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Expert validation of a causal model of 21st-century academic leadership in northeastern Thailand

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ABSTRACT

This study aimed to validate and refine a causal model of factors influencing 21st-century academic leadership among secondary school administrators in northeastern Thailand. The study addresses the growing need for an integrative leadership framework that reflects digital transformation, instructional demands, and contextual constraints in contemporary educational reform. A qualitative expert validation design was employed. A total 10 experts in educational leadership, curriculum administration, and organizational development were purposively selected to participate in semi-structured in-depth interviews. Data were analyzed using thematic content analysis and cross-expert validation to ensure conceptual clarity and contextual relevance. The findings confirmed four interrelated causal domains: leadership personality and identity; contextual and organizational support systems; proactive instructional and curriculum leadership; and innovation-oriented professional learning culture. Instructional leadership emerged as a central mediating mechanism linking internal leadership capacity and external organizational conditions to academic leadership outcomes. A refined causal model with validated indicators was synthesized, providing a theoretically grounded foundation for future instrument development and structural equation modeling (SEM). The findings offer practical and policy implications for leadership development and sustainable school improvement in rapidly changing educational environments.

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1. INTRODUCTION

The rapid transformation of global society—driven by the continuous expansion of digital technologies, the proliferation of artificial intelligence, evolving economic structures, and the transition toward knowledge-based economies—has fundamentally reshaped expectations for school leadership [1], [2]. Academic leaders are no longer confined to traditional administrative roles; rather, they are required to operate within increasingly complex educational ecosystems that demand adaptive capacity, technological fluency, instructional expertise, and the ability to cultivate collaborative professional learning cultures [3], [4]. A substantial body of recent international and regional research consistently demonstrates that academic leadership plays a critical role in enhancing school effectiveness, improving instructional quality, strengthening teacher professional development, and ultimately influencing student learning outcomes [5]–[7]. Consequently, school principals have become pivotal agents in driving educational improvement and facilitating systemic reform in the 21st-century [8].

Within the Southeast Asian context—particularly in Thailand—the national transition toward learner-centered education, competency-based learning, and technology-enhanced instructional practices continues to face significant structural and contextual challenges. northeastern Thailand exemplifies these systemic constraints, where school administrators must reconcile national policy expectations with local contextual realities. Although major policy frameworks—including the National Education Act (4th Amendment), B.E. 2562 (2019) [9], the 13th National Economic and Social Development Plan (2023–2027) [10], and international policy directions emphasizing future-oriented competencies and digital transformation [11], [12]—highlight decentralization, school autonomy, educational equity, and digital readiness, implementation across schools remains uneven. Rural secondary schools in particular continue to experience limited budgets, insufficient staffing, unclear instructional leadership guidelines, and inadequate technological readiness. These persistent challenges underscore the need for a deeper understanding of the causal factors shaping academic leadership in alignment with the demands of 21st-century education.

Although several studies have examined school leadership, administrative competencies, and transformational leadership behaviors [2], [13], relatively few have investigated the causal mechanisms influencing 21st-century academic leadership within culturally and structurally diverse regional contexts. Existing leadership models also tend to insufficiently incorporate emerging competencies emphasized in international frameworks such as those of the OECD and UNESCO, including digital literacy, innovation capability, ethical and value-based leadership, collaborative professional learning cultures, and flexible curriculum management [11], [12], [14], [15]. Recent global studies further highlight the need for integrative and context-responsive leadership models capable of addressing digital transformation, organizational complexity, and innovation-driven school improvement [16]–[18]. These gaps highlight the need for a theoretically robust and contextually responsive model capable of capturing the multifaceted and dynamic nature of contemporary academic leadership.

Expert validation represents a critical scholarly process for refining conceptual boundaries, enhancing contextual alignment, and strengthening the logical coherence of causal relationships in educational leadership research. Such validation is often supported by structured consultation techniques, including the Delphi approach and expert consensus methods, which help ensure theoretical rigor and contextual relevance [19]. Accordingly, this study aims to validate and refine a causal model of factors influencing 21st-century academic leadership among secondary school administrators in northeastern Thailand. Thus, the specific objectives are:

- To examine expert perspectives on key factors and causal mechanisms shaping 21st-century academic leadership within the context of secondary education in northeastern Thailand.
- To synthesize and validate the core constructs, dimensions, and indicators of the proposed causal model through in-depth expert analysis and cross-expert consensus.
- To refine and establish a theoretically grounded and contextually responsive causal model reflecting the complexity of contemporary educational leadership.
- To provide a validated conceptual foundation for the development of quantitative measurement instruments and subsequent structural equation modeling (SEM).

2. METHOD

2.1. Research design

This study employed a qualitative expert-validation design to examine, verify, and refine a causal model of factors influencing 21st-century academic leadership among secondary school administrators in northeastern Thailand. A theory-driven model development approach was adopted, beginning with a comprehensive synthesis of international and regional scholarship, followed by systematic model refinement through expert consultation. The qualitative validation process was conceptually aligned with analytic principles emphasizing construct validity, internal coherence, and pattern matching across expert perspectives, consistent with qualitative design logic described by Yin [20]. Although the present study did not employ a formal case study design, it adopted systematic cross-perspective comparison and causal pattern examination to enhance analytical rigor and contextual depth.

The preliminary causal framework derived from the literature was subjected to expert validation to enhance conceptual clarity, contextual relevance, and logical coherence among constructs. Such qualitative validation procedures are commonly utilized in leadership and educational research to strengthen conceptual robustness prior to quantitative instrument development and SEM. A semi-structured in-depth interview protocol was developed based on the preliminary model. The interview guide was designed to: i) validate construct definitions and conceptual boundaries; ii) assess the clarity, relevance, and adequacy of proposed indicators; iii) evaluate the plausibility and directional logic of hypothesized causal relationships; and iv) refine the model to ensure contextual alignment with secondary education in northeastern Thailand.

Data were analyzed using thematic content analysis combined with cross-expert comparison and causal mapping techniques. The analytic process involved iterative coding, category development, theme abstraction, and structured comparison across expert responses to identify areas of consensus, divergence, and refinement. Causal mapping procedures were applied to clarify directional relationships among constructs and strengthen the internal coherence of the refined framework. This methodological approach is consistent with internationally recognized qualitative model-validation frameworks and expert-informed model development procedures, including Delphi-informed validation and content validity processes. Through this systematic validation process, the study ensured that the refined causal model was theoretically grounded, contextually responsive, and methodologically rigorous prior to subsequent quantitative testing.

2.2. Participants

A total of 10 experts were purposively selected based on their professional expertise, scholarly contributions, and extensive experience in educational leadership and school administration in Thailand. Purposeful sampling was employed to ensure the inclusion of participants with substantial theoretical knowledge and practical experience relevant to the validation of the proposed causal model. The expert panel comprised: i) four university scholars specializing in educational administration, leadership theory, curriculum studies, or educational policy; ii) four secondary school administrators with a minimum of ten years of experience in administrative and instructional leadership; and iii) two specialists in instructional supervision, organizational development, or professional learning systems (e.g., professional learning communities (PLCs), coaching, and curriculum innovation). This diverse expert composition ensured balanced representation from academic, policy, and practitioner perspectives, thereby enhancing the conceptual validity, contextual relevance, and practical applicability of the refined causal model.

Participants were required to meet all of the following criteria: i) a minimum of ten years of professional experience in educational leadership or closely related domains; ii) demonstrated recognized expertise through scholarly publications, policy engagement, senior leadership positions, or substantial professional contributions; iii) familiarity with contemporary educational reforms, 21st-century learning frameworks, and school leadership practices in Thailand; and iv) capacity to provide informed, analytical, and critical judgments regarding causal mechanisms, leadership indicators, and contextual constraints relevant to the proposed model. The variation in professional roles, institutional affiliations, and experiential backgrounds contributed to the credibility, depth, and comprehensiveness of the expert-validation process. Such diversity ensured balanced representation across academic, administrative, and practitioner perspectives, thereby enhancing the conceptual validity and contextual robustness of the refined causal framework.

2.3. Research instruments

The primary research instrument was a semi-structured interview protocol developed from the preliminary causal model synthesized through an extensive literature review. The protocol was designed to systematically validate and refine the conceptual structure, core components, and causal relationships within the proposed model of 21st-century academic leadership. The interview protocol comprised three major sections:

2.3.1. Evaluation of major causal domains

Experts were invited to assess the conceptual clarity, theoretical alignment, and contextual relevance of each proposed domain within the causal model. Particular attention was given to the coherence between theoretical constructs and the practical realities of school leadership in northeastern Thailand.

2.3.2. Assessment of subcomponents and indicators

Experts examined the appropriateness, necessity, and sufficiency of indicators representing each construct. They were encouraged to propose revisions, additions, or eliminations to ensure that each indicator accurately reflected the intended dimensions of academic leadership and contextual conditions.

2.3.3. Examination of causal pathways

Experts reviewed the proposed directional relationships among variables and evaluated the logical consistency of the causal structure. Suggestions were provided regarding the addition, removal, or modification of relationships to enhance the explanatory power and contextual appropriateness of the model. Prior to data collection, the interview protocol underwent peer review and expert pre-validation to ensure clarity of wording, alignment with theoretical constructs, and suitability for in-depth qualitative inquiry. Minor refinements were made based on feedback to enhance coherence and comprehensibility. In addition to interview data, supplementary qualitative materials—including field notes, analytic memos,

and diagrammatic causal-mapping templates—were utilized to support data interpretation and model refinement. These materials enabled systematic documentation of expert feedback, emerging themes, and evolving conceptual relationships throughout the validation process.

2.4. Data collection procedures

Data collection was conducted through four systematic stages to ensure methodological rigor, transparency, and credibility throughout the expert-validation process.

2.4.1. Invitation and briefing

Each expert received a formal invitation outlining the study objectives, research procedures, ethical considerations, and an overview of the preliminary causal model. This initial briefing ensured that all participants clearly understood the conceptual framework, validation purpose, and expectations prior to the interviews.

2.4.2. Semi-structured in-depth interviews

Individual semi-structured interviews were conducted either face-to-face or via secure online platforms, depending on participant availability and geographic location. Each interview lasted approximately 45–90 minutes. Probing questions were employed to elicit detailed reflections on causal assumptions, contextual constraints, leadership mechanisms, and the appropriateness of proposed indicators and structural relationships. This flexible yet structured format enabled in-depth exploration of expert perspectives while maintaining procedural consistency across interviews.

2.4.3. Member checking

To enhance credibility and minimize potential misinterpretation, preliminary summaries of expert responses and emerging interpretations were returned to participants for verification. Experts were invited to review, clarify, and refine the summaries to ensure accurate representation of their perspectives. This member-checking procedure strengthened the trustworthiness, credibility, and confirmability of the qualitative findings.

2.4.4. Compilation and cross-expert aggregation

All interview recordings, transcripts, field notes, analytic memos, and diagrammatic concept maps were systematically compiled and organized. Data from all experts were then aggregated for cross-expert comparison and integrated analysis. This process facilitated the identification of shared themes, areas of consensus, and points requiring refinement within the causal model. These structured procedures ensured consistency in data collection, strengthened the credibility of expert input, and supported a rigorous and transparent model-validation process aligned with qualitative research standards in educational leadership and organizational studies.

2.5. Data analysis

Data were analyzed using a multi-layered qualitative analysis framework designed to ensure analytical rigor, conceptual clarity, and contextual relevance. The analysis integrated thematic content analysis, cross-expert validation, and causal mapping techniques to systematically refine the proposed causal model of 21st-century academic leadership.

2.5.1. Thematic content analysis

All interview recordings were transcribed verbatim and systematically reviewed. Data were analyzed through an iterative thematic content analysis process involving open coding, categorization, and theme development. The analytic procedure included: i) coding of recurring themes and patterns across expert interviews; ii) categorization of leadership factors, indicators, and causal mechanisms; iii) identification of areas of consensus, divergence, and contextual nuances; and iv) continuous comparison of emerging themes across participants.

This iterative coding process enabled the identification of core conceptual categories and relationships relevant to the refinement of the causal model. The analysis followed an inductive–deductive approach, allowing themes to emerge from expert insights while remaining aligned with the preliminary theoretical framework.

2.5.2. Cross-expert validation

To strengthen analytical credibility and conceptual robustness, cross-expert validation was conducted through systematic comparison of expert perspectives. This stage involved:

- Comparison of expert judgments across domains and indicators.
- Examination of levels of agreement regarding model components.
- Identification of contested or ambiguous elements requiring refinement.
- Synthesis of shared expert insights to enhance conceptual coherence.

Consensus patterns and divergent views were carefully examined to ensure balanced interpretation, reduce researcher bias, and support comprehensive model refinement. This cross-expert synthesis enhanced the trustworthiness and confirmability of the analytical process.

2.5.3. Causal mapping and model refinement

Causal mapping techniques were employed to integrate thematic findings into the preliminary conceptual model and refine its structural relationships. This process involved:

- Mapping emergent themes onto the preliminary causal framework.
- Revising the direction, strength, and logical coherence of proposed causal relationships.
- Removing redundant indicators and incorporating context-specific elements.
- Producing a refined causal model reflecting both theoretical and practitioner-informed perspectives.

The integration of thematic analysis and causal mapping enabled systematic refinement of the model's conceptual structure and strengthened its explanatory coherence. This multi-layered analytic strategy ensured that the final model was theoretically grounded, empirically informed, and contextually aligned with the realities of secondary education leadership in northeastern Thailand.

2.6. Trustworthiness and rigor

To enhance the trustworthiness and rigor of the analysis, several qualitative validation strategies were employed, including iterative coding, cross-expert comparison, and member checking. Analytic memos and audit trails were maintained throughout the research process to systematically document coding decisions, theme development, and model refinements. These procedures strengthened the credibility, dependability, and confirmability of the findings and ensured transparency in the analytic process. In addition, continuous reflection and cross-validation of emerging themes were conducted to minimize researcher bias and enhance interpretive accuracy. The integration of multiple validation strategies supported the robustness and consistency of the analytical outcomes. Overall, the analytic procedure ensured conceptual rigor, internal coherence, and contextual relevance, thereby establishing the refined model's readiness for subsequent quantitative validation and SEM. Qualitative model validation supported by expert insight and systematic analysis remains essential for strengthening conceptual clarity and contextual alignment prior to large-scale quantitative testing and model development in educational research [19], [21], [22].

3. RESULTS AND DISCUSSION

3.1. Results

The expert-validation process yielded a coherent and systematically refined causal model of 21st-century academic leadership. Rather than functioning as an exploratory qualitative inquiry, the interviews served as a structured validation procedure aimed at examining, confirming, and refining the conceptual domains, causal pathways, and indicators derived from the literature synthesis. The analysis demonstrated a strong convergence of expert perspectives, resulting in four validated domains, twelve key categories, and forty-eight refined indicators that collectively represent the core structure of academic leadership in contemporary secondary education. These validated components showed substantial alignment with both theoretical expectations and contextual realities in northeastern Thailand. The findings are presented according to thematic domains corresponding to the refined causal model.

3.1.1. Domain 1: personal attributes and leadership disposition

Experts consistently emphasized that academic leadership in the 21st century is grounded in the internal capacities and dispositions of school administrators. This domain comprises four interrelated categories that function as foundational drivers of effective instructional leadership and school improvement.

a. Professional knowledge and digital literacy

Experts highlighted the necessity for school leaders to possess strong professional knowledge in curriculum design, assessment, and technology-enhanced learning. Digital competence was viewed as an essential leadership capability in contemporary educational environments.

> "*Leaders today must understand both curriculum management and digital transformation; otherwise, they cannot support teachers*." (E2)

b. Ethical and moral leadership

Integrity, fairness, and ethical conduct were unanimously identified as indispensable components of effective academic leadership. Experts emphasized that ethical leadership establishes trust and legitimacy, enabling instructional leadership to function effectively within schools.

"*Integrity creates trust; without it, instructional leadership cannot occur.*" (E3)

c. Leadership self-efficacy

Leadership confidence in decision-making, problem-solving, and crisis management emerged as a critical factor influencing school improvement. Experts noted that leaders' self-efficacy directly shapes teacher confidence and organizational resilience.

"*A leader's confidence directly influences teachers' confidence.*" (E7)

d. Transformational influence

Experts identified inspirational leadership and positive role modeling as key mechanisms for shaping school culture and motivating teacher engagement. Transformational influence was viewed as a driving force for sustaining innovation and collaborative learning environments.

"*Transformational leadership is the engine that moves the entire learning culture*." (E9)

Collectively, these categories demonstrate that personal attributes and leadership disposition function as the psychological and motivational foundation of academic leadership. This domain exerts a direct influence on instructional leadership practices and the development of an innovation-oriented learning culture within schools.

3.1.2. Domain 2: contextual and structural support systems

Experts consistently emphasized that contextual and structural conditions play a decisive role in shaping a school leader's capacity to enact effective academic leadership. This domain represents the external enabling environment that either supports or constrains leadership practices within secondary schools. Four key categories were validated as essential components of this domain.

a. Policy alignment and governance support

Experts highlighted the importance of aligning national educational reforms with school-level implementation strategies. Effective academic leadership requires the ability to interpret policy directives and translate them into practical actions within specific school contexts.

"*Leaders must translate national policies into meaningful school-level actions*." (E4)

b. Adequacy of resources

The availability of financial resources, technological infrastructure, and qualified personnel was identified as a critical determinant of leadership effectiveness. Experts agreed that insufficient resources significantly limit a leader's capacity to sustain instructional improvement and innovation.

"*Leadership quality cannot be sustained if resources are insufficient*." (E5)

c. Physical and organizational climate

A supportive physical and organizational environment was viewed as essential for the successful implementation of instructional leadership. Experts noted that positive school climate, collaborative culture, and supportive working conditions enable teachers and administrators to engage more effectively in school improvement initiatives.

"*Culture and climate determine whether instructional leadership can thrive*." (E6)

d. School autonomy and human resource development (HRD) systems

Experts emphasized that school autonomy facilitates context-responsive decision-making and innovation. In addition, systematic HRD and individual development planning (IDP) were identified as key mechanisms for sustaining teacher capacity and professional growth.

"*Autonomy empowers schools to innovate in a way that fits local needs*." (E1)

Collectively, these findings indicate that contextual and structural support systems function as enabling conditions that shape the extent to which school leaders can implement effective academic leadership. This domain interacts with leaders' personal attributes and directly influences the implementation of instructional leadership and innovation-oriented school practices.

3.1.3. Domain 3: instructional leadership and proactive curriculum management

Experts consistently identified instructional leadership and proactive curriculum management as the central mediating mechanism linking leaders' personal attributes and contextual supports to educational outcomes. This domain represents the operational core of academic leadership, translating leadership capacity and structural support into concrete instructional practices and student achievement. Four interrelated categories were validated within this domain.

a. Systematic curriculum planning

Experts emphasized the importance of systematic curriculum planning aligned with national standards while remaining responsive to local contexts and student needs. School leaders play a key role in guiding curriculum design, implementation, and continuous review to ensure coherence between policy expectations and classroom practices.

b. Supervision and monitoring of teaching–learning processes

Instructional supervision and ongoing monitoring of teaching–learning processes were identified as critical mechanisms for improving instructional quality. Experts highlighted the role of feedback, coaching, and assessment-driven supervision in shaping teaching effectiveness and student outcomes.

"*Supervision directly affects teaching behavior and student achievement*." (E7)

c. Teacher development through PLCs, coaching, and mentoring

Continuous teacher development emerged as a universally validated causal factor. Experts emphasized the importance of PLCs, coaching systems, and mentoring processes in strengthening teachers' instructional competence and adaptability to evolving educational demands.

d. Collaborative leadership for student achievement

Experts underscored the significance of collaborative leadership practices that promote shared responsibility for student achievement. Data-driven decision-making, collective problem-solving, and distributed leadership were viewed as essential mechanisms for improving instructional outcomes and sustaining school improvement. Overall, this domain demonstrated the strongest consensus among experts regarding its centrality within the causal model. Instructional leadership and proactive curriculum management function as the primary mediating processes through which leadership attributes and contextual supports influence both instructional quality and long-term educational outcomes.

3.1.4. Domain 4: innovation and 21st-century professional learning culture

Experts concluded that sustainable school improvement in the 21st century depends on the establishment of a strong culture of innovation and continuous professional learning. This domain represents both a key outcome of effective academic leadership and a reinforcing mechanism that sustains long-term educational development. Four interrelated categories were validated within this domain.

a. Promotion of educational innovation

Experts emphasized that innovation must be embedded within the identity and daily practices of the school rather than implemented as isolated initiatives. Leaders play a crucial role in fostering an environment that encourages experimentation, creative problem-solving, and continuous improvement.

"*Innovation must be a culture, not an isolated project*." (E9)

b. Participatory culture of teachers, students, and community

A participatory culture involving teachers, students, and community stakeholders was identified as essential for building trust and enhancing academic processes. Collaborative engagement supports shared ownership of school improvement and strengthens relationships among stakeholders.

c. Flexible curriculum aligned with future skills

Experts highlighted the importance of curriculum flexibility to accommodate emerging competencies and evolving societal demands. Adaptive curriculum structures enable schools to integrate 21st-century skills, digital literacy, and interdisciplinary learning aligned with future workforce needs.

d. Continuous professional learning

Continuous professional learning—including PLCs, self-directed learning, and knowledge-sharing practices—was identified as a core mechanism for sustaining long-term school improvement. Experts

emphasized that ongoing professional development supports innovation, instructional quality, and organizational adaptability. Collectively, these findings indicate that innovation and professional learning culture function both as an outcome of effective academic leadership and as a reinforcing system that sustains leadership effectiveness over time. This domain strengthens the dynamic relationship among leadership attributes, contextual supports, and instructional practices within the refined causal model.

3.1.5. Expert consensus on model validity

The expert-validation process demonstrated a high level of agreement regarding both the structure and substantive components of the refined causal model. Overall consensus levels indicated strong support for the conceptual clarity, theoretical coherence, and practical applicability of the model within the context of secondary education in northeastern Thailand. Agreement across experts reached 100% for the four principal domains, indicating unanimous acceptance of the overarching conceptual framework of 21st-century academic leadership. Consensus regarding the twelve key categories ranged from 90% to 100%, reflecting strong alignment among experts concerning the essential subcomponents within each domain. Validation of the forty-eight proposed indicators yielded agreement levels between 85% and 97%, confirming their clarity, relevance, and contextual appropriateness for representing contemporary academic leadership practices.

In addition, the proposed causal pathways received an overall agreement level of 88%, demonstrating broad expert acceptance of the directional relationships and underlying causal logic embedded within the model. These findings indicate that the refined model is both theoretically coherent and contextually grounded, with strong potential for application across diverse secondary school settings in northeastern Thailand. Collectively, the high levels of expert consensus affirm that the validated model provides a robust conceptual foundation for future quantitative measurement development and SEM. The refined structure captures the dynamic interactions among leadership attributes, contextual support systems, instructional leadership processes, and innovation-oriented learning culture. Table 1 presents a synthesis of the validated domains, key categories, and representative expert statements that informed the refinement of the causal model. The synthesis presented in Table 1 demonstrates strong conceptual convergence across experts and highlights the interconnected nature of leadership attributes, contextual supports, instructional processes, and innovation-oriented learning culture within the refined model.

Table 1. Synthesized domains, key categories, and representative expert statements

Theme	Key categories	Sample expert codes
1. Personal attributes	Knowledge, ethics, self-efficacy, transformational influence	E3: "*Technology+vision+ethics=modern leadership*."
2. Contextual support	Governance, resources, climate, autonomy	E5: "*No resources=no leadership execution*."
3. Instructional leadership	Curriculum, supervision, teacher development, achievement	E7: "*Instructional supervision affects student learning immediately*."
4. Innovation culture	Innovation, participation, flexible curriculum, learning culture	E9: "*PLC must be a culture, not an activity*."

3.1.6. Refined causal mechanisms of academic leadership

Based on expert validation and thematic synthesis, four primary causal mechanisms were confirmed:

- Personal attributes and leadership disposition directly shape instructional leadership practices and influence the development of a school learning culture.
- Contextual and structural support systems strengthen leaders' capacity to implement effective instructional leadership.
- Instructional leadership functions as the central mediating mechanism linking leadership attributes and contextual factors to academic outcomes.
- Innovation and professional learning culture represents both a long-term outcome and a reinforcing system sustaining leadership effectiveness and school improvement.

Overall, the refined model demonstrates strong conceptual integrity and practical relevance. It provides a theoretically grounded and empirically supported framework for understanding academic leadership in contemporary educational contexts. The validated causal structure is illustrated in Figure 1.

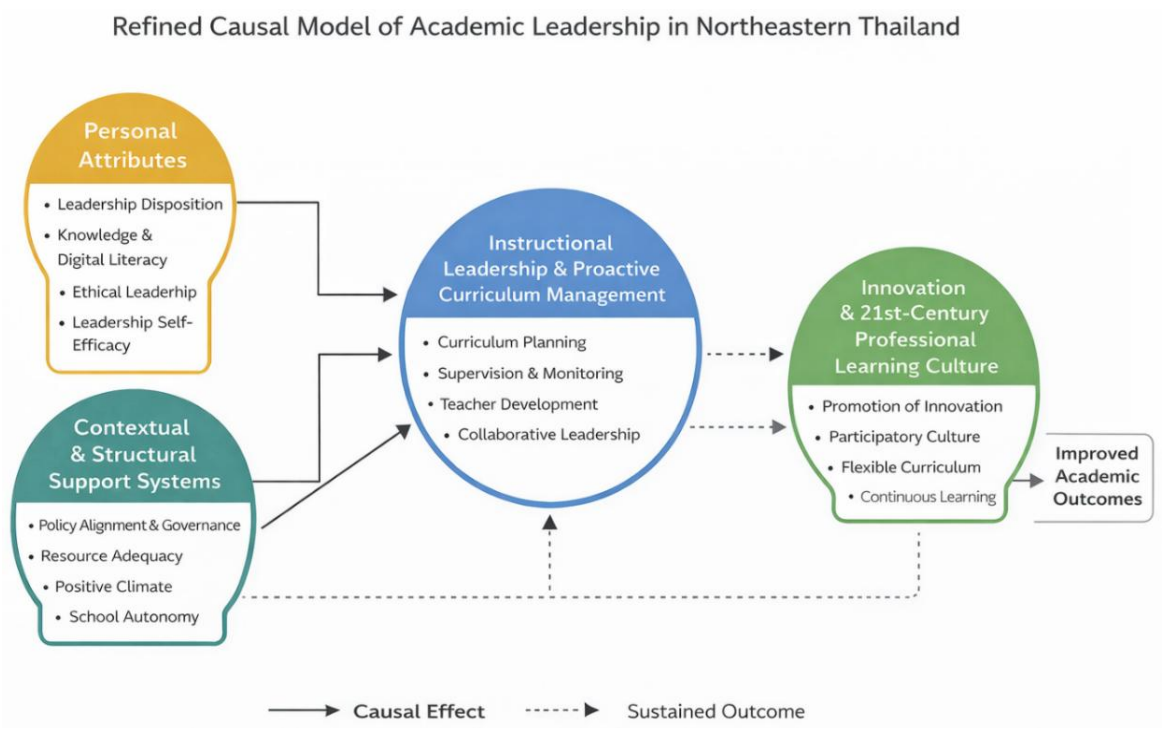

Figure 1. Refined causal model of academic leadership in northeastern Thailand

3.2. Discussion

This study sought to validate and refine a causal model explaining 21st-century academic leadership among secondary school administrators in northeastern Thailand. Through systematic expert validation, four interdependent domains—personal leadership attributes, contextual and structural support systems, instructional leadership, and innovation-oriented professional learning culture—were confirmed as the core mechanisms shaping academic leadership within contemporary educational systems. Beyond confirming existing leadership constructs, the findings advance a more integrated and system-oriented understanding of how academic leadership operates in complex, resource-constrained, and rapidly transforming educational environments. Rather than treating leadership as a collection of discrete traits or isolated practices, the refined model conceptualizes academic leadership as an emergent phenomenon resulting from dynamic interactions among internal capacities, organizational structures, instructional processes, and innovation-driven cultures.

3.2.1. Reinterpreting academic leadership: a systemic perspective

The findings reaffirm that personal attributes—particularly ethical orientation, leadership self-efficacy, digital competence, and transformational influence—form the psychological foundation of academic leadership. This aligns with Leithwood *et al*. [6] and transformational leadership theory [2], which emphasize the centrality of leader beliefs, values, and efficacy in shaping instructional behavior. However, the present study extends this perspective by demonstrating that such internal dispositions do not function independently; rather, they acquire operational significance only when activated within supportive structural conditions and translated into instructional leadership processes.

In contrast to leadership models that privilege individual competence alone, the findings reveal that contextual and structural support systems—policy coherence, governance alignment, resource adequacy, school autonomy, and organizational climate—serve as enabling or constraining conditions that determine whether leadership capacity can be effectively enacted. This reinforces Hallinger's [5] and Fullan's [4] emphasis on system alignment but further clarifies the causal pathways through which structural conditions influence instructional practice. The systemic dimension of leadership further resonates with Harris [23] conception of system-wide improvement, which highlights the importance of alignment across governance levels and distributed leadership capacity in driving sustainable reform. In the context of northeastern Thailand, where disparities in resources and infrastructure remain significant, leadership effectiveness emerges not solely from individual expertise but from the interaction between agency and structure.

Most notably, instructional leadership and proactive curriculum management were validated as the central mediating mechanism within the model. This finding corroborates Robinson *et al*. [7] and Spillane [3], who identify instructional practice as the primary pathway through which leadership affects student outcomes. Yet the present model contributes additional causal precision by demonstrating how instructional leadership functions as the operational bridge linking personal attributes and contextual support to both innovation culture and long-term academic improvement.

Finally, the identification of innovation-oriented professional learning culture as both an outcome and a reinforcing mechanism advances contemporary leadership theory. Consistent with OECD [11] and UNESCO [12] frameworks, innovation and continuous professional learning were validated not as peripheral enhancements but as systemic drivers of sustainability. This interpretation is further supported by research on professional capital [24] and PLCs [25], which emphasize collaborative cultures as engines of instructional improvement. Moreover, sustained professional learning has been shown to enhance teacher instructional quality when supported by coherent leadership structures [26], [27].

3.2.2. Theoretical contributions

This study makes three key theoretical contributions to the international discourse on educational leadership. First, it advances a multidimensional and systemic model that integrates leadership disposition, contextual structures, instructional processes, and innovation-oriented professional learning culture into a unified causal framework. While prior research has frequently examined these elements in isolation, the present study demonstrates their structural interdependence and dynamic interaction within complex educational environments.

Second, the findings clarify the mediating role of instructional leadership with greater causal specificity. By empirically validating instructional leadership as the central mechanism linking internal leadership attributes and contextual determinants to academic improvement, the study provides a more coherent explanation of how leadership capacity is operationalized into measurable educational outcomes. Third, the validation of forty-eight refined indicators establishes a theoretically structured and empirically grounded foundation for future quantitative measurement and SEM. By articulating clearly defined constructs and directional pathways, the model satisfies key assumptions of multivariate causal modeling, including construct validity, relational specification, and structural coherence, as recommended in complex modeling frameworks [28]. This strengthens the methodological bridge between qualitative expert validation and subsequent large-scale empirical testing.

In digitally transforming educational environments, leadership effectiveness increasingly depends on technological–pedagogical integration and data-informed instructional innovation. Frameworks such as technological pedagogical content knowledge (TPACK) [29] and research on information and communication technology (ICT)-supported professional development [30] underscore the necessity of aligning technological competence with instructional leadership processes rather than treating digital adoption as a standalone reform. Furthermore, contemporary analyses of digital transformation in education [31] caution that technological investment alone does not automatically translate into improved learning outcomes without coherent leadership mediation. These perspectives reinforce the present study's systemic interpretation of academic leadership, in which digital competence operates as an embedded dimension within broader instructional and organizational mechanisms.

3.3. Implications for policy and leadership development

3.3.1. Policy implications

The findings underscore the necessity of policy coherence and structural alignment. Leadership development efforts are unlikely to yield sustainable impact without adequate resource allocation, governance clarity, and school-level autonomy. Policymakers should therefore design reform initiatives that integrate leadership capacity-building with structural support mechanisms, particularly in rural and resource-constrained contexts.

3.3.2. Leadership preparation and professional development

Leadership preparation programs must move beyond administrative training toward capacity-building in digital competence, instructional coaching, transformational leadership, and innovation management. Strengthening leaders' self-efficacy and adaptive capacity is critical for navigating technological disruption and educational reform [15], [21]. Critical scholarship on education and technology further reminds us that digital transformation must be approached reflexively and ethically rather than technocratically [32]. Furthermore, leadership development must incorporate technology-integrated instructional frameworks such as TPACK [20] and ICT-supported professional learning systems [33]. Leaders must be equipped not only to manage schools but to guide pedagogical innovation and foster organizational learning [22].

3.3.3. School-level practice

At the school level, institutionalizing PLCs [25], strengthening instructional supervision systems, and cultivating participatory cultures aligned with professional capital principles [24] are essential strategies for sustaining academic leadership. Empirical evidence linking leadership practices to student learning [33] further supports the prioritization of instructional coherence and collaborative professionalism.

3.4. Limitations and directions for future research

Although the model was validated through rigorous expert analysis, it remains contextually grounded in northeastern Thailand. Future research should empirically test the model using SEM across diverse regional and international contexts to examine its cross-cultural stability and generalizability. Additionally, longitudinal research may further explore the recursive relationships identified in this study, particularly the reinforcing dynamics between instructional leadership and innovation-oriented learning culture. Comparative studies across urban and rural systems may also illuminate contextual variations in the activation of leadership mechanisms.

4. CONCLUSION

The refined causal model advances a systemic and context-sensitive understanding of academic leadership in the 21st century. By integrating internal leadership disposition, structural conditions, instructional mediation, and innovation-oriented professional culture, the study provides an empirically validated and theoretically coherent framework for strengthening leadership practice in contemporary educational systems. Rather than conceptualizing academic leadership as a static set of competencies, the model positions it as a dynamic and evolving system shaped by continuous interaction among leaders, institutions, and learning communities. In doing so, this study contributes a robust foundation for future empirical research, policy design, and leadership development initiatives within Thailand and beyond.

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AUTHOR CONTRIBUTIONS STATEMENT

This journal uses the Contributor Roles Taxonomy (CRediT) to recognize individual author contributions, reduce authorship disputes, and facilitate collaboration.

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C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
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I : **I**nvestigation
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D : **D**ata Curation
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E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
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CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

INFORMED CONSENT

Informed consent was obtained from all participants prior to data collection. Participation was voluntary and all information was kept confidential.

ETHICAL APPROVAL

The study involving human participants was reviewed and approved by the Human Research Ethics Committee of Nakhon Phanom University, Thailand (Certification No. HE16968; approved on 26 August 2025). All procedures were conducted in accordance with institutional research ethics guidelines and the principles of the Declaration of Helsinki. Written informed consent was obtained from all participants prior to data collection.

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [DB], upon reasonable request.

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