Multi-Paper Synthesis & Literature Review

From Extraction to Synthesis - An Intentional Approach

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Welcome to Day 4

Where We've Been

Your Journey So Far

Day 1: Experienced the challenges, learned the Three Gulfs

Day 2: Built extraction prompts systematically

Day 3: Learned to evaluate rigorously

Today: Putting it all together for real literature review work

Today's Focus

From Single Papers to Synthesis

The central challenge:

- You've extracted information from individual papers
- But literature review requires **synthesis** across papers
- Finding connections, patterns, gaps
- Creating coherent narrative

This is what you actually need for your work!

Before We Start

Opening Discussion + Shared Doc

First, we want to hear from YOU:

- Your current literature review practices
- What's challenging about synthesis
- What tools you use

Please contribute to our shared doc

Then: We'll show you one approach and extract principles together

Your Current Practice

What You Told Us

Common Themes from Discussion

[Summarize 3-4 key points from their opening discussion]

- Pain point 1: [from your input]
- Pain point 2: [from your input]
- Challenge: [from your input]
- Wish: [from your input]

Let’s see one approach to addressing these challenges

A Real-World Example

The Project

Writing a Book Chapter with IAEA Colleague

The task:

- Chapter on banana, cassava, and coffee isotope research
- 20+ reference papers to synthesize
- Specific audience and style requirements
- Must respect IP/copyright constraints

The approach: Intentional, iterative, AI-assisted synthesis

What “Intentional” Means

Not Just Throwing Papers at AI

Intentional synthesis requires:

- Carefully crafted context
- Clear specifications
- Iterative refinement
- Human guidance and control

Key insight: You can’t just prompt “write my literature review” and expect quality

Live Demo: The Workflow

What We'll Show

Four Key Aspects

1. **Crafted context** - The preparation work
2. **Pooling context** - Dynamic information retrieval
3. **Steering through editing** - Driving the AI
4. **Iteration** - The reality of the process

Tool: SolveIt (advanced features, but principles transfer)

[Live Demo Part 1]

The Preparation: Crafted Context

Before starting synthesis:

- Book/chapter TOC and outline
- 20+ papers pre-extracted (Day 2 methods)
- Style calibration document
- IP requirements specified

This preparation enables quality synthesis

Why This Preparation Matters

Precision and Recall for Synthesis

Information retrieval concepts apply here:

- **Recall:** Did we capture all relevant information from papers?
- **Precision:** Is the information we provide actually useful?

Good context = High recall + High precision

- Extract comprehensively (Day 2 methods)
- Filter to what's relevant for this synthesis

Poor context → Poor synthesis

[Live Demo Part 2]

The Process: Iteration and Control

Working through synthesis:

- Dynamic context pooling (tool calls)
- Editing AI outputs to steer direction
- Outline → sections → transitions → intro
- Multiple refinement passes

Human guidance at every step

Key Principles

What Made This Work

Transferable Lessons

1. Context is everything

- Pre-process papers systematically (Day 2 extraction!)
- Define audience, purpose, structure upfront
- Provide style examples
- Specify constraints (IP, length, tone)

This preparation is 50% of the work - but it's what makes synthesis possible

What Made This Work (cont.)

Transferable Lessons

2. Work iteratively, not linearly

- Start with outline refinement
- Work section by section
- Refine transitions and flow
- Write introduction last

What Made This Work (cont.)

Transferable Lessons

3. Maintain control

- Edit AI outputs to guide direction
- Don’t accept everything as-is
- You’re the expert, AI is the assistant

Remember: AI scales your effort, doesn’t replace your judgment

The Role of Evaluation

Connecting to Day 3

Throughout the process:

- Check for failure modes identified in evaluation
- Ensure consistency across sections
- Verify IP compliance
- Maintain quality standards

This is why Day 3 matters! Evaluation guides refinement

IP Constraints

Why This Matters

Legal and Ethical Requirements

When synthesizing from papers:

- Cannot reproduce copyrighted text verbatim
- Must paraphrase and transform
- Proper attribution essential
- Fair use principles apply

For IAEA/FAO work: Particularly critical for public-facing documents

IP-Aware Synthesis

Key Requirements

From the MARIS system approach:

- **Paraphrase and synthesize** - don't copy
- **Limit quotations** - max 2-3 sentences, always cited
- **Transform, don't reproduce** - add analytical value
- **Always attribute** - cite sources properly

These constraints must be in your synthesis prompt

Example IP Specifications

From Our Workflow

```
**IP Requirements:**
- Paraphrase all content, do not reproduce verbatim
- Maximum one short quote per source (under 20 words)
- Always provide citations in (Author, Year) format
- Transform information through synthesis and analysis
- Respect copyright while providing educational value
```

This becomes part of your context - guides the AI throughout

Tool Considerations

What About Your Tools?

Exploring Different Approaches

SolveIt features shown:

- Advanced context pooling (tool calls)
- Granular editing control
- Persistent conversation with full context

But many tools can support this workflow - each with different strengths

Your Available Tools

Different Strengths for Synthesis

You all have access to: - **Microsoft Copilot Pro** (integrated in Office)

Other options you might use:

- ChatGPT/Claude - Powerful models, iterative work
- NotebookLM - Synthesis across sources, citations
- Elicit/SciSpace - Research-specific workflows
- … and many more

In Session 4B: Explore what's possible with your preferred tool

Adapting the Approach

What's Possible Without SolveIt?

Core principles still work:

- Pre-extract papers (you learned this Day 2!)
- Prepare context documents
- Work section by section
- Iterate and refine

Limitations to work around: - Smaller context windows → work in smaller chunks - Less control → more careful prompt engineering - No tool calls → manually manage context

NotebookLM Example

A Good Alternative

NotebookLM strengths for this:

- Upload multiple source documents
- Good at synthesis across sources
- Citation tracking
- Conversational interface

Try it in Session 4B - see what's possible with your tools

The Intentional Approach

What We Mean by “Intentional”

Deliberate, Not Delegated

Intentional synthesis means:

1. **You define** the structure and narrative
2. **You prepare** the context carefully
3. **You guide** the iteration process
4. **You evaluate** the outputs critically
5. **You refine** based on your expertise

AI assists, but you drive

Why This Matters

Avoiding the "Magic Button" Trap

The temptation:

> "Just give AI all my papers and let it write the review"

Why this doesn't work:

- Quality requires your domain expertise
- Structure needs your strategic thinking

Why This Matters (cont.)

Your Expertise Is Essential

AI cannot replace:

- Your analytical judgment for synthesis
- Your critical eye for evaluation
- Your understanding of what matters in your field

Key principle: AI scales your effort, doesn't replace it

The Effort Distribution

A Hypothesis to Discuss

Traditional approach: Heavy on reading/extraction

AI-assisted approach: Shifts toward preparation, guidance, and critical evaluation

Key questions:

- Does this actually save time overall?
- Or does it produce better quality for similar effort?
- What's the learning curve cost?

Your experience: What would your distribution look like?

Session 4B Preview

Your Turn to Try

Hands-On Synthesis Practice

What you'll do:

- Choose 3-5 papers from your domain
- Define synthesis task and context
- Try multi-paper synthesis with your tools
- Apply IP-aware prompting
- Iterate and refine

Goal: Experience the intentional approach with your own work

What to Prepare

For Session 4B

You'll need:

1. **Papers:** 3-5 from your research area (ideally already extracted)
2. **Task definition:** What are you synthesizing? For whom?
3. **Structure:** Rough outline of what you want
4. **Tool access:** Whatever AI tool you'll use

We'll provide: Templates and guidance for the exercise

Questions & Discussion

Before We Break

Key Takeaways

1. ✅ Synthesis requires intentional, iterative approach
2. ✅ Context preparation is crucial (50% of work)
3. ✅ IP constraints must be specified upfront
4. ✅ Tools vary, but principles transfer
5. ✅ You drive, AI assists

Next: Hands-On Practice

Session 4B Coming Up

Break time, then:

- Detailed instructions for synthesis exercise
- Work with your own papers and tools
- Practice the intentional approach
- Get support as you work

See you in Session 4B!