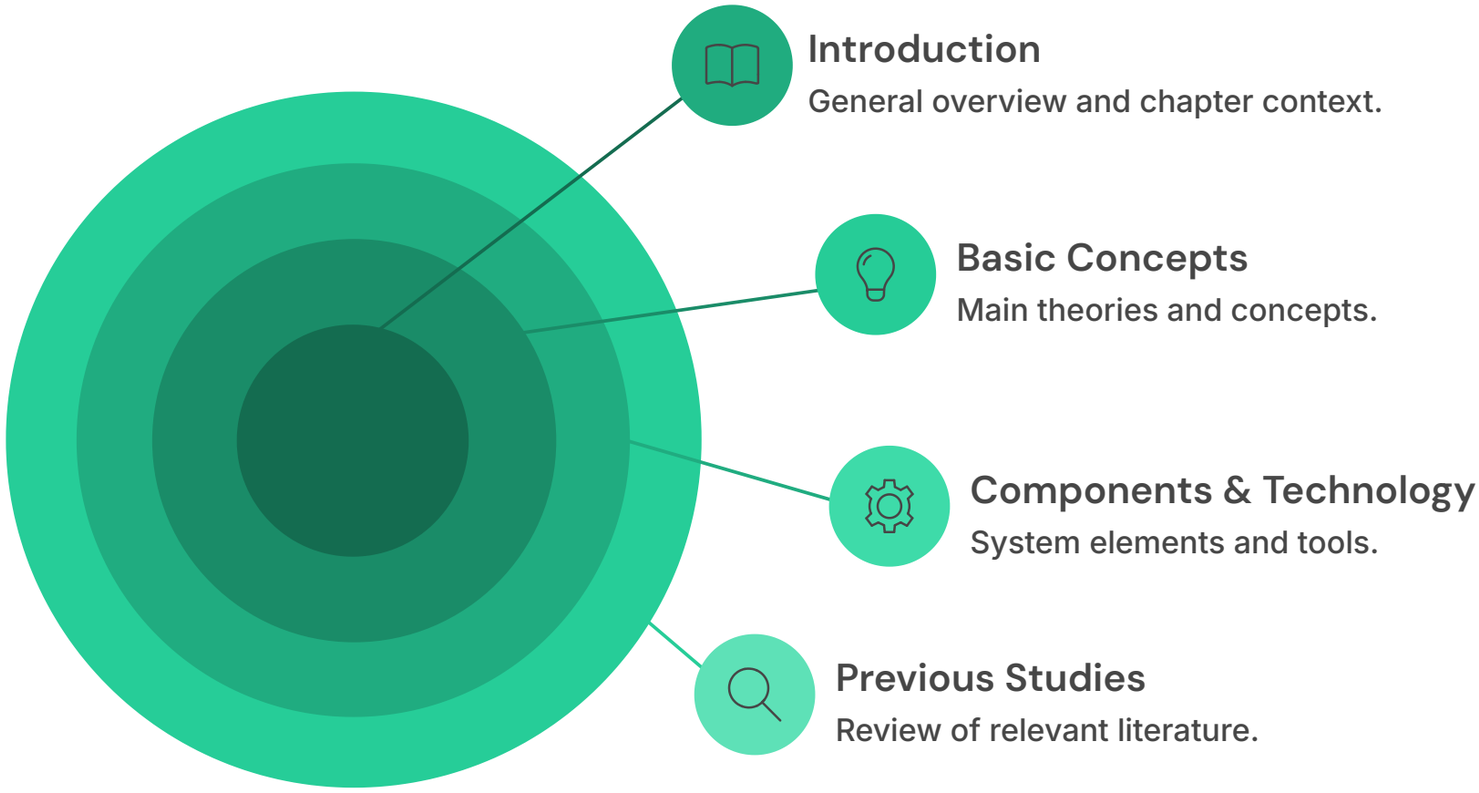
Connects literature findings with the methods that will be used in Chapter 3.

Principles of Literature Review Writing

Good writing must follow the following basic principles: structured from **general to specific**, focused on the research topic, and showing a clear relationship between the literature and the project being developed.



Overall Structure of Chapter 2



Each section plays its own role in building a strong academic argument. This structure ensures that readers can follow the flow of ideas from the general context to the justification of the project.

SECTION 2.1

Introduction to Chapter 2

Purpose of the Introduction

Introduce the scope of Chapter 2, explain the aspects that will be discussed, and connect Chapter 1 with Chapter 2 in a logical and smooth way.

Content That Should Be Included

- Overview of the research topic
- Importance of conducting a literature review
- Outline of the subtopics to be discussed
- Clear transition from Chapter 1

Recommended length: 1–2 paragraphs only.

How to Write the Introduction to Chapter 2

1 **Start with General Context**

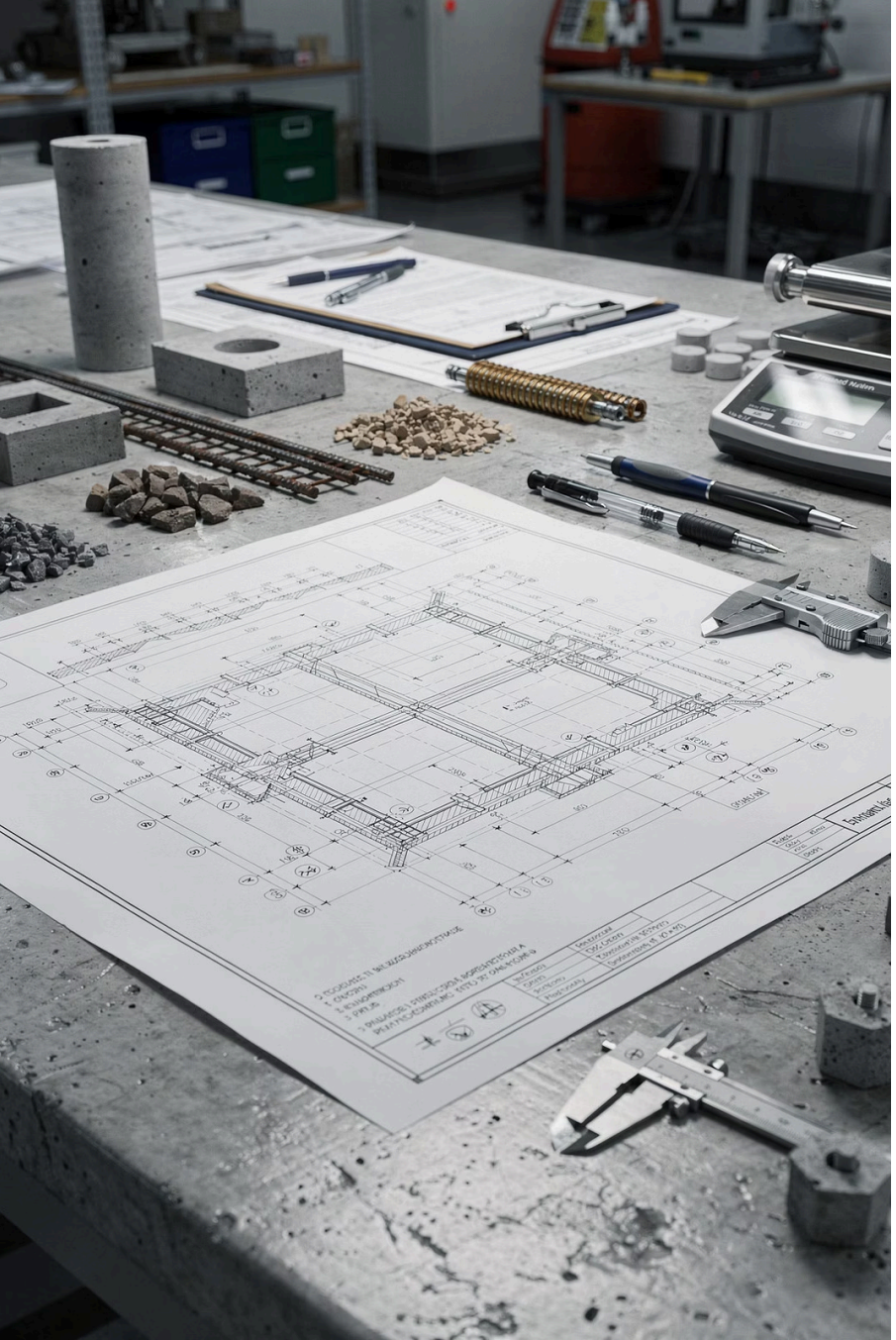
State the field of study broadly. For example, begin with the importance of sustainable construction in the current civil engineering industry.

2 **Narrow Down to the Specific Topic**

Shift the focus to your project topic specifically, explaining why the literature review in this field is important.

3 **State the Discussion Structure**

End the introduction with a sentence that explains the subtopics to be discussed in Chapter 2, giving the reader a roadmap.



SECTION 2.2

Basic Concepts of the Study

This section provides an explanation of the main concepts or theories related to the project. It builds the foundation of understanding needed before the reader can follow the more in-depth technical discussion.

Key Elements in the Fundamental Concept



Definitions of Key Terms

Define all technical terms used in the project. Ensure the definitions are taken from recognized sources such as BS standards, ASTM, or indexed academic journals.



Principles & Standards

State the basic principles and the relevant standards or codes of practice. For example, MS 522 for concrete blocks or ASTM C90 for hollow concrete units.



Supporting Theory

Present the scientific or engineering theories that form the basis of the study. Explain how those theories directly support the approach taken in the project.

Example: Recycled Plastic Concrete Project

FYP Title: *Recycled Plastic as Partial Replacement in Concrete Blocks*

Concrete Block

Definition, types, and manufacturing standards of concrete blocks in the Malaysian construction industry.

Cement & Aggregates

The role of cement, fine aggregates, and coarse aggregates in determining the mechanical properties of concrete.

Plastic Waste

Types of recyclable plastic (PET, HDPE), their physical properties, and their potential as a partial replacement in concrete.

Sustainable Construction

The concept of sustainable construction and the importance of reducing construction material waste in both global and local contexts.

Example: Smart Drainage System Project (IoT)

FYP Title: *Development of Smart Solar Powered Rainwater Harvesting System* — Basic concept subtopics cover the core technologies integrated into the system.

Rainwater Harvesting System

Concepts, components, and benefits of a rainwater collection system in the context of sustainable water resource management.

Solar Energy System

Solar panels, storage batteries, and charge controllers — principles of renewable energy generation and storage.

Water Filtration System

Layers of gravel, sand, activated carbon, and coconut fiber as natural filtration media.

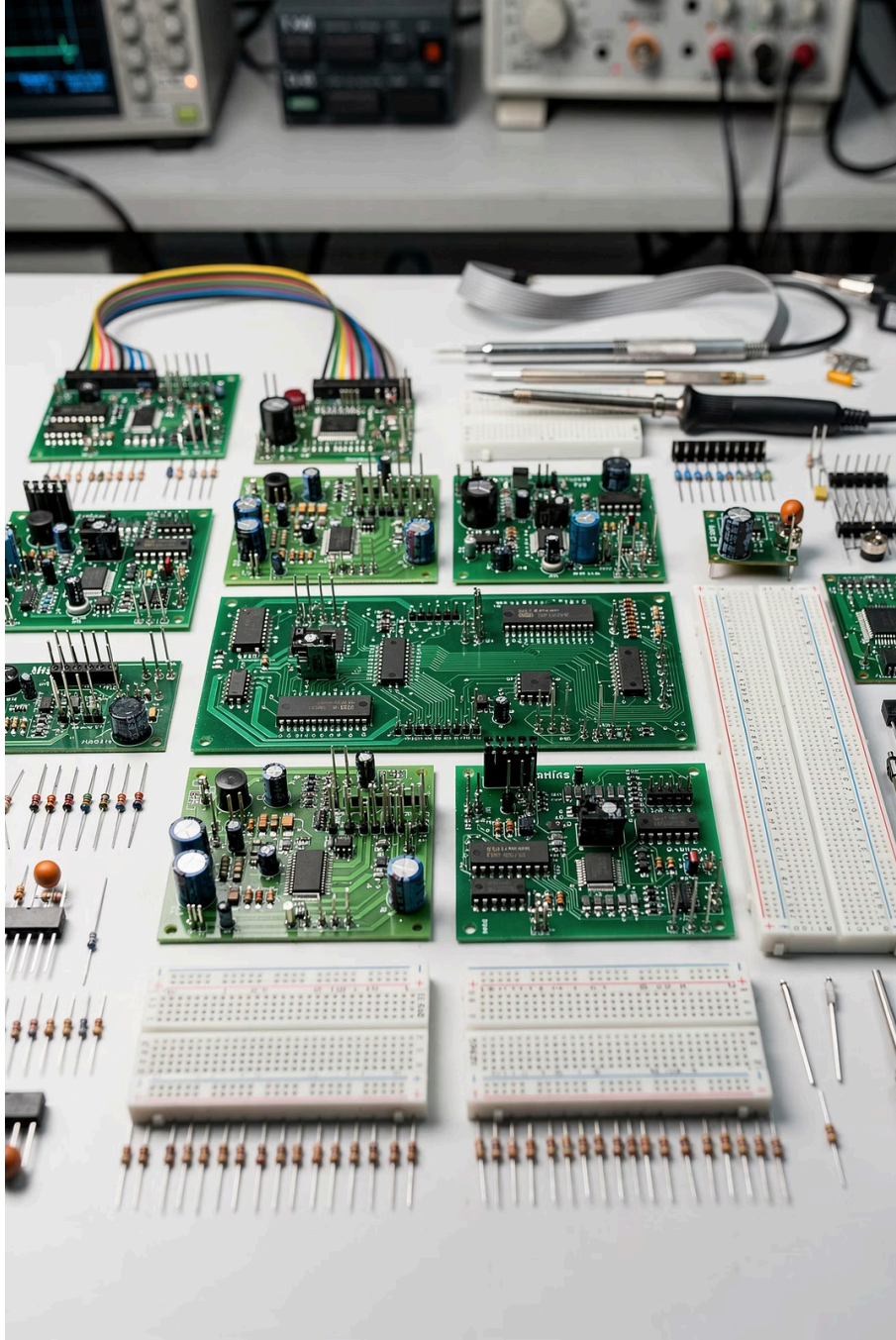
Arduino Automation System

Arduino Uno, water level sensor, relay module, and pump as automatic control components.

SECTION 2.3

Study of Components or Technology

This section explains each component or material used in the project in detail. The discussion should cover the function, type, advantages, disadvantages, and applications in the current industry.



Framework for Component Discussion

1

Function

What role does this component play in the overall system or study?

2

Types & Specifications

What variations exist? Technical specifications relevant to the project.

3

Advantages & Disadvantages

Critical analysis of the strengths and limitations of the component.

4

Industrial Applications

How is this component used in the project or in real industry settings?

Example: Description of IoT Drainage Project Components



Arduino Uno

ATmega328P-based microcontroller. Functions as the brain of the automation system, processing input from sensors and sending commands to actuators.



Ultrasonic Sensor

The HC-SR04 sensor measures distance using ultrasonic sound waves. Used to detect water level in the tank accurately and without physical contact.



Solar Panel

Photovoltaic panel that converts sunlight into electricity. Provides a sustainable, off-grid power source for the rainwater harvesting system.

IoT Drainage Project Components (Continuation)



Water Level Sensor

The water level sensor provides continuous analog readings of water height. It is integrated with Arduino for automatic control of the pump and solenoid valve.



GSM Module

The SIM800L module enables the system to send SMS notifications or data to an IoT platform wirelessly, allowing remote monitoring by users.



IoT Platform

Platforms such as Blynk or ThingSpeak enable real-time data visualization, record storage, and device control from the user's smartphone.

Example: Water Filtration Components

For a rainwater harvesting system project, the filtration section is critical to ensure the quality of the produced water.

Gravel

The first filtration layer. Filters out coarse particles, leaves, and large debris from collected rainwater.

Sand

The second layer filters fine particles and suspended sediment. Silica sand is commonly used because of its filtration efficiency.

Activated Carbon

Absorbs odors, color, and organic compounds from water. It is highly effective in improving the organoleptic quality of water.

Coconut Fiber

A natural, eco-friendly layer that functions as a preliminary filter and supports the growth of beneficial biofilm.

Writing Tips for the Components Section

1

Use Primary Sources

Refer to manufacturer datasheets, ASTM/BS standards, or indexed Scopus/Web of Science journals for accurate technical specifications.

2

Compare Options

If there are several component options, explain why the selected component is the most suitable for your project based on technical criteria.

3

Relate to the Project

Each component description must end with an explanation of why it is relevant and how it will be used in the context of your specific project.

4

Include a Diagram

Diagrams or component photos improve the clarity of the discussion and show the writer's technical understanding.

SECTION 2.4

Literature Review

This section is the main foundation of Chapter 2. Here, the writer discusses relevant previous research critically and analytically, rather than simply summarizing the content of the articles.



Essential Elements for Every Article

01

Author & Year

State the author's name and the publication year according to the specified citation format (APA, IEEE, or Harvard).

02

Research Objective

What is the main aim of the research? State it briefly and precisely.

03

Research Method

How was the study conducted? Laboratory experiment, computer simulation, field study, or questionnaire survey?

04

Main Findings

What are the most important results or conclusions obtained from the study?

05

Research Limitations

What are the study's limitations or weaknesses? This forms the basis for identifying your research gap.

Recommended Number of Articles

10–20

Relevant Articles

The minimum recommended number of articles for a comprehensive and robust literature review.

5

Most Recent Years

Prioritize articles published within the last 5 years to ensure the relevance and timeliness of the study.

70%

Indexed Journals

At least 70% of the sources should come from Scopus- or Web of Science-indexed journals.

Example Table of Previous Studies

A summary table is an effective way to present many studies in an organized manner before a detailed discussion is carried out.

Author	Objective	Method	Findings	Research Gap
Ahmad et al. (2023)	Studying concrete strength with PET plastic	Laboratory experiment	Compressive strength increased by 8% at 5% replacement	No durability and water absorption tests
Lee et al. (2024)	Using recycled HDPE plastic in concrete	Laboratory testing + statistical analysis	Concrete weight reduced by 12% compared with the control	No cost analysis and long-term sustainability assessment
Tan & Yusof (2022)	Evaluating the thermal properties of plastic concrete blocks	Numerical simulation	Thermal conductivity value decreased by 15%	Study limited to tropical climates only

How to Write a Literature Review Narratively

Do Not Just Summarize

Write analytically, not merely by retelling what the researchers did. Discuss the significance of the findings in the context of your study.

Make the Connection

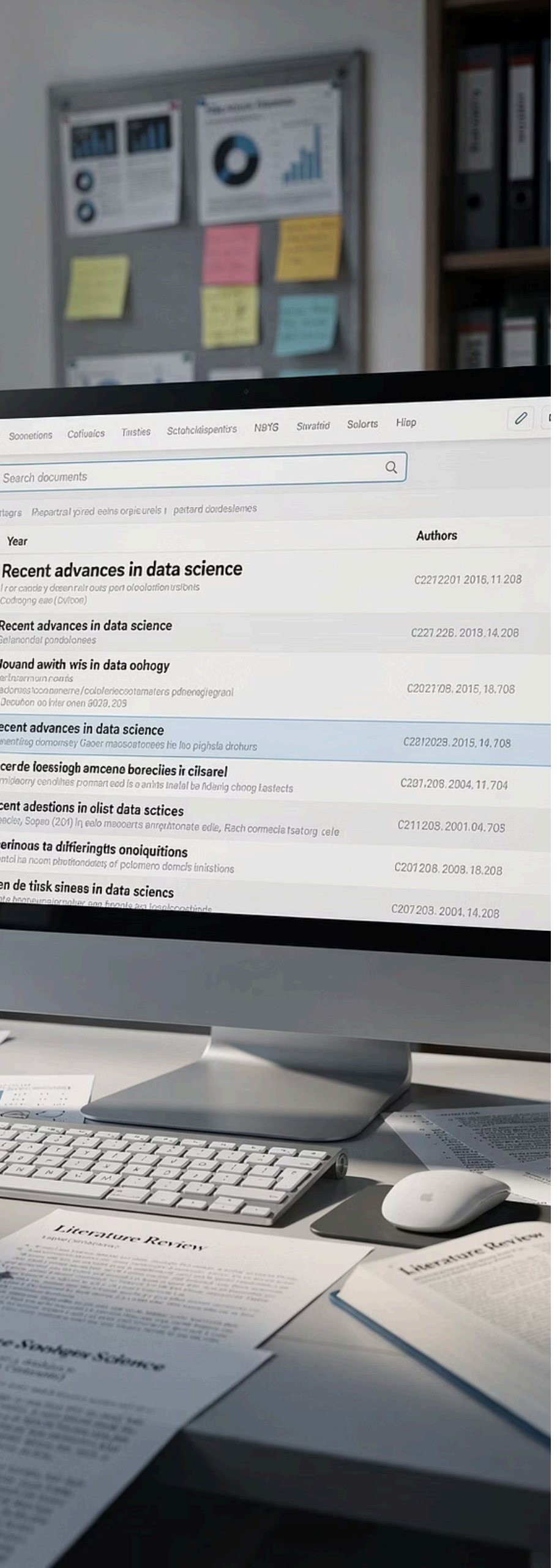
Clearly explain how each cited study relates to your FYP project. Do not leave the reader to make assumptions on their own.

Use Transitional Phrases

Use phrases such as "Next...", "Unlike the studies above...", "Consistent with the findings of Ahmad et al. (2023)..." to maintain narrative flow.

Group by Theme

Organize previous studies by theme or subtopic, not by chronology, to make comparative analysis more meaningful.



Recognized Reference Sources

Scopus – Indexed Journals

Construction and Building Materials, Journal of Cleaner Production, Engineering Structures

IEEE/Web of Science Journals

IEEE Transactions, Computers & Structures, Cement and Concrete Composites

Technical Standards

MS 522, ASTM C90, BS 6073, BS EN 771 for material specifications and testing

Theses & Dissertations

PhD and Master's theses from reputable universities can be used as supporting sources, not primary sources.

SECTION 2.5

Comparison of Previous Studies

After discussing the previous studies individually, this section compares those studies critically to identify patterns, similarities, differences, and trends in the field of study.

Similarities

What methodologies, materials, or findings are shared among several studies?

Differences

What aspects distinguish the studies in terms of scope, approach, or context?

Current Trends

What is the direction of research in this field? Where are leading researchers heading?

Example Comparative Study Table

The comparative table allows supervisors and readers to clearly and efficiently see the differences between studies.

Study	Material	Method	Strength	Limitation	Context
Study A	PET	Experiment	Strong compressive strength data	High cost, no climate testing	Europe
Study B	HDPE	Laboratory	Reduced concrete weight	Poor long-term durability	East Asia
Study C	PP	Simulation + Testing	Comprehensive thermal analysis	Limited scope, only 1 ratio	Local

Analyzing Trends in Previous Studies

Early Phase (2010–2015)

Studies focused on the basic compressive strength of plastic in concrete with low replacement ratios.

1

2

Development Phase (2016–2020)

Researchers began examining durability, water absorption, and thermal performance of plastic concrete more comprehensively.

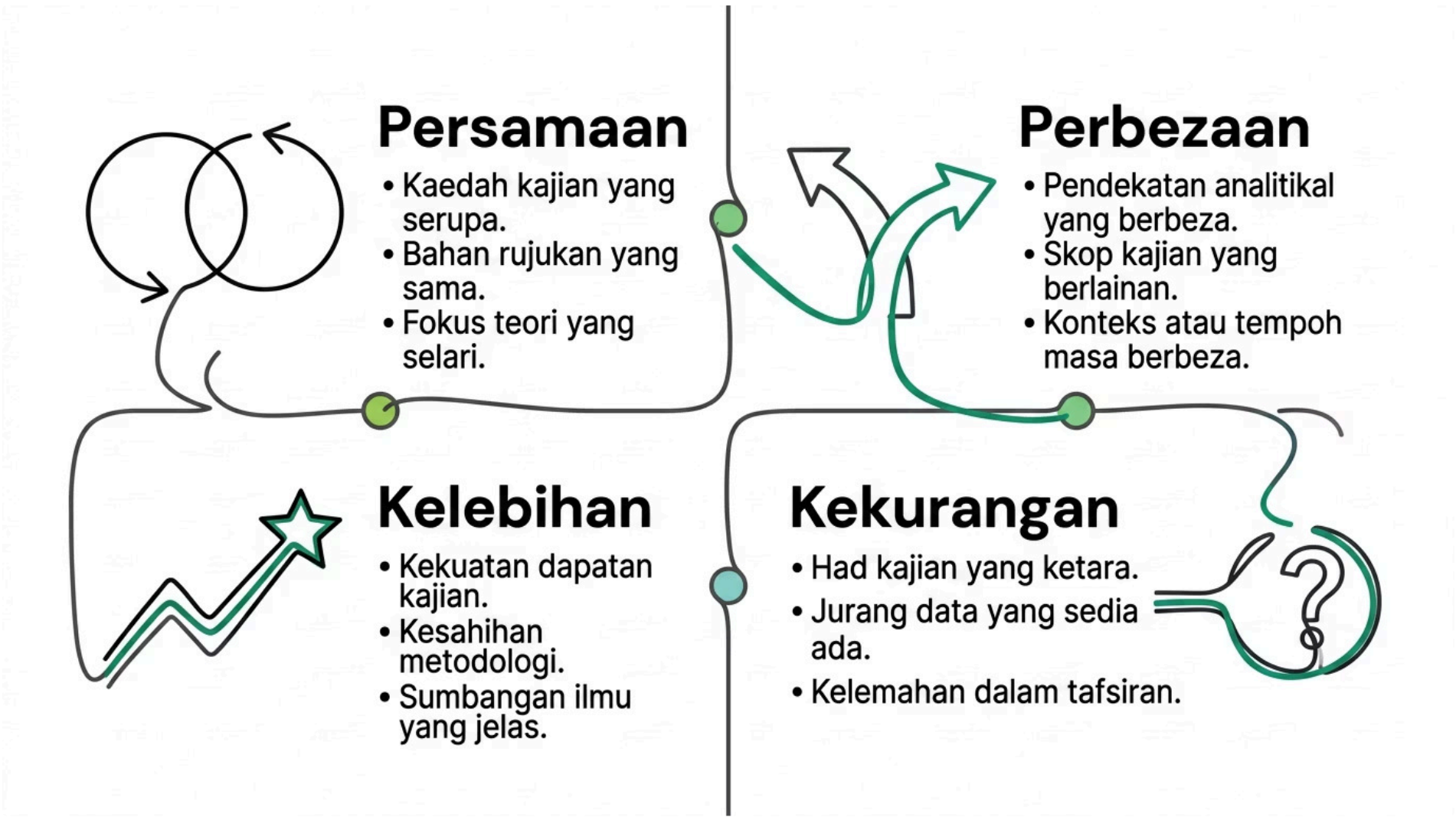
3

Current Phase (2021–Present)

The focus has shifted to life cycle analysis (LCA), environmental impact, and the use of local recycled plastics.

Understanding the evolution of research helps explain where your project sits within the broader context of knowledge.

Infographic: Comparative Approaches to Studies



This four-quadrant comparison framework helps you organize the analysis systematically before writing the comparative narrative in text.

SECTION 2.6

Research Gap

The research gap is the **most important justification** for your FYP project. This section proves to your supervisor that your study has real added value to knowledge and to engineering practice.



Four Key Questions of the Research Gap

1

What Has Been Studied?

Briefly summarize what previous researchers have done. Show the breadth of current knowledge in this field.

2

What Has Not Been Studied?

Identify precisely the aspects that have not yet been explored or have not been satisfactorily answered by existing studies.

3

Why Is This Project Needed?

Explain the importance of filling this gap from a technical, economic, environmental, or social perspective.

4

How Does This Project Contribute?

Describe your project's unique contribution to existing knowledge or engineering practice.

Example Research Gap: Plastic Concrete Project

Focus Too Narrow

Most previous studies have only assessed compressive strength alone, without considering other properties such as elastic modulus or flexural strength.

Limited Water Absorption Studies

Studies on water absorption and resistance to chemical attack for concrete containing plastic remain very limited in both local and international literature.

Local Plastic Overlooked

No studies have used recycled plastic from Malaysia's local waste stream, which has a composition and properties different from plastic from other countries.

Contribution of This Study

This project combines compressive strength assessment *and* water absorption testing using local recycled plastic, filling a gap that has not been comprehensively explored.

Example Research Gap: IoT Solar System Project

Existing Studies

- Passive rainwater harvesting systems have been widely studied
- Solar panels for water supply systems have been well documented
- Filtration systems using natural materials have been tested
- Automation using Arduino has been implemented separately

Identified Gaps

- Integration of *all components* into a single integrated system is still limited
- Studies on the energy efficiency of an integrated solar-IoT-filtration system are very limited
- There are no studies specifically on system performance in Malaysia's humid tropical climate
- Cost-benefit analysis of the integrated system has not been carried out systematically

How to Present a Research Gap Effectively

Make a Direct Statement

Use clear phrases: "Previous studies did not address...", "To the best of the author's knowledge, no study has..." or "This gap needs to be filled because..."

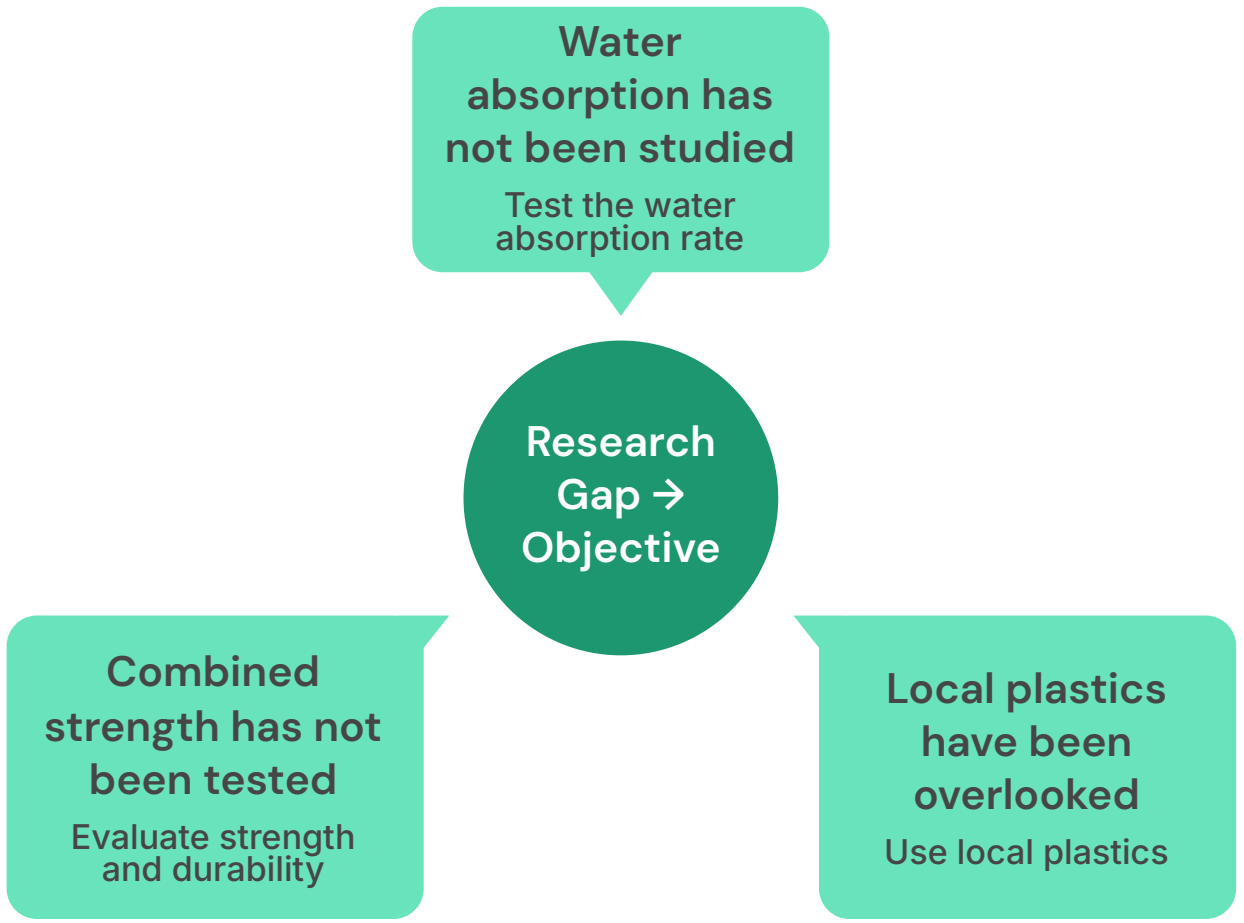
Support with Evidence

Every gap statement must be supported by a reference. Do not claim that something has not been studied without showing evidence from the literature review conducted.

Link to the Objectives

Make sure each identified gap is directly related to the research objectives in Chapter 1. The research gap is the justification for each objective set.

Relationship Between Research Gaps and FYP Objectives



Showing the direct link between research gaps and project objectives is the best way to demonstrate that your project is designed with a clear purpose and is evidence-based.



SECTION 2.7

Chapter 2 Summary

The summary of Chapter 2 closes the literature discussion and provides a strong bridge to Chapter 3 (Methodology). It should be written briefly but comprehensively, covering all the important points that have been discussed.

Content of Chapter 2 Summary

Summary of Literature Findings

Summarize the main findings from the previous studies discussed. Focus on the findings that are most relevant to your project.

Theory–Project Relationship

Explain how the theories and concepts discussed in Chapter 2 provide the foundation for the design and approach of your project.

Support for the Methodology

State explicitly how the literature review supports the choice of methods, materials, and procedures that will be explained in Chapter 3.

Recommended length: 1–2 paragraphs only. Avoid repeating too much information from the previous sections.

Complete Example: Chapter 2 Structure for Solar IoT FYP

Title: *Development of Smart Solar Powered Rainwater Harvesting System*

01

2.1 Introduction

Overview of the need for a smart rainwater harvesting system in the context of sustainable development.

02

2.2 Rainwater Harvesting System

Concept, main components, and advantages of conventional and smart rainwater harvesting systems.

03

2.3 Solar Energy System

Solar panels, batteries, and charge controllers — the foundation of renewable energy technology.

04

2.4 Water Filtration System

Gravel, sand, activated carbon, and coconut fiber as natural filtration media.

05

2.5 Arduino & Automation System

Arduino Uno, water level sensors, relay modules, and pumps as the system control components.

Chapter 2 Outline for Solar IoT FYP (Continued)

01

2.6 Previous Studies

Discussion of 10–15 articles related to rainwater harvesting systems, solar energy, and IoT in the context of civil engineering.

02

2.7 Comparison of Previous Studies

Table and comparative analysis of studies based on methods, components, findings, and research limitations.

03

2.8 Research Gap

Identification of three main gaps justified through the literature analysis conducted.

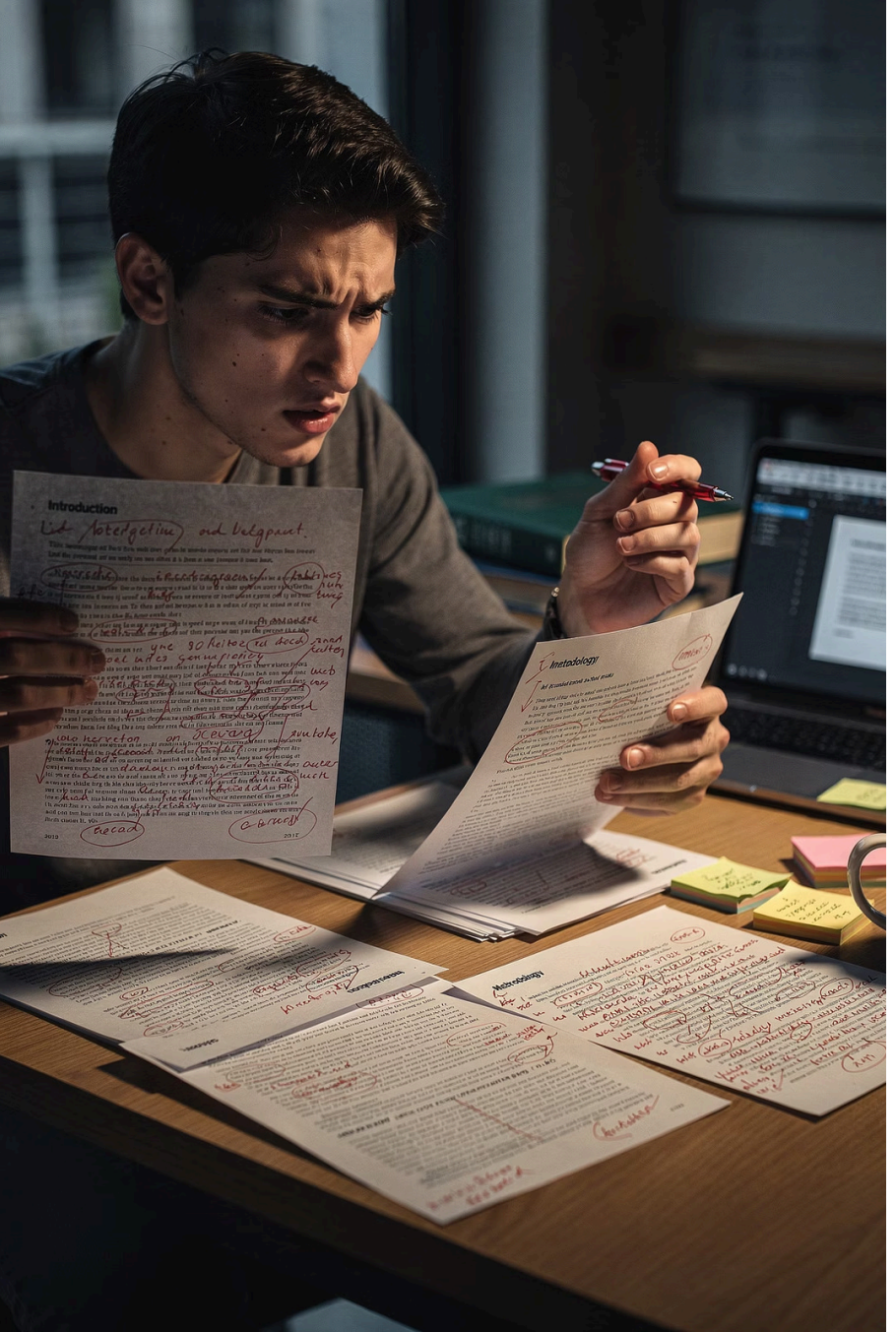
04

2.9 Chapter Summary

Comprehensive summary connecting the literature findings with the Chapter 3 methodology.

Chapter 2 Structure Summary

Section	Title	Main Content
2.1	Introduction	Overview, importance of the literature review, subtopic arrangement
2.2	Basic Concepts	Definition of terms, basic principles, standards, supporting theory
2.3	Components & Technology	Functions, types, advantages, disadvantages, industry applications
2.4	Previous Studies	Authors, objectives, methods, findings, weaknesses (10–20 articles)
2.5	Study Comparison	Similarities, differences, advantages, disadvantages, trends
2.6	Research Gap	What has been studied, what has not been studied, project needs & contribution
2.7	Chapter Summary	Literature summary, theory-project relationship, methodology support



Common Mistakes in Chapter 2 Writing

Recognizing and avoiding common mistakes is the key to producing a high-quality Chapter 2 that satisfies your supervisor.

Common Mistakes to Avoid

❌ Simply Summarizing Articles

A literature review is not a summary of articles one by one. You need to analyze, compare, and critically evaluate them. Show your understanding of the field.

❌ Unindexed References

Relying on blogs, Wikipedia, or unofficial websites will weaken the academic credibility of your writing overall.

❌ Failing to Show Relationships

Each section must be connected to your project. Do not leave the reader wondering why a particular study or concept is being discussed.

❌ A Too-Vague Research Gap

A research gap that is not supported by literature evidence, or is too general, is not convincing. It must be specific, evidence-based, and directly related to the project objectives.

More Mistakes to Avoid

❌ Articles That Are Too Old

Using too many articles published more than 10 years ago suggests a lack of updates. Prioritize articles from the last 5 years except for established foundational theories.

❌ Unsystematic Structure

Organize from general to specific. Do not jump between different topics without a clear connection. Use subheadings to help readers follow the flow of discussion.

❌ Plagiarism

All ideas taken from other sources must be paraphrased and properly cited. Do not copy text directly without quotation marks and accurate references.

Chapter 2 Checklist

Use this checklist before submitting the draft to your supervisor to ensure the quality of your writing.

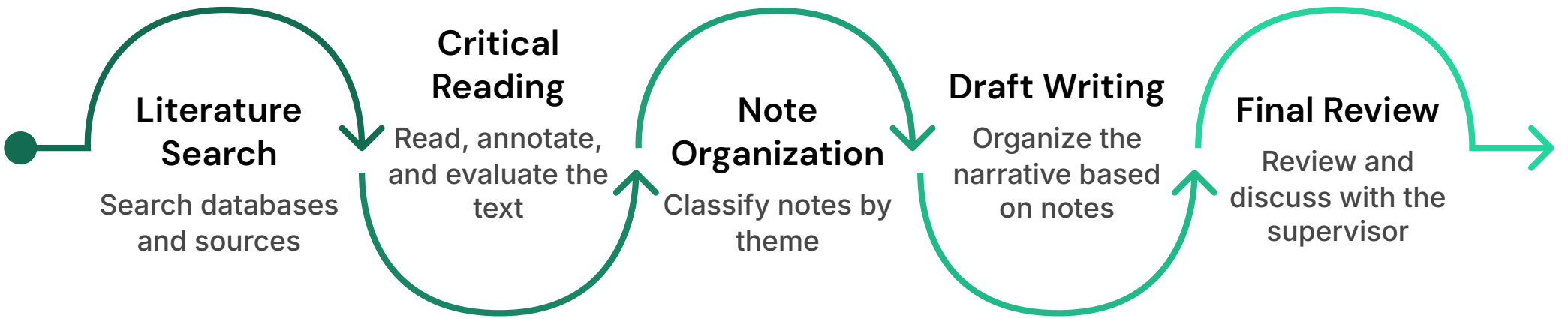
Content & Structure

- [x] ~~The introduction explains the scope and structure of the chapter~~
- [x] ~~Basic concepts are clearly defined and cited~~
- [x] ~~Each component is explained in full~~
- [x] ~~A minimum of 10 previous research articles are discussed~~
- [x] ~~A summary table of previous studies is included~~

Analysis & Quality

- [ ] Comparative analysis of the studies is conducted critically
- [ ] The research gap is identified and supported by evidence
- [ ] The relationship between the literature and the methodology is explained
- [ ] All articles are from Scopus/ISI-indexed journals
- [ ] Citation format is consistent throughout the chapter

Chapter 2 Writing Workflow



The Chapter 2 writing process is systematic and begins well before the writing itself. Thorough literature searching and reading are a highly valuable investment of time.

Effective Literature Search Strategies

Scopus & Web of Science

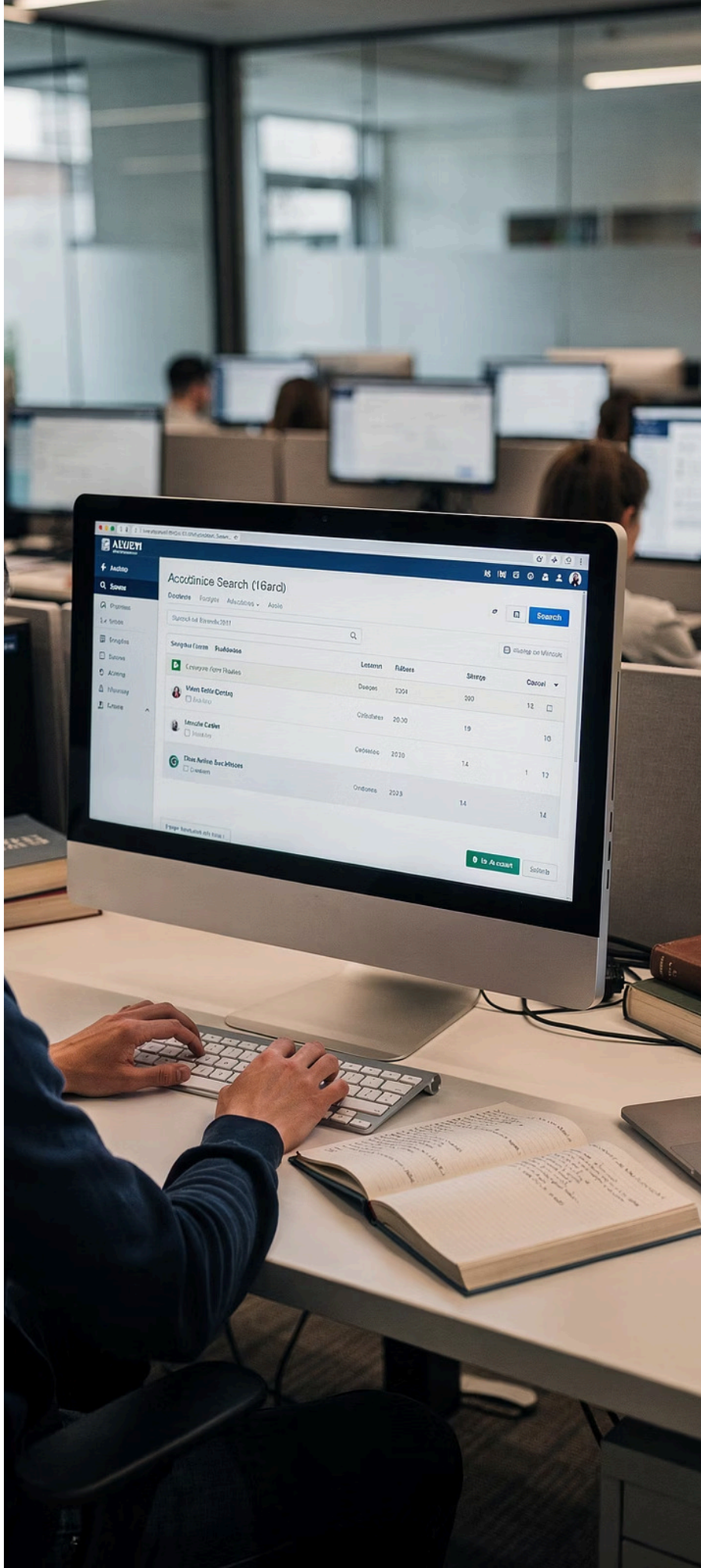
Main platforms for high-index journals. Use Boolean searches: AND, OR, NOT for precise results.

Google Scholar

Useful for initial searches and identifying highly cited articles. Verify journal indexing before use.

Local Journals

MJCE, IJTech, Pertanika JSET for the Malaysian context. Important for studies involving local materials or climate.



Keywords for Literature Searches

Choosing the right keywords is key to successful literature searches. Use a combination of different keywords to achieve comprehensive coverage.



Precise Technical Terms

Use specific component, material, or method names. Example: "compressive strength", "recycled PET aggregate", "photovoltaic rainwater system".



Keyword Combinations

Combine the main topic with methods or outcomes. Example: "concrete blocks AND plastic waste AND mechanical properties".



Time & Language Filters

Limit searches to the last 5–10 years. Include articles in Malay for relevant local context.

Writing Format and Citation

Common Citation Styles

- **APA 7th:** Ahmad et al. (2023) — Most commonly used in civil engineering in Malaysia
- **IEEE:** [1], [2] — Common in electrical and electronic engineering
- **Harvard:** (Ahmad, 2023) — Used in some public universities

Check with your supervisor or your department's FYP guidelines for the required format.

Reference Management Software

- **Mendeley:** Free, easy to use, good Word integration
- **Zotero:** Open source, suitable for all platforms
- **EndNote:** Professional, available in most university libraries

Use this software from the beginning to avoid reference management problems at the end of writing.

Academic Writing: Useful Phrases

Use precise academic phrases to improve the quality of writing and demonstrate critical analytical skills.

Introducing Studies

"Ahmad et al. (2023) found that...", "In a study conducted by...", "Lee et al. (2024) reported..."

Comparing

"In contrast to...", "Consistent with the findings...", "Contrary to the view...", "This study supports the findings..."

Identifying Gaps

"However, the study did not address...", "To the best of the author's knowledge...", "There is still limited research that examines..."

Summarizing

"Overall...", "Based on the literature reviewed...", "These findings indicate that..."

Supervisor Assessment of Chapter 2 Quality



Understanding your supervisor's assessment criteria helps you focus your efforts on the aspects that have the greatest impact on your score and the overall quality of the chapter.

Comparison of Weak vs Strong Chapter 2

Weak Chapter 2

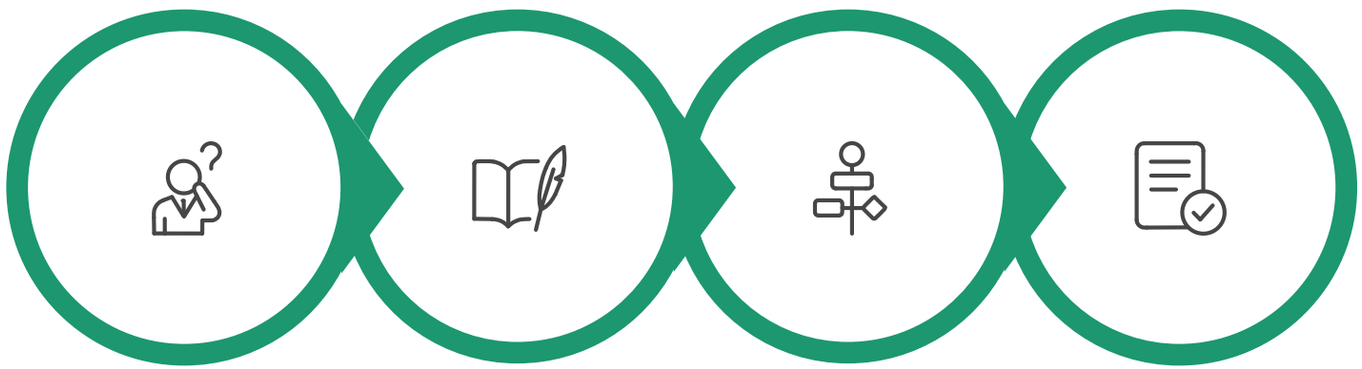
- Only summarizes articles without analysis
- Old and unindexed references
- No comparison between studies
- Research gap is unclear or irrelevant
- No connection to methodology



Strong Chapter 2

- Critical analysis and in-depth comparison
- Recent references from Scopus-indexed journals
- Comprehensive comparison table
- Specific research gap supported by strong evidence
- Clear transition to Chapter 3 methodology

Relationships Between Chapters in the FYP



Chapter 1 Chapter 2 Chapter 3 Chapter 4/5

Chapter 2 does not stand alone — it is a critical bridge that connects the research problem in Chapter 1 with the solution approach that will be explained in Chapter 3. The relationship between chapters is a hallmark of high-quality research.

Closing: Keys to Success in Chapter 2

📚 Read Widely

Use at least 10–20 indexed articles. The more reading you do, the deeper and more convincing your analysis will be.

🔍 Analyze Critically

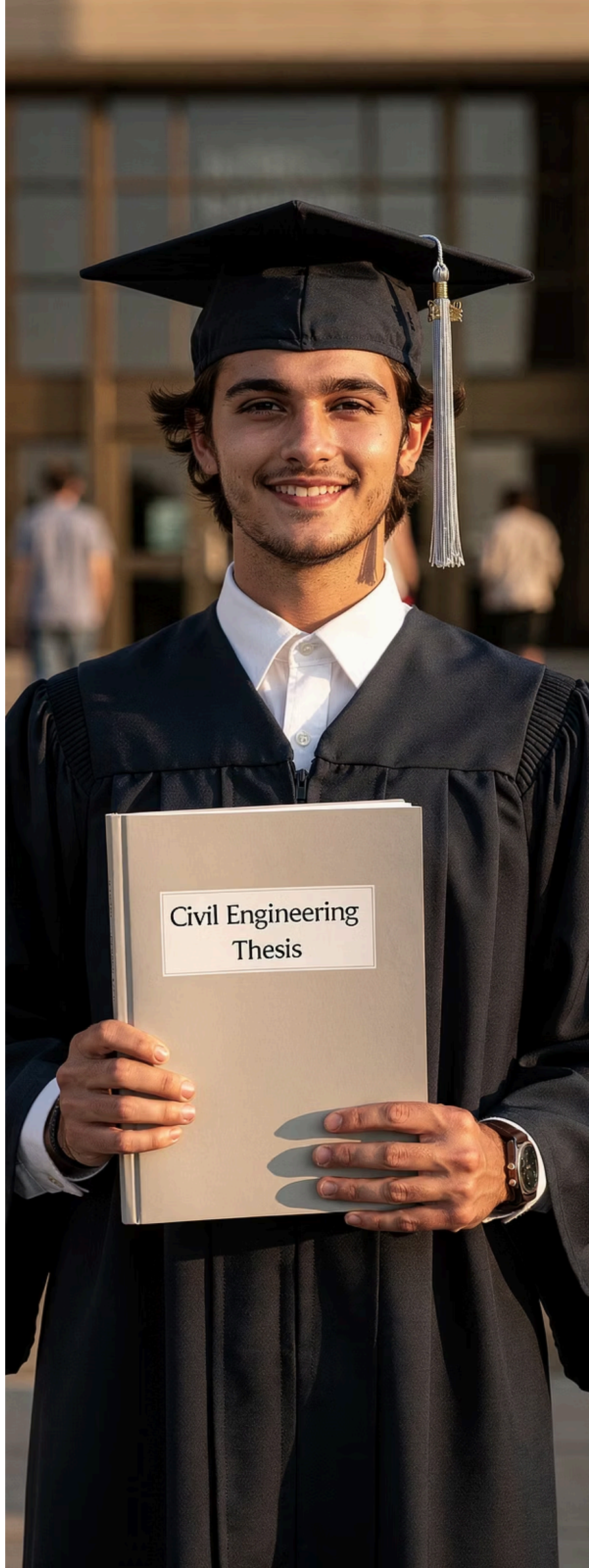
Question every study: what are its strengths? What are its limitations? How is it related to your project?

🎯 Focus on the Gap

A clear and specific research gap is the strongest evidence that your project has real scientific value.

🔗 Connect Everything

Every part of Chapter 2 should provide context and justification for your project. No information should be "floating" without purpose.



Useful Reference Guides

Here are additional sources that can help you produce a high-quality literature review for your civil engineering FYP.

1	2	3
FYP Writing Guide Refer to the **department handbook** and the FYP format issued by your department or faculty. This is the main reference document that must be followed.	**Digital Library** **MyTO, PTAR, and OPUS** — repositories of Malaysian public university theses that can be used as examples of approved FYP Chapter 2s.	**Methodology Books** **Creswell (2022)** *Research Design* and **Fellows & Liu (2015)** *Research Methods for Construction* are standard references for engineering research methodology.

Always discuss with your supervisor before and during the writing of Chapter 2. Early feedback saves time and ensures the right direction.