AI and Critical Thinking in Business Education

A Multi-Country Comparative Study of AACSB-Accredited Schools

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Artificial Intelligence and Critical Thinking in Business Education

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Citation

박병화, 채충일, Jiongcheng Lu, Erin. (준비 중). 투고 예정.

Abstract

인공지능(AI) 도구의 급속한 확산은 비즈니스 교육 환경에서 비판적 사고 역량의 의미와 개발 방식을 근본적으로 재고하게 만들고 있다. 본 연구는 비즈니스 교육 맥락에서 AI 활용과 비판적 사고 역량 간의 관계를 탐색하고, AI 도구가 학습자의 비판적 사고 발달에 미치는 영향을 분석한다. AI가 정보 검색, 논리적 추론, 문제 해결 등 인지적 작업을 대체하거나 보조하는 환경에서, 비즈니스 교육이 학습자의 비판적 사고 역량을 어떻게 함양할 수 있는지에 대한 교육적 함의를 제시한다. 본 연구는 AI 시대 비즈니스 교육의 설계와 실천에 기여하는 이론적·실천적 프레임워크를 제공함으로써, 미래 비즈니스 리더 양성을 위한 교육적 방향을 모색한다.

핵심어: 인공지능, 비판적 사고, 비즈니스 교육, 고등교육, AI 리터러시, 학습 역량

Planning

Schedule

- 2026-03-31: 프로젝트 초기화 완료
- 2026-05-30: 투고 목표

Data

- 미정 (데이터 수집 계획 수립 중)

Progress

☒ 프로젝트 템플릿 준비 완료
☐ 연구 설계 확정
☐ 데이터 수집
☐ 분석
☐ 원고 작성
☐ 저널 투고

Authorship and Authors

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  - 박병화
- Conceptualization:
  - 박병화, Chungil (Chad) Chae
- Investigation:
  - 박병화, Chungil (Chad) Chae, Jiongcheng Lu, Erin
- Methodology:
  - Chungil (Chad) Chae
- Writing -- original draft:
  - 박병화, Chungil (Chad) Chae
- Writing -- review & editing:
  - 박병화, Chungil (Chad) Chae, Jiongcheng Lu, Erin

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- Chae (2024)

Chungil Chae Chae (2024) is an assistant professor in the field of business analytics, with a distinguished track record in organizational behavior, human resource development (HRD), learning, and development. With a prolific publication record that spans various dimensions of HRD

and organizational studies, Dr. Chae has made significant contributions to understanding the dynamics of organizational support on knowledge sharing, virtual team leadership, and the structural determinants of HRD research collaboration networks. And his work embodies a deep commitment to enhancing understanding and practices in organizational behavior, HRD, learning, and development. His interdisciplinary research not only contributes to academic discourse but also offers tangible strategies for organizational improvement and individual development.

Acknowledgement

- 연구 참여자 및 협력자에 감사 (추후 업데이트)

Declaration

IRB

미정 (연구 설계 확정 후 IRB 심의 계획)

Funding

미정

AI

본 연구에서 AI 도구는 다음과 같이 활용되었다:

- Claude Code (Anthropic): 문헌 검토 보조 및 원고 초안 작성 보조
- NotebookLM (Google): 문헌 검토 및 연구 노트 정리 보조

모든 해석과 이론적 논의는 연구자에 의해 수행되었으며, 본 논문의 서술도 AI 보조를 받아 초안이 작성된 후 연구자가 검토 및 수정하였다.

Research Logs

Research Log

xxxx-xx-xx

- entry.

Meeting Log

xxxx-xx-xx

- ☒ 10:00–10:30: Kick-off meeting

Analysis Version

Version 0.0.1

- Starting draft

Draft Version

Ver 0.0.1

- Starting draft

Research Note

Ideas and Thoughts

This chapter documents key research ideas and conceptual developments. Entries are logged chronologically with a unique ID.

IDEA-001: AACSB International Comparison + Advanced Methodology Integration (2026-04-08)

Background

Hwang et al. (2025), published in JBMC, conducted a first-mapping study limited to the top 40 US AACSB schools. Using Content Analysis + Comparative Mapping, they derived three clusters (Explicit CT Leaders, Implicit CT Integrators, Nominal CT Adopters), but the study has two key limitations: no international comparison, and reliance on qualitative mapping alone.

Core Idea: Three Extensions

Extension 1 — Scope: US vs China vs Korea Comparison

Rationale for three-country selection:

Country	AACSB Accredited	Comparative Value
US	~550+	Baseline of prior research; leading AI curricula
China	~60+ (growing rapidly)	State-led AI strategy; unique AI tool ecosystem (DeepSeek, etc.)
Korea	~20+	Digital talent development policy; manageable census size

Additional contextual variables (beyond existing 4-dimension coding):

- National AI Policy Level (National AI Strategy Index)
- AACSB accreditation tenure (years)
- Faculty AI competency (proportion of AI-related faculty)
- Use of domestic vs. foreign AI tools (ChatGPT vs. DeepSeek vs. domestic)

Sampling strategy:

- US: Use existing 40 schools (Hwang et al. data reused)
- China: 20--30 schools (AACSB-accredited census or top-ranked)
- Korea: 15--20 schools (near full census of AACSB-accredited)

Extension 2 — Methodology: QCA + Topic Modeling + Network Analysis

2-A. QCA (Qualitative Comparative Analysis)

Purpose: ``What combination of conditions produces Explicit CT Leaders?'' --- identifying combinatorial causality

Design:

- Outcome: Higher CT Integration (Explicit = 1, others = 0)
- Conditions: Country, Program Level, Curricular Theme diversity, Pedagogical Approach type (Active/Passive), Assessment Mode (Reflective/Traditional), National AI Policy Strength
- csQCA (dichotomous) or fsQCA (continuous CT Level with calibration)

Expected output: Country-invariant sufficient conditions vs. country-specific pathways (equifinality)

2-B. Topic Modeling (STM)

Purpose: Inductively discover latent topics beyond the 5 pre-defined themes → deductive/inductive triangulation

Design:

- Corpus: AI-related course description/syllabus text from all sampled schools
- Recommended model: STM --- `prevalence ~ country + program_level` directly models cross-national topic differences
- Alternatives: LDA (easier to interpret), BERTopic (semantic similarity)
- Implementation: R `stm` package

Analysis steps:

1. Topic extraction (k = 10--20)
2. Cross-national/program comparison of topic distributions
3. Match extracted topics with 5 pre-defined themes → identify newly discovered themes

2-C. Network Analysis

Purpose: Visualize and compare connection patterns among themes, pedagogy, and assessment

Design:

- Network Type 1 --- Bipartite (school × coding attributes): community detection vs. existing 3 clusters
- Network Type 2 --- Co-occurrence (attribute × attribute): weighted network by co-occurrence frequency; cross-national sub-network comparison; centrality analysis for key categories
- Network Type 3 --- Country Comparison: statistical test of cross-national network structure differences via QAP

Extension 3 — Integrated Research Design

```
Phase 1: Data Collection & Coding
     US: Reuse existing data
     China: Collect AACSB data + coding
     Korea: Collect AACSB data + coding

Phase 2: Qualitative Comparative Mapping (extending existing method)
     Derive clusters per country
     Cross-national cluster distribution comparison

Phase 3: Quantitative Analysis (new methods)
     Topic Modeling (STM) → Latent themes + cross-national differences
     Network Analysis → Connection patterns + cross-national comparison
     QCA → Condition combinations for Explicit CT Integration

Phase 4: Integration & Triangulation
     Qualitative mapping   Quantitative clustering
     Pre-defined themes   Topic Modeling
     Network communities   QCA pathways
```

Expected Contributions

1. First international AI--CT comparative study: Extends US-centric research to Asia
2. Mixed methods refinement: Qualitative mapping + QCA + STM + Network Analysis triangulation
3. Policy implications: Illuminates the pathway from national AI policy to business education curricula
4. Methodological contribution: Combining Comparative Mapping with QCA is a novel approach in curriculum research

Practical Considerations

Issue	Response
Multilingual coding	Secure Korean/Chinese coders; translation verification protocol
Data accessibility	Chinese university syllabi may have low public availability → website + direct contact
QCA case count	fsQCA minimum 15--20 cases; verify sufficiency per country
Topic Modeling corpus	Course descriptions alone may be small → include full syllabus text
Research timeline	2026-05-30 deadline → Phase 1--2 priority; Phase 3 can be a separate follow-up paper

Publication Separation Strategy (Option)

- Paper 1: International Comparative Mapping (Phase 1--2) --- extending existing methodology
- Paper 2: Mixed Methods in-depth analysis (Phase 3--4) --- QCA + STM + Network
- Or: Single integrated paper covering Phase 1--4

Created: 2026-04-08 Related: Hwang et al. (2025) JBMC, docs/01_기존자료/기존분석/

Research Q & A

Procedures

This chapter documents the step-by-step execution procedures for the AACSB international comparison study (PROC-001), based on IDEA-001.

PROC-001: AACSB International Comparison Study — Step-by-Step Execution Procedure (2026-04-08)

Phase 1: Data Collection & Coding

1-1. Sample Confirmation

Step 1: Collect AACSB-Accredited School Lists

- US: Obtain Hwang et al. (2025) existing 40-school list (from Tables 2a, 2b, 3a, 3b of the paper)
- China: Collect full list of Chinese accredited schools from AACSB official website
- Korea: Collect full list of Korean accredited schools from AACSB official website
- Source: https://www.aacsb.edu/accredited

Step 2: Determine Sample Selection Criteria

- US: Use existing 40 as-is (Top 20 UG + Top 20 MBA)
- China: Full census or top-ranked by global ranking (Financial Times, QS, etc.)
- Korea: Full census (manageable accredited count)

Step 3: Collect Sample Metadata

- Per school: accreditation years, program level (UG/MBA), city, student enrollment

1-2. Data Collection

Step 4: Collect Public Data by Country

Data Type	US	China	Korea
Course Catalogs	University website	University website + registrar office	University website + course list
Syllabi	Open faculty repositories	Public course outlines (limited)	Department website + direct requests
Innovation Reports	School websites	Teaching reform reports	Educational innovation reports
Program Descriptions	Official program pages	Major introduction pages	Major introduction pages
AI Policy Documents	School AI guidelines	School AI usage guidelines	School AI policy documents

Step 5: Multilingual Processing Protocol

- Preserve originals + parallel English translation
- Translation method: researcher translation + AI-assisted + cross-validation
- Coding performed in original language (assign native-proficient coders per language)

1-3. Coding

Step 6: Apply Coding Framework

Apply Hwang et al.'s (2025) 4-dimension coding framework identically:

- Dimension 1: Curricular Themes (S, E, D, En, L)
- Dimension 2: Pedagogical Approaches (C, S, B, P, L)
- Dimension 3: Assessment Modes (A, R, F, Q)
- Dimension 4: AI--CT Relationship (CT Level: H/M/L, CT Linkage: E/I/A)

Step 7: Coder Training and Pilot

- Coder composition: Minimum 2 coders per language (English/Chinese/Korean)
- Pilot coding: Code 5 schools per country first

- Inter-coder reliability: Target Cohen's Kappa $\geq$ 0.80
- Disagreement resolution: Discussion → coding guideline refinement → re-coding

Step 8: Full Coding Execution

- Two independent coders → discuss disagreements → finalize coding
- Code additional contextual variables (national AI policy, accreditation years, etc.)

Step 9: Organize Coding Data

- Compile school-level coding results into structured spreadsheet/CSV
- File location: `docs/05_ /Data_Raw/`

Phase 2: Qualitative Comparative Mapping

Step 10: Derive Country-Specific Clusters

- Place schools on CT Level x CT Linkage matrix (identical to Hwang et al.)
- Derive clusters independently for US / China / Korea
- Verify applicability of 3 clusters (Explicit/Implicit/Nominal) + check for new cluster emergence

Step 11: Cross-National Comparison

- Compare cluster distributions (e.g., does Korea have more Nominal?)
- Compare within-cluster detail patterns (same Explicit cluster but different themes/pedagogy?)
- Visualization: Alluvial diagram or Sankey diagram for cross-national flow representation

Step 12: Qualitative Interpretation

- Explain cross-national differences using contextual variables (AI policy, educational tradition, accreditation experience)
- Construct cross-case comparison tables

Phase 3: Quantitative Analysis

3-A. Topic Modeling (STM)

Step 13: Corpus Preparation

- Collect course description/syllabus text by country
- Preprocessing: tokenization, stopword removal, stemming (language-specific)
- Construct English unified corpus (post-translation) or country-specific individual analysis

Step 14: STM Execution

- Use R `stm` package
- Determine number of topics: `searchK()` function, k = 5–25 range
- Model fitting: `prevalence ~ country + program_level`
- Output: Top keywords per topic, representative documents, topic proportions

Step 15: STM Results Analysis

- Statistical test of topic distribution by country (`estimateEffect`)
- Match against 5 pre-defined themes
- Interpret newly discovered themes
- File location: `docs/05_ /Quan/`

3-B. Network Analysis

Step 16: Construct Network

- Convert coding data to adjacency matrix
- Co-occurrence network: create edges between coding categories co-occurring in the same school
- Weight = co-occurrence frequency

Step 17: Execute Network Analysis

- R `igraph` or `tidygraph` + `ggraph` packages
- Whole network: degree centrality, betweenness centrality, community detection (Louvain)
- Country-specific sub-networks: repeat same analysis
- Cross-national structural comparison: QAP (Quadratic Assignment Procedure) via `sna` package

Step 18: Visualization

- Force-directed layout for whole and country-specific network visualization
- Node size = centrality; edge thickness = co-occurrence frequency; color = coding dimension
- File location: `docs/05_ /Quan/`

3-C. QCA

Step 19: Calibration (for fsQCA)

- Transform each condition variable to 0–1 fuzzy set
- Set calibration anchors (fully in, crossover, fully out)
- Example: CT Level Higher = 1.0, Mid = 0.5, Lower = 0.0

Step 20: Necessity Analysis

- Test whether each condition is a necessary condition for the outcome
- Consistency $\geqslant$ 0.90 $\rightarrow$ necessary condition

Step 21: Sufficiency Analysis (Truth Table)

- Construct truth table $\rightarrow$ set frequency threshold (minimum 2 cases)
- Consistency threshold $\geqslant$ 0.80
- Boolean minimization $\rightarrow$ derive parsimonious / intermediate / complex solutions

Step 22: Results Interpretation

- Identify sufficient condition paths (what condition combinations lead to Explicit CT)
- Confirm equifinality (do different paths exist by country?)
- R packages: `QCA` or `SetMethods`
- File location: `docs/05_ /Quan/`

Phase 4: Integration & Triangulation

Step 23: Integrate Results

- Confirm alignment: qualitative mapping clusters vs. network communities
- Evaluate: pre-defined 5 themes vs. STM topics matching
- Map: QCA paths vs. sub-patterns within mapping clusters

Step 24: Interpret Divergences

- If divergence between methods: analyze cause and provide theoretical interpretation
- The divergence itself can be a research contribution (reporting methodological sensitivity differences)

Step 25: Write Final Report

- File location: `docs/06_ /`

Phase 5: Writing & Submission

Step 26: Draft Paper

- IMRaD structure (Introduction, Method, Results, Discussion)
- Determine target journal (top AACSB/education-related journals)

Step 27: Internal Review

- All co-authors review → incorporate feedback

Step 28: Submit

- Submit to target journal; respond to revisions

Tools and Software

Purpose	Tool
Coding data management	Excel / Google Sheets
Topic Modeling	R (`stm`, `tidytext`, `quanteda`)
Network Analysis	R (`igraph`, `tidygraph`, `ggraph`, `sna`)
QCA	R (`QCA`, `SetMethods`)
Visualization	R (`ggplot2`, `ggraph`) + Quarto for reports
Reference management	Zotero / BibTeX

Purpose	Tool
Collaboration	Google Drive + GitHub Pages (`public/`)

Timeline (Draft)

Period	Task
2026-04 to 05	Phase 1: Data collection and coding
2026-05 to 06	Phase 2: Comparative Mapping
2026-06 to 08	Phase 3: Quantitative Analysis
2026-08 to 09	Phase 4: Integration
2026-09 to 10	Phase 5: Writing & Submission

Created: 2026-04-08 Related: IDEA-001, Hwang et al. (2025) JBMC Analysis outputs: *docs/05_ /Qual/* (mapping), *docs/05_ /Quan/* (STM, Network, QCA)

Theoritical Framework

Related Theories

Theortical Relationship

Theoretical Framework

This chapter presents the two-layer theoretical framework that guides the study. Because the analysis spans three levels --- national/institutional, school/instructor, and individual student --- no single theory can explain the full range of phenomena. A macro layer provides the overarching integrative structure; an operational layer supplies RQ-specific explanatory mechanisms.

Overview: Two-Layer Theory Structure

Layer	Unit of Analysis	RQs	Theories
Macro	Whole study	RQ1--RQ5	Bloom's Revised Taxonomy + IEA Curriculum Framework
National/Institutional	Cross-country comparison	RQ1, RQ2	Comparative Education Theory, fsQCA Configurational Theory
School/Instructor	Pedagogical gap	RQ3, RQ4	Dynamic Capabilities Theory, TPB
Individual	Student perception	RQ5	TAM, SDT

Layer 1 — Macro Theories (Study-Wide)

Intended–Enacted–Achieved (IEA) Curriculum Framework

Source: Goodlad (1979); Van den Akker (2003)

The IEA framework is the raison d'être of this study. Hwang et al. (2025) analyzed only the Intended Curriculum (documents) and acknowledged this as an explicit limitation. This study aims to be the first AACSB-based research to address all three curriculum layers.

Layer	Definition	Position in This Study
Intended	What curriculum documents prescribe	Phase 1 (document coding, QCA)
Enacted	What instructors actually teach	Phase 2a (instructor interviews)
Achieved	What students actually learn	Phase 2b (student surveys)

Theoretical contribution: Among the 55 papers reviewed in the SLR, none explicitly applies the IEA framework to AI--CT integration research. This constitutes the core originality of this study.

Bloom's Revised Taxonomy

Source: Anderson & Krathwohl (2001)

Bloom's Revised Taxonomy serves as the common language for measuring CT level across all data sources. It is the most frequently cited theory in the SLR corpus (4 papers) and was adopted by Hwang et al. (2025), ensuring continuity and comparability with the baseline study.

Bloom's Level	CT Level	Coding Criterion
Remembering, Understanding, Applying	Low (L)	Accepting/utilizing AI outputs
Analyzing	Mid (M)	Analyzing/applying AI-generated content
Evaluating, Creating	High (H)	Critiquing AI outputs, generating alternatives, leading debate

The taxonomy bridges the Phase 1 coding condition variable (BLOOM_LEVEL) and the Phase 2b student survey (HOTS scale).

Layer 2 — Operational Theories (RQ-Specific)

RQ1: Cross-National Patterns — Comparative Education Theory

Source: Bray & Thomas (1995) Multi-level Comparative Framework

This theory provides the framework for explaining differences in AI--CT integration patterns across countries. It is absent from the 55-paper SLR corpus, which reflects the single-country dominance of prior research (primarily US or China). Adopting this framework is itself a theoretical contribution, providing the rationale for a multi-country comparative design.

- Analytical dimensions: national level (AI policy intensity, AACSB maturity), institutional level (school type, program), individual level (instructors and students)
- Role in QCA: Theoretical justification for the COUNTRY condition variable

RQ2: Conditions for Explicit CT Integration — fsQCA Configurational Theory

Source: Ragin (2008) Redesigning Social Inquiry

This methodological theory analyzes ``what combinations of conditions lead to Explicit CT Integration.'' Only 2 papers in the SLR use fsQCA (both single-country, China). Multi-country application is a first for this research.

- Key concept: Equifinality --- different condition combinations leading to the same outcome. The US, Korea, and China may reach the same level of CT integration through different pathways.
- Identifies sufficient condition paths and deviant cases → theoretical basis for Phase 2 sample selection

RQ3: Institutional Variation in Intended–Enacted Gap — Dynamic Capabilities Theory

Source: Teece, Pisano & Shuen (1997)

Why do some schools show a large gap between Intended (documents) and Enacted (actual teaching) curricula, while others do not? An institution's dynamic capabilities (sensing, seizing, reconfiguring) determine the size of this gap.

- SLR frequency: 1 paper (Gong et al., 2025)
- Can be used as a coding frame for Phase 2a interviews: does the instructor have the capacity to change behavior?

RQ4: Instructor Pedagogical Intention — Theory of Planned Behavior (TPB)

Source: Ajzen (1991)

TPB is the standard model for predicting intentional behavior --- in this case, an instructor's deliberate decision to incorporate AI--CT integration into the curriculum. SLR frequency: 2 papers (including Nowinski et al., 2025).

- Components: Attitude + Subjective Norm + Perceived Behavioral Control → Behavioral Intention
- Directly applicable as a structuring tool for Phase 2a interviews: ``Why does this instructor explicitly teach CT (or not)?''

RQ5: Student CT Perception (Achieved) — TAM + SDT

Sources: Davis (1989) TAM; Ryan & Deci (2000) SDT

Two complementary theories for measuring student-level AI--CT perception and learning outcomes.

Theory	Role	SLR Frequency
TAM (Technology Acceptance Model)	Pathway from AI tool acceptance to CT utilization	4 papers

Theory	Role	SLR Frequency
SDT (Self-Determination Theory)	Intrinsic motivation (autonomy, competence, relatedness) mediates HOTS attainment	3 papers

- Provides the theoretical basis for Phase 2b survey scale construction
- Cross-national comparison: cultural differences in autonomy and competence may be reflected in CT perception differences

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Background Contextual Theories (Supplementary)

Social Construction of Technology (SCOT)

Source: Bijker, Hughes & Pinch (1987); Gupta et al. (2024)

Explains why the same AI technology is educationally interpreted differently across countries. Supplements the socio-cultural explanation of national-level pathway differences.

Dynamic Capabilities (National System Level)

Applies Dynamic Capabilities to national AI education policy capacity. Supplements theoretical description of US--Korea--China policy maturity differences.

Defense Logic

Q: ``Why so many theories?''

This study analyzes at three distinct levels: national (RQ1--2), school (RQ3), and individual (RQ4--5). Because different mechanisms operate at each level, level-specific theories are required. The IEA Framework and Bloom's Taxonomy provide the integrative macro structure; the remaining theories operate only at their respective levels.

Q: ``Why isn't the IEA Framework a mainstream theory?''

Prior literature (55 papers) focused exclusively on Intended Curriculum analysis and therefore had no need for the IEA Framework. This study is the first to include Enacted and Achieved layers in an AACSB-based design; adopting this framework is itself the theoretical contribution.

Q: ``Can Comparative Education Theory be justified if it is absent from the literature?''

Its absence from the literature strengthens the case for adopting it. Designing a multi-country comparative study without a comparative education theory framework would actually weaken the methodological justification.

Theory–RQ–Measurement Mapping

RQ	Core Theory	Phase	Measurement
RQ1: AI--CT integration patterns by country	Bloom's Taxonomy + Comparative Education Theory	Phase 1	Document coding, cross-national cluster comparison

RQ	Core Theory	Phase	Measurement
RQ2: Condition combinations for Explicit CT integration	fsQCA Configurational Theory	Phase 1	QCA with 6 condition variables
RQ3: Intended--Enacted gap	IEA Framework + Dynamic Capabilities	Phase 2a	Instructor interviews + triangulation
RQ4: Instructor intention mechanisms	TPB	Phase 2a	Interview coding (attitude, norm, PBC)
RQ5: Student CT perception (cross-national)	IEA Framework (Achieved) + TAM + SDT	Phase 2b	Student survey (Likert + HOTS scale)

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Methodology and Method

Methodology

This study employs a Sequential Explanatory Mixed Methods Design (Creswell, 2003), built as an extension of Hwang et al. (2025). Phase 1 discovers patterns in Intended Curriculum across three countries; Phase 2 explains those patterns by examining Enacted and Achieved Curriculum through qualitative and quantitative methods.

```
Phase 1 (QUAN/QUAL)              →          Phase 2 (QUAL + QUAN)
Intended Curriculum                         Enacted + Achieved
Document coding + QCA                       Interviews + Surveys
"What are the patterns?"                    "Why those patterns?"
Full sample (~80 schools)                   Purposive sub-sample (~15-30 schools)
```

Design Rationale

Why a Two-Phase Design?

Rationale	Explanation
Comparability with existing research	Phase 1 operates at the same level (Intended) as Hwang et al., enabling direct comparison with the US baseline
Phase 1 informs Phase 2	QCA results (pathways and deviant cases) provide the theoretical basis for Phase 2 sample selection
Illuminates the Intended--Enacted gap	Addresses the core question: ``The document says Explicit CT --- but is it actually taught?''
Multiple publication outputs	Phase 1 = standalone paper; Phase 1+2 = second paper

Curriculum Layers and Phase Mapping

Curriculum Layer	Definition	Phase	Data
Intended	What the curriculum document prescribes	Phase 1	Public document coding
Enacted	What actually happens in the classroom	Phase 2a	Instructor interviews
Achieved	What students actually learn	Phase 2b	Student surveys

This three-layer structure follows the IEA Curriculum Framework (Goodlad, 1979; Van den Akker, 2003), which is absent from all 55 papers reviewed in the SLR --- constituting the core theoretical originality of this study.

Phase 1: Intended Curriculum — International Comparison + Pathway Identification

Purpose

- Map AI--CT integration patterns in AACSB-accredited business schools across US, China, and Korea
- Identify condition combinations (pathways) for Explicit CT Integration via QCA
- Triangulate findings with Topic Modeling and Network Analysis

Sample

Country	N	Basis
US	40	Reuse of Hwang et al. (2025) data

Country	N	Basis
China	20--30	AACSB-accredited schools, filtered by global ranking + data availability
Korea	15--20	Near-census of all AACSB-accredited schools

Methods

- Content Analysis: Apply Hwang et al.'s 4-dimension coding framework identically
- Comparative Mapping: Derive country-specific clusters; compare across countries
- QCA (fsQCA): Identify condition combinations leading to Explicit CT Integration
- Topic Modeling (STM): Inductively discover latent themes; `prevalence ~ country + program_level`
- Network Analysis: Visualize co-occurrence patterns of coding elements; compare by country

Phase 1 Outputs

- Cross-national cluster distribution comparison table
- QCA sufficient-condition paths (including country-specific paths)
- List of deviant cases → criteria for Phase 2 sample selection

Research Questions (Phase 1)

- RQ1: How do AI--CT integration patterns differ across US, China, and Korea among AACSB-accredited business schools?
- RQ2: What combinations of conditions lead to Explicit CT Integration, and do country-specific pathways exist?

Phase 1 → Phase 2 Connection

Phase 2 sampling is theoretically informed by Phase 1 QCA results (purposive sampling logic).

Phase 1 QCA Results

```
Path A: Active Pedagogy × Strategy Theme → Explicit CT  (predominantly US)
Path B: AI Policy × Theme Diversity → Explicit CT        (predominantly China)
Path C: Weak or undiscovered path                        (Korea)
Deviant cases: Schools with the conditions but unexpected outcomes
```

Phase 2 Sample Selection (Purposive Sampling)

```
2-3 typical cases from each path
2-3 deviant cases
Balanced country allocation (e.g., US 5, China 5, Korea 5)
```

Phase 2a: Enacted Curriculum — Instructor Interviews

Purpose

- Identify the gap between Intended (documents) and Enacted (actual teaching) curriculum
- Qualitatively explain the causal mechanisms underlying QCA pathways
- Explore the origins of deviant cases

Participants

- Instructors of AI-integrated courses
- 5--10 per country; selected based on Phase 1 QCA pathways

Method

- Semi-structured interviews, 45--60 minutes (online or in-person)

Interview Guide — Core Question Areas

Domain	Sample Question	Phase 1 Dimension
AI integration decision-making	``What led you to integrate AI into the curriculum?''	Curricular Themes
Actual teaching practice	``How do students interact with AI in class?''	Pedagogical Approaches
CT facilitation strategies	``What do you intentionally do to promote critical thinking?''	CT Level / CT Linkage
Intended--Enacted gap	``Is there a gap between what the syllabus says and what actually happens?''	Coding validity
Assessment & feedback	``How do you assess CT? Has AI use changed this?''	Assessment Modes
Contextual factors	``How have school policy, accreditation requirements, or national policy influenced AI integration?''	QCA contextual conditions

Analysis

- Thematic Analysis: Braun & Clarke (2006) 6-step procedure
- Deductive--inductive hybrid coding against Phase 1 framework

Research Questions (Phase 2a)

- RQ3: What is the gap between AI--CT Intended curriculum (documents) and Enacted curriculum (teaching practice), and what causes it?
- RQ4: How do instructor-perceived facilitating and inhibiting factors for AI--CT integration differ by country?

Phase 2b: Achieved Curriculum — Student Survey

Purpose

- Measure CT experience and perception of students enrolled in AI-integrated courses
- Triangulate the full Intended → Enacted → Achieved curriculum chain
- Test whether Phase 1 cluster membership predicts student perception differences

Participants

- Students enrolled in courses taught by Phase 2a interviewees
- 30--50 per course; total estimated 300--500

Method

- Online survey (Likert scale + open-ended items)

Survey Structure

Section	Content	Instrument
A. AI usage experience	Frequency and mode of AI use in class	Self-developed (frequency, type, tools)
B. CT self-perception	Perceived impact of AI use on critical thinking	Adapted CT self-efficacy scale
C. CT skills (optional)	Indirect measurement of actual CT ability	Watson-Glaser short form or CCTST subscale
D. Pedagogical experience	Teaching methods and assessment experienced	Student version of Hwang et al. coding framework
E. Contextual awareness	AI policy, school support, cultural factors	Self-developed

Analysis

- Descriptive statistics + cross-national comparison (ANOVA / Kruskal-Wallis)
- Test CT perception differences by Phase 1 cluster membership
- Triangulation: Enacted (instructor interviews) ↔ Achieved (student surveys)

Research Question (Phase 2b)

- RQ5: How do CT experience and perception of students enrolled in AI-integrated courses differ by country and cluster?

Integrated Analysis Framework

	Intended (Phase 1) Document Coding	Enacted (Phase 2a) Instructor Interviews	Achieved (Phase 2b) Student Surveys
Curricular Themes	Course description →	"Why this theme?"	"How did you use AI?"
Pedagogy	Syllabus coding →	"How do you actually teach?"	"Did class activities help your CT?"
Assessment	Assessment items coding →	"How do you assess CT?"	"Was assessment fair and CT-reflective?"
CT Level/Linkage	Bloom's mapping + explicitness check →	"What is your intentional CT strategy?"	CT self-efficacy + CT test scores
National Context	AI policy coding →	"Did policy/ accreditation influence you?"	"Did the national AI environment affect your learning?"

Publication Strategy

Paper	Content	Phase	Target Journal Type
Paper 1	International Comparative Mapping + QCA	Phase 1	Business education journals (IJME, JME, DSJIE)
Paper 2	Mixed Methods: Intended--Enacted--Achieved Triangulation	Phase 1+2	Higher education journals (Studies in Higher Education, Higher Education, AAHE)
Paper 3 (optional)	Topic Modeling + Network Analysis methodology paper	Phase 1 deep dive	Methods/ed-tech journals (Educational Research Review, C&E)

Timeline

Period	Task	Phase
2026-04 to 06	Data collection, coding, Comparative Mapping	Phase 1
2026-06 to 07	QCA + Topic Modeling + Network Analysis	Phase 1
2026-07 to 08	Paper 1 writing + submission	Phase 1
2026-07 to 08	IRB approval, interview guide/survey development, pilot	Phase 2 prep
2026-09 to 11	Interview + survey data collection	Phase 2
2026-12 to 2027-02	Phase 2 analysis + Paper 2 writing	Phase 2

IRB Considerations (Phase 2)

Item	Details
When needed	Before Phase 2 data collection (both interviews and surveys)
Applying institution	Research lead university IRB
International considerations	Local IRB or partner institution approval required for China/Korea data collection
Risk level	Minimal risk (educational research, anonymous/de-identified)
Consent forms	Instructor interview consent + student survey consent (multilingual)

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Method

This chapter details the specific analytical methods applied in Phase 1 of the study: (1) Content Analysis using Hwang et al.'s coding framework, (2) Qualitative Comparative Analysis (QCA), (3) Structural Topic Modeling (STM), and (4) Network Analysis. These four methods triangulate findings from multiple analytical angles.

Overview of Phase 1 Methods

```
Phase 1 Methods
  Content Analysis (Comparative Mapping)
     Hwang et al. 4-dimension coding → cluster derivation
     Country-by-country, then cross-national comparison

  QCA (fsQCA)
     Conditions → Outcome: Explicit CT Integration
     Sufficient condition paths; equifinality across countries

  Topic Modeling (STM)
     Inductive discovery of latent themes in course text corpus
     Country × program level differences

  Network Analysis
      Co-occurrence network of coding attributes
      Cross-national structural comparison (QAP)
```

Method 1: Content Analysis and Comparative Mapping

Coding Framework (4 Dimensions)

Hwang et al.'s (2025) coding framework is applied identically across all three countries to ensure comparability.

Dimension	Codes	Description
Curricular Themes	S, E, D, En, L	Strategy, Ethics, Data/Analytics, Entrepreneurship/Innovation, Literacy
Pedagogical Approaches	C, S, B, P, L	Case-based, Simulation, Brainstorming/Debate, Project-based, Lecture/Lab
Assessment Modes	A, R, F, Q	AI-Assisted Projects, Reflective Critiques, Faculty-graded, Quizzes
AI--CT Relationship	CT Level (H/M/L) + CT Linkage (E/I/A)	Bloom's level × Explicit/Implicit/Absent integration

Cluster Classification

Based on CT Level × CT Linkage matrix, schools are assigned to one of three clusters:

Cluster	Definition
Explicit CT Leaders	CT Level = High AND CT Linkage = Explicit
Implicit CT Integrators	CT Level = Mid AND CT Linkage = Implicit
Nominal CT Adopters	CT Level = Low AND CT Linkage = Absent

Inter-Coder Reliability

- Minimum 2 coders per language (English/Chinese/Korean)
- Pilot coding: 5 schools per country before full coding
- Target: Cohen's Kappa ≥ 0.80
- Disagreements resolved through discussion and guideline refinement

Comparative Mapping Output

- Country-specific cluster distributions
- Cross-national cluster comparison (US vs China vs Korea)
- Alluvial / Sankey diagram visualization of national flows

Method 2: QCA (Qualitative Comparative Analysis)

Basic QCA Structure

```
[Case] × [Conditions] → [Outcome]

Case       = each school (or school-program combination)
Conditions = variables expected to influence the outcome
Outcome    = Explicit CT Integration (CT Level = High AND CT Linkage = Explicit)
```

Outcome Variable

Preferred: fsQCA (fuzzy-set)

Score	Definition	Operationalization
1.0	Fully in	Higher CT + Explicit Linkage
0.67	More in than out	Higher CT + Implicit, or Mid CT + Explicit
0.33	More out than in	Mid CT + Implicit, or Lower CT + Explicit
0.0	Fully out	Lower CT + Absent Linkage

Condition Variables (6 Conditions)

Condition	Logic	Calibration (fsQCA)
COUNTRY (decomposed)	National AI policy + AACSB maturity	Government AI Readiness Index; accreditation years
PROGRAM	Program level	1 = MBA; 0 = Undergraduate

Condition	Logic	Calibration (fsQCA)
ACTIVE_PEDAGOGY	Active (Case/Simulation/Debate) vs Passive (Lecture/Project)	1.0 = 2+ active types; 0.67 = 1 active + 1 passive; 0.33 = passive only (2+); 0.0 = lecture only
REFLECTIVE_ASSESSMENT	Reflective (AI Projects/Critiques) vs Traditional (Graded/Quiz)	1.0 = A+R both; 0.67 = A or R + traditional; 0.33 = graded only; 0.0 = quizzes only
THEME_DIVERSITY	Number of curricular themes integrating AI	1.0 = 3+ themes; 0.67 = 2 themes; 0.33 = 1 non-literacy theme; 0.0 = literacy only
STRATEGY_INNOVATION	Presence of Strategy (S) or Entrepreneurship/Innovation (En) theme	1 = S or En present; 0 = neither

Unit of Analysis

Recommended: School-level (Option A)

- Each school = 1 case (~US 40 + China 25 + Korea 20 = ~85 cases)
- PROGRAM included as condition variable to capture UG/MBA differences
- Country-specific supplementary analyses as scope conditions if needed

QCA Procedure

Step 1: Calibration - Transform each condition variable to 0--1 fuzzy set - Set calibration anchors: fully in (1.0), crossover (0.5), fully out (0.0) - Check distribution (histogram) --- re-adjust if extreme skew

Step 2: Necessity Analysis - Test whether each condition is a necessary condition for the outcome - Consistency ≥ 0.90 → necessary condition

Step 3: Sufficiency Analysis (Truth Table) - Construct truth table → set frequency threshold (minimum 2 cases) - Consistency threshold ≥ 0.80 - Boolean minimization → derive parsimonious / intermediate / complex solutions

Step 4: Interpretation - Identify sufficient condition paths (what combinations lead to Explicit CT) - Confirm equifinality (do different paths exist by country?) - R packages: `QCA`, `SetMethods`

Expected Scenarios

Scenario	Description
A: Universal path	``Active Pedagogy × Reflective Assessment × Strategy Theme'' → Explicit CT regardless of country
B: Equifinality	US: Active Pedagogy × Strategy; China: AI Policy × Theme Diversity; Korea: Reflective Assessment × MBA
C: Necessary condition	Active Pedagogy necessary but not sufficient alone --- requires combination with other conditions

QCA Coding Worksheet Template

| School_ID | Country | Program | Active_Ped | Reflect_Assess | Theme_Div | Strat_Innov | AI_
|---|---|---|---|---|---|---|---|---|---|
| US_001 | US | MBA | 1.0 | 0.67 | 1.0 | 1 | 1.0
| CN_001 | China | MBA | 0.33 | 0.67 | 0.67 | 1 | 0.6
| KR_001 | Korea | UG | 0.67 | 0.33 | 0.33 | 0 | 0.5

Method 3: Topic Modeling (Structural Topic Model — STM)

Purpose

Inductively discover latent themes beyond the 5 pre-defined curricular themes → triangulate with deductive coding.

Design

- Corpus: Course description and syllabus text collected from all sampled schools
- Recommended model: STM (`stm` package in R)
  - `prevalence ~ country + program_level` directly models country-level topic differences
- Alternatives: LDA (easier to interpret), BERTopic (semantic similarity)

Procedure

Step 1: Corpus preparation - Collect course/syllabus text by country - Preprocessing: tokenization, stopword removal, stemming (language-specific) - Construct English unified corpus (post-translation) or country-specific corpora

Step 2: STM execution - Determine number of topics: `searchK()` function, k = 5--25 range - Model fitting: `prevalence ~ country + program_level` - Output: Top keywords per topic, representative documents, topic proportions

Step 3: Analysis - Statistical test of topic distribution by country (`estimateEffect`) - Match STM topics against 5 pre-defined themes - Interpret newly discovered themes

Output location: `docs/05_ /Quan/`

Method 4: Network Analysis

Purpose

Visualize and compare co-occurrence patterns among coding attributes across countries.

Network Types

Network Type	Description
Bipartite (school × coding attributes)	Community detection → compare with existing 3 clusters
Co-occurrence (attribute × attribute)	Weighted network by co-occurrence frequency. Centrality analysis to identify core categories
Country-comparison	QAP (Quadratic Assignment Procedure) statistical test of structural differences between country sub-networks

Procedure

Step 1: Network construction - Convert coding data to adjacency matrix - Co-occurrence network: create edges between coding categories co-occurring in the same school - Weight = co-occurrence frequency

Step 2: Network analysis - R packages: `igraph`, `tidygraph`, `ggraph`, `sna` - Whole network: degree centrality, betweenness centrality, community detection (Louvain algorithm) - Country sub-networks: same analysis repeated per country - Cross-country structural comparison: QAP

Step 3: Visualization - Force-directed layout for whole and country-specific networks - Node size = centrality; edge thickness = co-occurrence frequency; color = coding dimension

Output location: `docs/05_ /Quan/`

Triangulation Logic

Method Pair	What is triangulated
Content Analysis ↔ Network Analysis	Do community-detected clusters match qualitative mapping clusters?
Pre-defined themes ↔ STM topics	Do inductively discovered topics align with deductive coding themes?
QCA paths ↔ Mapping clusters	Do QCA sufficient condition paths correspond to sub-patterns within clusters?

When methods diverge, the divergence itself becomes a finding --- reporting methodological sensitivity differences as a contribution.

Software and Tools

Purpose	Tool
Coding data management	Excel / Google Sheets
Topic Modeling	R (stm, tidytext, quanteda)
Network Analysis	R (igraph, tidygraph, ggraph, sna)
QCA	R (QCA, SetMethods)
Visualization	R (ggplot2, ggraph) + Quarto
Reference management	Zotero / BibTeX
Collaboration	Google Drive + GitHub Pages (public/)

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Data Collection Strategy

Data collection is organized as a 5-layer architecture. The AACSB Excel database (1,077 schools) determines where to look (sampling frame + metadata). The actual coding content is collected from school websites, syllabi, and Phase 2 participants. A dual-criteria sampling strategy (global ranking + data availability) ensures cross-national comparability while maintaining coding feasibility.

The 5-Layer Data Architecture

```
Layer 1: AACSB Excel (already secured)
  = WHO + WHERE + HOW BIG
  = Sampling frame + QCA contextual variables

Layer 2: Course catalogs / program pages  (additional collection)
  = WHAT (how AI is included thematically)
  = Curricular Themes coding

Layer 3: Syllabi originals  (Open Syllabus / direct collection)
  = HOW + EVIDENCE + WHY
  = Pedagogical Approaches + Assessment + AI-CT Relationship coding

Layer 4: Instructor interviews  (Phase 2)
  = ENACTED (actual teaching practice)

Layer 5: Student surveys  (Phase 2)
  = ACHIEVED (student CT experience)
```

Layer-by-Layer Details

Layer 1 — AACSB Excel (Secured)

Variable	Use
School list (1,077 schools)	Confirm population
Country (69 countries)	Filter: US 556, China 54, Korea 19
Public/Private	QCA condition variable
Student enrollment	School size variable
Program level (UG/MBA/PhD)	QCA condition variable
Program list	Pre-screening by ``AI'' keyword
Delivery mode	Descriptive statistics
Website URL	Entry point for Layer 2 collection

Layer 2 — Course Catalogs (Additional Collection Required)

Target	Source	Codeable Dimensions
AI-related course titles/descrip-tions	University website course catalog	Curricular Themes (S/E/D/En/L)
Program learning outcomes	Program pages	CT Linkage (explicit or not)

Layer 3 — Syllabi (Additional Collection Required)

Target	Source	Codeable Dimensions
Learning objective verbs	Syllabi originals	CT Level (Bloom's mapping)
Class activity descriptions	Syllabi originals	Pedagogical Approaches (C/S/B/P/L)
Assessment/assign-ment items	Syllabi originals	Assessment Modes (A/R/F/Q)
Explicit CT mentions	Syllabi originals	CT Linkage (Explicit/Implicit/Absent)

Country-specific sources:

Country	Primary Source	Expected Coverage
US	Open Syllabus	~80% match expected
China	University website + direct requests	Limited public availability
Korea	University website + direct requests	Moderate availability

Layers 4–5 — Phase 2 (Interviews + Surveys)

Conducted after Phase 1 QCA results are available. Purposive sub-sample (~15--30 schools) selected from Phase 1 QCA pathways and deviant cases.

Sampling Strategy: Dual-Criteria Approach (Strategy D)

Available Sampling Strategies

Strategy	Description	Pros	Cons
A: Single ranking (Hwang et al. method)	US News Top 20 UG + 20 MBA	Simple; replicates prior study	US-centric; no cross-national comparability
B: Country-specific local rankings	US = US News, China = ARWU, Korea = JoongAng	Reflects local context	Different criteria; ``Top 20'' means different things per country
C: Single global ranking	QS or FT, same criteria for all three countries	Comparable across countries	Limited entries from China/Korea

Strategy	Description	Pros	Cons
D: Dual criteria --- Ranking + Data availability	Global ranking controls ``quality level''; data availability ensures ``coding feasibility''	Best of both worlds	Requires two-step filtering

Recommended: Strategy D — Dual-Criteria Filtering

```
Filter 1: AACSB Accreditation  (population)
  US: 556  |  China: 54  |  Korea: 19
        ↓
Filter 2: Global Ranking Entry  (QS/FT)
  US: ~100  |  China: ~30  |  Korea: ~10-15
        ↓
Filter 3: Data Availability  (Open Syllabus / website syllabi)
  US: ~60-80  |  China: ~20-25  |  Korea: ~10-15
        ↓
Final Sample
  US: 40  (maintains Hwang et al. comparability)
  China: 20-25  (maximum available)
  Korea: 15-19  (near-census or full census)
```

Stratification within Each Country

Tier	Criterion	Role
Tier 1	Global Top 100	Leading schools
Tier 2	Global 101--300	Mid-tier schools
Tier 3	AACSB-accredited, not ranked	Offsets ``elite bias''

Expected Country × Tier Distribution

Country	Tier 1	Tier 2	Tier 3	Total
US	15--20	10--15	5--10	~40
China	5--10	10--15	5	~20--25
Korea	3--5	5--7	5--7	~15--19

Country	Tier 1	Tier 2	Tier 3	Total
Total				~75--84

Advantages of Strategy D

Benefit	Explanation
Comparability	Same global ranking controls ``quality level'' across three countries
Feasibility	Data availability filter removes schools where coding is impossible
QCA use	Ranking Tier usable as QCA condition variable: ``Do higher-ranked schools show Explicit CT?''
Hwang et al. continuity	US 40 maintained → direct comparison with prior study
Korea census	19 schools allows near-census → minimal sampling bias
Bias mitigation	Tier 3 inclusion reduces ``elite school only'' bias

QCA Adequacy Check

Country	Expected Sample	Minimum for fsQCA	Judgment
US	40	15--20	Sufficient
China	20--25	15--20	Sufficient
Korea	15--19	15--20	Borderline (full census compensates)
Total	75--84	---	Sufficient for combined analysis

COUNTRY Variable Calibration (fsQCA)

The COUNTRY variable is decomposed into structural proxies rather than used as a nominal condition:

Proxy Condition	Operationalization	Source
National AI Policy Strength	Government AI Readiness Index score	Oxford Insights
AACSB Maturity	Mean AACSB accreditation years per country	AACSB data

Ranking Tier calibration:

Score	Criterion
1.0	Tier 1 (Global Top 100)
0.67	Tier 2 (Global 101--300)
0.33	Tier 3 (AACSB-accredited, unranked)

Comparison with Hwang et al. (2025)

Item	Hwang et al.	This Study
Sampling frame	US News Top 20 UG + 20 MBA	AACSB Excel 1,077 → country-specific selection
Layer 1 data	None (direct selection)	AACSB metadata (size, type, etc.)
Layer 2 data	Course catalogs, program websites	Same + systematic collection
Layer 3 data	Publicly available syllabi	Open Syllabus (US) + direct (China/Korea)
QCA condition variables	None	AACSB Excel metadata
Countries	US only	US, China, Korea

Improvement: Using AACSB Excel metadata (Public/Private, size, programs) as QCA conditions enables institution-characteristic--based analysis that was not possible in Hwang et al.

Data Collection Execution Flow

```
Step 1: AACSB Excel country-specific filtering  (Layer 1)
  US 556 → Top 40-50 selected
  China 54 → Full list or top-ranked
  Korea 19 → Full census

Step 2: Access course catalogs via website URLs  (Layer 2)
  Identify AI-related courses
  Collect course descriptions

Step 3: Obtain syllabi  (Layer 3)
  US → Open Syllabus matching
  China/Korea → Website + direct requests

Step 4: Apply 4-dimension coding framework
  Layer 2-3 data coded using Hwang et al. framework

Step 5: QCA + Comparative Mapping  (Phase 1 analysis)

Step 6: Purposive case interviews/surveys  (Layers 4-5, Phase 2)
```

Data Requirements to Collect

Data	Source	Notes
QS Global MBA Ranking	topuniversities.com	Published annually, free to view
FT Global MBA Ranking	rankings.ft.com	Published annually, free to view

Data	Source	Notes
Shanghai ARWU Business	shanghairanking.com	Research-based; includes Chinese schools
Government AI Readiness Index	Oxford Insights	For COUNTRY variable calibration
OECD AI Policy Index	oecd.ai	Supplementary AI policy data

Data

This chapter describes the data sources and data structure used in this study. Data is organized across five layers, from the AACSB accreditation database (already secured) through curriculum documents to Phase 2 interview and survey data.

Overview: Data by Research Phase

Phase	Data Layer(s)	Source	Status
Phase 1	Layers 1–3	AACSB Excel + School websites + Open Syllabus	Layer 1 secured; Layers 2–3 to be collected
Phase 2a	Layer 4	Instructor interviews (purposive sample)	Pending Phase 1 completion
Phase 2b	Layer 5	Student surveys	Pending Phase 1 completion

Layer 1: AACSB Accreditation Database

Status: Secured

The AACSB Excel database (1,077 accredited schools, 69 countries) serves as the sampling frame for the entire study. It provides school-level metadata used both to select the sample and as QCA condition variables.

Country Distribution (Target Countries)

Country	AACSB Accredited	Target Sample
US	556	~40 (maintains Hwang et al. comparability)
China	54	20–25
Korea	19	15–19 (near-census)

Variables Available in Layer 1

Variable	Type	Role in Study
School name	ID	Case identification
Country	Categorical	QCA scope condition / decomposed into AI policy proxy
Public/Private	Binary	QCA condition variable
Student enrollment	Continuous	School size variable
Program level (UG/MBA/PhD)	Categorical	QCA condition variable
Program list	Text	``AI'' keyword pre-screening
Delivery mode	Categorical	Descriptive statistics
Website URL	URL	Entry point for Layer 2 data collection
Accreditation tenure (years)	Continuous	AACSB Maturity proxy for QCA

Key improvement over Hwang et al. (2025): AACSB metadata enables institution-characteristic-based QCA analysis that was impossible with the US News-based approach used in the prior study.

Layer 2: Course Catalogs and Program Pages

Status: Additional collection required

Layer 2 provides the what of AI curriculum integration -- what themes are included, how AI appears in program learning outcomes.

Target	Source	Codeable Dimension
AI-related course titles and descriptions	University website course catalog	Curricular Themes (S/E/D/En/L)
Program learning outcomes	Program pages	CT Linkage (explicit or not)

Collection procedure:

1. Access school websites via Layer 1 URL list
2. Search for AI-related course listings (keyword: ``artificial intelligence'', ``AI'', ``machine learning'', ``ChatGPT'', etc.)
3. Download course titles, descriptions, and program learning outcomes
4. Organize by school and country

Layer 3: Syllabi

Status: Additional collection required

Layer 3 provides the how of AI integration -- actual pedagogical approaches, assessment modes, and CT linkage evidence in syllabus text.

Target	Source	Codeable Dimension
Learning objective verbs	Syllabi originals	CT Level (Bloom's mapping)
Class activity descriptions	Syllabi originals	Pedagogical Approaches (C/S/B/P/L)
Assessment/assignment items	Syllabi originals	Assessment Modes (A/R/F/Q)
Explicit CT mentions	Syllabi originals	CT Linkage (Explicit/Implicit/Absent)

Country-Specific Collection Approaches

Country	Primary Source	Expected Coverage
US	Open Syllabus (opensyllabus.org)	~80% of target schools
China	University website + direct email requests	Limited public availability
Korea	University website + direct email requests	Moderate availability

Multilingual Processing Protocol

1. Preserve originals in source language
2. Parallel English translation (researcher + AI-assisted + cross-validation)
3. Coding performed in original language (assign language-proficient coders per country)
4. Translation used for secondary verification only

Layer 4: Instructor Interview Data (Phase 2a)

Status: Pending Phase 1 completion

Semi-structured interviews with instructors of AI-integrated courses selected through Phase 1 QCA results.

Sample Design

Criterion	Details
Selection basis	Phase 1 QCA pathways (typical cases 2-3 per path; deviant cases 2-3)
Country balance	~5 per country (US 5, China 5, Korea 5)
Total target	15-30 instructors

Data Collected

Domain	Data Type
AI integration decision-making	Audio recording + transcript
Actual teaching practice	Field notes + artifacts (slides, handouts) where available
CT facilitation strategies	Interview transcript + memo
Intended-Enacted gap reflection	Interview transcript
Assessment methods	Description + examples
Contextual factors	Interview transcript

Analysis Path

- Thematic Analysis (Braun & Clarke, 2006) -- 6-step procedure
- Deductive-inductive hybrid coding against Phase 1 framework
- Member checking for validation

Layer 5: Student Survey Data (Phase 2b)

Status: Pending Phase 2a completion

Online surveys administered to students enrolled in courses taught by Phase 2a interviewees.

Sample Design

Item	Target
Per course	30-50 students
Total estimated	300-500 students across all three countries
Recruitment	Via Phase 2a instructors

Survey Sections

Section	Content	Measurement
A. AI usage experience	Frequency, type, tools used in class	Self-developed scale
B. CT self-perception	Perceived impact of AI use on CT	Adapted CT self-efficacy scale
C. CT skills (optional)	Indirect CT measurement	Watson-Glaser short form or CCTST subscale
D. Pedagogical experience	Teaching methods and assessment types experienced	Student version of Hwang et al. coding framework
E. Contextual awareness	AI policy, school support, cultural factor perceptions	Self-developed scale

Analysis Path

- Descriptive statistics + cross-national comparison (ANOVA / Kruskal-Wallis)
- Test CT perception differences by Phase 1 cluster membership
- Triangulation with Phase 2a instructor interview data

Data File Structure

```
docs/05_ /
  Data_Raw/
      layer1_aacsb_schools.xlsx          # Layer 1: AACSB database
      layer2_course_descriptions/         # Layer 2: Collected by country
          us_courses.csv
          china_courses.csv
          korea_courses.csv
      layer3_syllabi/                     # Layer 3: Syllabus originals
          us/
          china/
          korea/
      qca_coded_data.csv                  # QCA coding worksheet
```

```
  Qual/                                  # Phase 1 qualitative mapping outputs
      comparative_mapping/
  Quan/                                  # Phase 1 quantitative analysis outputs
      stm/                               # STM results
      network/                           # Network analysis results
      qca/                              # QCA results
```

Data Governance

Item	Policy
Layers 1–3 (documents)	Public sources only; no personal data
Layer 4 (interviews)	IRB approval required; audio + consent forms; anonymized transcripts
Layer 5 (surveys)	IRB approval required; anonymous/de-identified; multilingual consent
Storage	Google Drive (private folder) + local backup
Access	Research team only; no external sharing without co-author agreement
Existing materials	`docs/01_  /` -- NEVER delete or overwrite
Raw data	`docs/05_ /Data_Raw/` -- NEVER delete or overwrite

Literature Review

Searching and Inclusion & Exclusion

Round 1

Search kewwords and category

keywords combination

Round 2

Search kewwords and category

keywords combination

Round 3

Search kewwords and category

keywords combination

PRISMA

Reference List

Category, Classification and Decision Note for Selected Literature in Rounds

Round 1

Round 2

Round 3

Additional (during and after writing)

Research Problems

This chapter synthesizes research problems, gaps, and limitations identified through the Systematic Literature Review (SLR) of 55 papers on AI and critical thinking in business education (ScholarRAG, 2026-04-09).

> Note: This analysis was generated as part of the ScholarRAG SLR pipeline. All identified gaps and problem statements have been verified by the research team.

Section 1: Research Problem Landscape

Problem Theme 1: Inconsistent Evidence on AI's Effect on Critical Thinking

Critical

Empirical studies on the effect of AI tool use on students' critical thinking (CT) in business education produce conflicting results, with no theoretical or methodological consensus. Essien et al. (2024) found that ChatGPT use showed meaningful improvement only at lower Bloom levels (remembering, understanding, applying), with limited effects on higher-order thinking. Gerlich (2025) reported null results ($p > 0.05$), warning that AI integration does not automatically guarantee CT improvement. Together, these studies signal that AI tool adoption is necessary but not sufficient --- pedagogical design and contextual conditions are the key determinants of CT effects (Valcea et al., 2024).

Problem Theme 2: Intended–Enacted Curriculum Gap and Institutional Policy Lag

Critical

Even when business schools explicitly claim AI--CT integration in official documents (Intended Curriculum), a structural gap exists between those claims and instructors' actual teaching practice (Enacted Curriculum). Institutional policy

consistently lags behind practice. Stewart et al. (2026) confirmed this qualitatively through inductive coding of 18 education leadership students' reflective records. Nowinski et al. (2025) demonstrated through PLS-SEM (N=133) that instructors' AI integration intentions are shaped by formal AI training and self-efficacy pathways --- not mere experience accumulation --- suggesting that the quality of experience, not its quantity, governs Intended--Enacted alignment.

Problem Theme 3: Heterogeneity in Student Experience (Achieved Curriculum) and AI Over-Reliance

Emerging

Student CT development in AI-integrated curricula is bifurcated by usage patterns. Albannai (2025) found (N=40 DBA students) a heterogeneous spectrum from complementary use (stimulating CT) to over-reliance (insufficient critical verification). Fischer et al. (2024) found that approximately 90% of graduate students (N=118) used AI only for surface tasks (writing, paraphrasing), with fewer than 1 in 10 achieving higher-level sensemaking. Abdelwahab et al. (2023) showed that Dutch business students widely perceived their institutions as not adequately preparing them for AI work environments, highlighting the Intended--Achieved perception gap.

Problem Theme 4: Absence of Cross-National AI–CT Integration Research

Emerging

Research on AI--CT integration in business education is concentrated in specific countries (primarily the UK, US, and India), with virtually no systematic cross-national comparative research involving the US, China, and Korea. Ode et al. (2025) conducted a UK--Nigeria comparison, showing cultural differences affect AI tool use motivation and continuance intention --- but this is not specific to AACSB business schools and does not directly examine CT integration patterns. Liang et al. (2026) applied fsQCA in a Chinese logistics education context but cross-validation for the US or Korean context has not been conducted.

Problem Theme 5: Institutional Alignment Gap Between AACSB Standards and AI–CT Integration

Ongoing

Systematic empirical research examining how AI--CT integration aligns with AACSB accreditation learning outcome standards is scarce. Akhtar et al. (2024) confirmed misalignment between existing curricula and industry AI/big data competency demands in 38 AACSB supply chain programs. Desai (2024) argued conceptually that business schools can play a key role in AI talent development, but explicit empirical mapping of CT and AI integration in the AACSB accreditation context has not been conducted.

Section 2: Research Gaps

Theoretical Gaps

T1: Absence of an Integrative IEA Curriculum Theory Framework

The literature lacks an integrative theoretical framework that simultaneously encompasses Intended, Enacted, and Achieved curriculum dimensions for AI--CT integration. Individual dimensions are studied (Xu & Babaian, 2021; Nowinski et al., 2025; Abdelwahab et al., 2023), but no study theorizes the alignment and gaps between all three layers simultaneously.

T2: Absence of Comparative Education Theory Framework

Analysis of the SLR corpus shows Bloom's Taxonomy, TAM, SDT, and TPB are repeatedly used, while comparative education theory frameworks are almost never adopted. Ode et al. (2025) combined SDT and EDT for UK--Nigeria comparison, but this is insufficient to theorize country-specific pathway differences (equifinality) in the US--China--Korea AACSB context.

T3: Underdevelopment of Complex Causal Theory Permitting Equifinality

Most literature relies on theoretical frameworks explaining AI--CT integration outcomes through single-pathway linear causality. Only Liang et al. (2026) used fsQCA to explore asymmetric causality and equifinality --- limited to China. A theoretical framework permitting multiple pathways (equifinality) across countries is underdeveloped.

Methodological Gaps

M1: Absence of Longitudinal Research Design

Most studies rely on cross-sectional designs. No genuine longitudinal tracking exists to study long-term CT competency development following AI curriculum integration.

M2: Insufficient Systematic Curriculum Document Analysis

Studies conducting systematic coding and comparative analysis of actual curriculum documents are very rare. Akhtar et al. (2024) and Lyytinen et al. (2021, 2023b) conducted curriculum analysis but did not systematically code Explicit/Implicit/Nominal AI--CT integration levels for cross-national comparison.

M3: Absence of Multi-Stakeholder International Comparative Mixed Methods

Gupta and Jaiswal (2024) included both students (SEM N=525) and faculty (interviews N=35), but limited to India. No international comparative research using multi-stakeholder mixed methods (curriculum analysis + instructor interviews + student surveys) across the US, China, and Korea currently exists.

M4: Rarity of fsQCA Application in Business Education AI–CT Research

fsQCA appears in only 2 papers in the SLR corpus (Gong et al., 2025; Liang et al., 2026), both limited to China. Application of fsQCA to cross-national comparison of AI--CT Explicit integration in AACSB business schools is absent.

Contextual Gaps

C1: Complete Absence of Korean Business Education Context

Not a single paper in the SLR corpus sets a Korean AACSB-accredited business school as the research context. This completely blocks exploration of country-level pathway differences within East Asian business education.

C2: Insufficient AACSB-Specific AI–CT Integration Research

Studies explicitly targeting AACSB-accredited institutions are limited to Gupta et al. (2025), Akhtar et al. (2024), and Gupta (1994). None analyzes AI--CT integration patterns in relation to AACSB accreditation requirements.

C3: Rarity of UG–MBA Cross-Program Level Comparison

Only Lyytinen et al. (2021) simultaneously covers undergraduate and MBA levels --- limited to IS curriculum without CT linkage. Studies including MBA programs do not conduct systematic comparison with undergraduate programs.

Section 3: Limitations of Existing Literature

Structural Limitation	Description
Single-country/institution bias	Most studies from a single country (UK, India, China, US) with no cross-national comparability
Small samples and non-standardized measures	Many studies: N=15--40; only Gerlich (2025) uses standardized CT assessment (Watson-Glaser)
CT concept inconsistency	``Critical thinking'' operationalized as cognitive levels (Bloom), decision-making, problem-solving, sensemaking, systems thinking, AI literacy --- no theoretical consensus
Instructor perspective bias	Faculty-perspective studies concentrated in specific countries; no simultaneous US--China--Korea comparison

Structural Limitation	Description
No IEA three-layer simultaneous study	No study examines all three curriculum layers (Intended, Enacted, Achieved) in a single international comparative design
Excess conceptual papers	Conceptual papers and literature reviews constitute a large share; frameworks proposed are not empirically validated

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Section 4: New Research Problem Statements

PS1: Cross-National Distribution of AI–CT Integration Clusters in AACSB Schools

Statement: How do Explicit/Implicit/Nominal AI--CT integration cluster distributions systematically differ across US, China, and Korea in AACSB-accredited business schools, and how does program level (UG vs. MBA) moderate these differences?

RQ link: RQ1, RQ1a, RQ1b ¦ Theory: Bloom's Taxonomy + Comparative Education Theory ¦ Method: Mixed (curriculum content analysis + ANOVA/chi-square + NLP text analysis)

PS2: Equifinality of Conditions for Explicit AI–CT Integration by Country

Statement: What combinations of conditions lead to Explicit AI--CT integration in AACSB business schools, and do country-specific pathways (equifinality) exist across the US, China, and Korea?

RQ link: RQ2, RQ2a, RQ2b ¦ Theory: Dynamic Capabilities Theory ¦ Method: Mixed (fsQCA + curriculum analysis + institutional characteristics data)

PS3: Causal Structure and Cross-National Variation of the Intended–Enacted Gap

Statement: What is the nature and causal structure of the gap between AI--CT Intended Curriculum (documents) and Enacted Curriculum (actual teaching), and how does this gap differ across the US, China, and Korea?

RQ link: RQ3 ¦ Theory: TPB ¦ Method: Qualitative (semi-structured interviews + thematic analysis) or Mixed (interviews + fsQCA)

PS4: Cross-National and Cross-Cluster Variation in Student CT Perception and Experience

Statement: How do CT perception and experience of students enrolled in AI-integrated curricula in AACSB business schools systematically differ across the US, China, and Korea, and across Explicit/Implicit/Nominal clusters?

RQ link: RQ5 ¦ Theory: SDT ¦ Method: Quantitative (survey + SEM) or Mixed (survey + focus group interviews)

PS5: Cross-National Variation in Instructor-Perceived Facilitating and Inhibiting Factors

Statement: How do instructor-perceived facilitating and inhibiting factors for AI--CT integration systematically differ across the US, China, and Korea, and by what institutional and cultural conditions are these differences explained?

RQ link: RQ4 ¦ Theory: SCOT ¦ Method: Qualitative (semi-structured interviews + IPA or thematic analysis)

PS6: International Validation of Equifinality via fsQCA

Statement: Are there both universal conditions (operating regardless of country) and country-specific pathways (equifinality) for Explicit AI--CT integration across UG and MBA programs in AACSB schools?

RQ link: RQ2a, RQ2b ¦ Theory: Dynamic Capabilities + Triadic Reciprocal Determinism ¦ Method: Mixed (fsQCA + curriculum content analysis + institutional characteristics)

Gap–RQ Mapping Summary

RQ	Primary Gaps Addressed	Supporting Gaps
RQ1 (Pattern comparison)	C1 + C2 + I1 + M2	T2 + C3
RQ2 (Condition combinations)	T3 + M4 + T2	C1 + I2
RQ3 (I--E gap)	T1 + M3 + C2	C1 + I2
RQ4 (Instructor factors)	T2 + M3 + C1	C2 + I2
RQ5 (Student experience)	T1 + M3 + C1	I1 + Tp2

Legend: T = Theoretical gap, M = Methodological gap, C = Contextual gap, Tp = Temporal gap, I = Integrative gap

Key References

Quotes and Paraphrases

Products

References

Chae, C. (2024). Introduction to chad (chungil) chae. https://chadchae.github.io