

Meta-skills-oriented academic management in higher education: evidence from Chinese HEIs

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ABSTRACT

Higher education institutions (HEIs) increasingly face pressure to develop graduates' meta-skills, yet meta-skills are typically treated as learner-level outcomes rather than an institutional management orientation that can reshape academic management systems. This study proposes and tests a meta-skills-oriented academic management framework that links meta-skills orientation (metacognitive capacity, emotional intelligence, and motivational competence) to academic management frames (structural, human resource, political, and symbolic) and institutional performance. Using a cross-sectional survey of 2,406 academic administrators and faculty from 60 Chinese HEIs (national key, provincial, and regular colleges) selected through stratified sampling, the study employed validated questionnaire measures and analyzed data via structural equation modeling (SEM) (AMOS 26.0). The model demonstrated acceptable fit (CFI=0.968; RMSEA=0.042). Meta-skills orientation positively predicted structural ($\beta=0.685$), human resource ($\beta=0.573$), political ($\beta=0.412$), and symbolic ($\beta=0.524$) frames (all $p<0.001$), while structural ($\beta=0.486$) and human resource ($\beta=0.445$) frames significantly predicted institutional performance (all $p<0.001$). Multi-group analysis indicated stronger meta-skills-to-structural pathways in national key universities than other HEI types. The findings position meta-skills orientation as an actionable institutional logic and provide frame-specific levers for evidence-based academic management reform.

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1. INTRODUCTION

In the rapidly evolving landscape of higher education, the transformation of academic management and leadership structures has become increasingly critical as institutions face unprecedented challenges in developing future-ready graduates. The development of effective leadership approaches and understanding of power dynamics in university structures form the foundation for institutional transformation [1], [2]. The perception and implementation of leadership behaviors in educational contexts have evolved significantly, particularly in how institutional leadership is conceptualized and executed [3], [4]. Skills and skill orientation are conceptual foundations that need to be clearly defined in scientific management. As already stated, meta-skills encompass higher cognitive abilities and behavioral predispositions that contribute to learning, adaptation, and development in various fields. Based on recent theoretical developments, these abilities include metacognitive skills for overseeing and regulating learning processes, emotional intelligence for

understanding and managing interpersonal relationships, as well as precursor skills for maintaining goal-oriented activities [5]. In the organizational context, meta-skill orientation denotes an orientation guided by a meta-skill institutional strategy that consistently develops these abilities as a management tool [6]. This orientation has moved away from the conventional administrative model and emphasized the importance of self-learning institutions that possess emotions and can learn. Particularly in higher education management, meta-skill orientation from the perspective of integrated policies serves as a framework of practices and processes directed toward organizational development, focusing on the formation of these core competencies, supporting both personal and institutional development within complex educational frameworks [7]. Analysis of presidential leadership has revealed the complex interplay between organizational structure and leadership effectiveness [8].

The cybernetic nature of academic organizations and the mechanisms of academic leadership provide crucial frameworks for understanding institutional management [9], [10]. This understanding is further enhanced by contemporary perspectives on organizational reframing and the evaluation of management effectiveness across multiple sectors [11], [12]. Recent research has emphasized the importance of leadership orientation instruments in assessing and developing institutional capabilities [13].

The integration of meta-skills into educational frameworks represents a significant evolution in academic management approaches [14]. This development necessitates robust research methodologies and theoretical foundations in educational leadership [15], [16]. The influence of global isomorphism on governance reform and the application of institutional theory in higher education research have become increasingly relevant in understanding these transformations [17], [18]. The contextualization of higher education within broader societal frameworks highlights the need for sophisticated management approaches that can address both educational and societal demands [19].

The distinction between educational management and leadership has become particularly significant as institutions adopt more comprehensive research designs [20], [21]. The emergence of creative meta-skills as a crucial component of professional development coincides with the increasing emphasis on excellence and diversity in institutional governance [22], [23]. This evolution is particularly evident in the changing dynamics of state involvement in higher education and the essential skills required for effective educational leadership [24], [25].

Contemporary research on institutional leadership has highlighted the complex interplay between different administrative roles and responsibilities [26], [27]. Historical analyses of institutional dynamics provide valuable insights into the development of current management structures [28], [29]. The assertion of global leadership in higher education requires careful consideration of leadership orientations and the relationship between leadership and organizational trust [30]–[32].

This research aims to examine the reconstruction of academic management models in HEIs through a meta-skills-oriented perspective. By synthesizing established theories of educational leadership with contemporary analytical approaches, this study seeks to develop a comprehensive understanding of how institutional structures can be optimized to facilitate meta-skills development while maintaining academic excellence and institutional effectiveness [33], [34]. The changing roles of institutional leaders and the unique characteristics of educational management in different contexts provide crucial insights for this investigation [35]–[38]. The examination of governance reforms and management practices within HEIs offers valuable perspectives on potential paths forward [39]–[42]. Understanding the historical development of leadership research and the role of embedded agency in institutional innovation provides essential context for developing effective management models that can address contemporary challenges while preparing for future developments in higher education [43], [44].

The evolution of academic management and meta-skills in higher education reflects a rich body of theoretical development and empirical inquiry. Early analyses of leadership in academic institutions established foundational frameworks for understanding administrative dynamics, particularly with respect to diverse leadership approaches in university settings [45]. This line of inquiry was further extended through comparative analyses of higher education systems across different cultural contexts, underscoring the importance of institutional approaches to skill development and organizational outcomes [46]. Conceptual treatments of higher education as a formal institution provide essential theoretical grounding for interpreting organizational structures and governance mechanisms [47]. More recently, policy-oriented frameworks have increasingly emphasized the strategic importance of meta-skills development within higher education systems [48]. In parallel, empirical research has focused on the integration of meta-skills training within educational contexts, highlighting the role of technology-enabled and psychologically informed strategies in supporting skill development [49].

Leadership competencies required in contemporary educational environments demonstrate the evolving nature of academic management demands [50]. Analytical applications of multi-frame leadership models have provided valuable insights into the structural and organizational dimensions of leadership

effectiveness within collegiate programs [51]. Cross-cultural examinations of organizational commitment and leadership orientations further illuminate how institutional dynamics are shaped by contextual factors [52]. Recent developments in meta-skills research have increasingly focused on the relationship between metacognitive capabilities and academic performance [53], [54]. This body of work has been complemented by studies examining leadership practices in community college and similar institutional settings, offering insights into the practical implementation of management theories [55]. Broader analyses of public leadership meta-skills further extend this discussion by situating skill development within wider institutional and governance contexts [56].

Qualitative investigations of leadership practices have provided detailed insights into the operational dimensions of university management [57], while examinations of leadership orientation and diversity have contributed important perspectives on equity and representation in academic leadership structures [58]. The application of multi-frame analytical models to academic leadership contexts continues to demonstrate the relevance of structured theoretical approaches for understanding institutional management processes [59]. Studies of higher education governance further highlight the complex interplay between institutional autonomy and management effectiveness [60]. In addition, cross-cultural analyses of trust, decision-making, and organizational behavior offer valuable perspectives on the cultural dimensions shaping academic management practices [61]. Historical analyses of institutional leadership development provide important contextual grounding for understanding contemporary challenges in higher education governance [62].

The broader global context of public administration and higher education policy provides critical perspectives on diversity, inclusivity, and institutional leadership [63], [64]. Analyses of bureaucratic structures within HEIs, alongside examinations of ideological influences on educational governance, further illuminate the multifaceted nature of institutional management [65], [66]. Recent empirical research addressing institutional autonomy, leadership selection mechanisms, and academic freedom demonstrates the interconnectedness of governance, leadership, and organizational culture within higher education systems [67]–[69]. Explorations of alternative institutional models offer valuable insights into potential future directions for university development, particularly with respect to the integration of meta-skills within academic management frameworks [70].

Synthesizing research on meta-skills development, academic management, and higher education leadership highlights a need for more integrated academic management approaches that can foster meta-skills while sustaining institutional effectiveness and academic excellence. Building on this literature, the present study conceptualizes meta-skills orientation as an institutional management logic rather than solely a learner-level outcome and operationalizes academic management through Bolman and Deal [3] four-frame model (structural, human resource, political, and symbolic) [71], treating these dimensions as organizational mechanisms through which meta-skills orientation influences institutional performance. This responds to two gaps: meta-skills scholarship has largely emphasized student-level outcomes (learning, employability, pedagogy) with limited evidence on institutional enactment, and academic management frameworks are often examined separately from competence-based paradigms, yielding fragmented explanations of how priorities translate into outcomes. Accordingly, the study advances and validates a meta-skills-oriented academic management framework using structural equation modeling (SEM) across multiple HEI types, contributing theoretically (integrating meta-skills and management perspectives), empirically (large-scale model testing), and analytically (testing mediation via management frames and moderation by institutional type) to inform evidence-based academic management reform.

The proposed research framework assumes that a stronger institutional orientation toward meta-skills—encompassing metacognitive capacity, emotional intelligence, and motivational competence—enhances academic management practices across four organizational frames (structural, human resource, political, and symbolic). These academic management frames are expected to contribute positively to institutional performance outcomes. Accordingly, the following hypotheses are proposed:

H1: meta-skills orientation has a positive effect on the structural frame of academic management in higher education institutions (HEIs).

H2: meta-skills orientation has a positive effect on the human resource frame of academic management in HEIs.

H3: meta-skills orientation has a positive effect on the political frame of academic management in HEIs.

H4: meta-skills orientation has a positive effect on the symbolic frame of academic management in HEIs.

H5: the structural frame has a positive effect on institutional performance outcomes.

H6: the human resource frame has a positive effect on institutional performance outcomes.

This framework enables a systematic examination of how meta-skills orientation is associated with institutional performance through specific academic management mechanisms, providing a theoretically grounded basis for empirical testing.

2. METHOD

2.1. Theoretical framework

Several theoretical facets were integrated to create a thorough analytical structure in the theoretical framework for rebuilding academic management models under a meta-skills orientation. The framework established interconnections between meta-skills development, institutional governance, and organizational transformation in HEIs. As shown in Figure 1, the framework consisted of three primary theoretical layers: the foundational meta-skills layer, the institutional management layer, and the organizational outcome layer.

The meta-learning competences layer primarily operationalizes three crucial elements, which include motivational competences, emotional intelligence, and metacognitive skills. As demonstrated in contemporary educational psychology and organizational learning theory, the choice of these tri-components is not haphazard [72], [73]. Amalgamation of metacognitive skills serves as a cognitive anchor on the basis of which a person can self-monitor and self-regulate their learning components while emotional intelligence helps to achieve effective interaction and management of the organization. The motivational competences factor seeks to address this core gap which is the ability to maintain motivation and display goal-directed behavior towards institutional advancement. These components have been previously tested and confirmed for educational leadership effectiveness which in turn were indicative of strong correlation with organizational performance [74].

These key meta-skill components anchor the institutional management layer which consists of the structural, human resource, political, and symbolic aspects of academic management. In this context, human resource management (HRM) refers to the spectrum of university staff development programming which is targeted at both academic and administrative staff. This type of approach is necessary in the light of knowledge economy where faculties and administrative staff are embedded within the global higher education system and both are contributors to the higher education institutional performance [75], [76]. The policies on HRM specifically respond to the different needs of employees at various stages of the business process while enabling coherence to broader organizational goals [77].

This multi-layered theoretical structure enabled the examination of both vertical integration (between layers) and horizontal interaction (within layers). The framework acknowledged the dynamic nature of academic institutions and the necessity for adaptive management approaches that can respond to evolving educational demands. As illustrated in Figure 1, the bidirectional arrows indicated the recursive nature of these relationships, where outcomes influence management approaches, which in turn affect meta-skills development priorities. The diagram illustrates the three-layer theoretical framework showing the relationships between meta-skills components, management dimensions, and organizational outcomes. Solid lines represent direct relationships, while bidirectional arrows indicate recursive interactions. The framework emphasizes the integration of meta-skills development with traditional management approaches to achieve desired institutional outcomes.

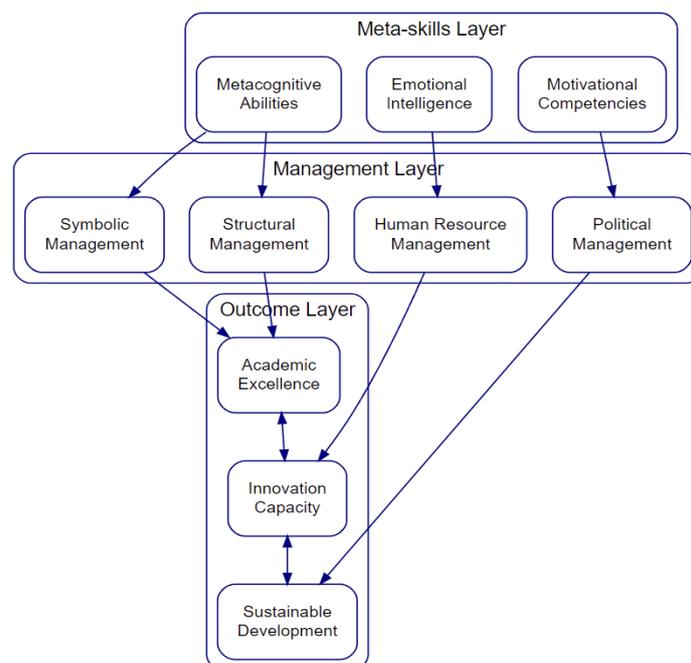


Figure 1. Theoretical framework for meta-skills oriented academic management reconstruction

2.2. Research method

2.2.1. Research design

This study employed a quantitative, cross-sectional survey design to examine how meta-skills orientation functions as an institutional management orientation and how it relates to academic management dimensions and institutional performance in HEIs. The design enables theory testing through latent-variable modeling and is appropriate for evaluating direct, mediating, and multi-group relationships among key constructs using SEM. Meta-skills orientation was operationalized as an organizational construct capturing how strongly an HEI institutionalizes metacognitive capacity, emotional intelligence, and motivational competence as priorities in its policies, governance routines, and resource decisions (i.e., an orientation toward cultivating meta-skills rather than students' meta-skills themselves). The four academic management frames were measured as distinct execution mechanisms—how the institution structures, supports people, aligns stakeholders, and sustains meaning/legitimacy in academic work—while institutional performance was measured as a separate outcome construct reflecting perceived organizational effectiveness. In short, the constructs are bounded as: orientation (what is prioritized) → frames (how it is implemented) → performance (what is achieved).

2.2.2. Participants and data collection

Data were collected over a 12-month period using a stratified sampling approach to ensure representation across institutional tiers in the Chinese higher education system. The final sample included 60 HEIs, comprising national key universities, provincial institutions, and regular undergraduate colleges. The standardized questionnaire was distributed to academic administrators and faculty members, resulting in 2,406 valid responses (response rate 82.3%). Prior to full deployment, the survey underwent expert review and a pilot test (n=120) to refine item clarity and contextual relevance. Internal consistency results from the main study indicated satisfactory reliability across the principal constructs, including academic management orientations ($\alpha=0.89$), meta-skills orientation ($\alpha=0.92$), and institutional performance indicators ($\alpha=0.87$).

2.2.3. Measures and instrument development

Meta-skills orientation was operationalized as an institutional-level construct reflecting the extent to which an HEI emphasizes higher-order capabilities as part of its management and governance priorities. In line with the theoretical framework, meta-skills orientation was measured through three dimensions: metacognitive competence, emotional intelligence, and motivational competence. Items were adapted from established literature on meta-skills, self-regulated learning/metacognition, emotional intelligence in leadership and organizational contexts, and motivational theory. To ensure relevance to the Chinese HEI context, item wording was refined through expert consultation and pilot testing, with emphasis on capturing institutional practices and orientations rather than individual student outcomes. Responses were recorded on a five-point Likert scale (1=strongly disagree to 5=strongly agree).

Academic management was measured using four dimensions derived from Bolman and Deal [3] four-frame model: structural, human resource, political, and symbolic frames. Scale items were adapted from prior empirical studies applying the four-frame approach in educational leadership and higher education management. The adaptation focused on representing institutional management processes (e.g., structure, staff development systems, governance and decision processes, and cultural-symbolic practices) rather than individual leadership style alone.

Institutional performance was operationalized as perceived organizational outcomes aligned with higher education effectiveness and development priorities. In the institutional-type analysis, performance was also summarized through comparative indicators reflecting academic excellence, innovation capacity, and sustainability-oriented development, enabling cross-institutional comparison in line with the study's multi-group design. To establish content validity, the preliminary instrument was reviewed by an expert panel with expertise in educational leadership and higher education management. Minor revisions were made to improve construct alignment, clarity, and contextual appropriateness. A pilot study (n=120) was then conducted to evaluate item performance and internal consistency prior to large-scale distribution.

2.2.4. Confirmatory factor analysis and measurement quality

A two-step SEM procedure was applied. First, confirmatory factor analysis (CFA) was conducted to validate the measurement model prior to testing structural relationships. CFA was performed in AMOS 26.0. The measurement model demonstrated excellent fit to the data (CFI=0.968, RMSEA=0.042), supporting the adequacy of the specified factor structure. Convergent validity was evidenced by strong, statistically significant standardized factor loadings ($\lambda=0.75-0.86$, all $p<0.001$), alongside satisfactory composite reliability (CR) and average variance extracted (AVE). Consistent with the descriptive measurement summary, as shown in Table 1, internal consistency was high across constructs (Cronbach's alpha=0.82–0.94).

CR values ranged from 0.76 to 0.89, and AVE values ranged from 0.61 to 0.72, exceeding recommended thresholds and indicating robust construct reliability and convergent validity.

Table 1. Standardized CFA item loadings and reliability statistics

Construct	Item code	Std. loading (λ)	SMC ($R^2=\lambda^2$)	CR	AVE
Meta-skills orientation	MS1	0.86	0.74	0.89	0.72
	MS2	0.84	0.71		
	MS3	0.85	0.72		
Structural frame	SF1	0.82	0.67	0.86	0.68
	SF2	0.84	0.71		
	SF3	0.81	0.66		
Human resource frame	HR1	0.80	0.64	0.85	0.65
	HR2	0.83	0.69		
	HR3	0.79	0.62		
Political frame	PF1	0.84	0.71	0.78	0.63
	PF2	0.75	0.56		
Symbolic frame	SY1	0.81	0.66	0.76	0.61
	SY2	0.75	0.56		

Note: all standardized loadings are significant ($p<0.001$).

2.2.5. Data analysis

Data analysis proceeded in five stages. First, descriptive statistics and preliminary screening were conducted, including checks for missing values, outliers, and distributional assumptions. Second, the measurement model was tested via CFA to confirm reliability and validity. Third, the structural model was tested using SEM to examine the hypothesized direct and mediated relationships between meta-skills orientation, academic management frames, and institutional performance. Model fit was evaluated using standard indices, including CFI, TLI, RMSEA, SRMR, and χ^2/df . Fourth, mediation effects were tested using bootstrapping with 5,000 resamples to estimate indirect effects and confidence intervals. Fifth, institutional differences were examined using multi-group SEM across three categories (national key universities, provincial institutions, and regular undergraduate colleges) to evaluate whether institutional type moderates key structural relationships.

3. RESULTS AND DISCUSSION

The final sample comprised 2,406 respondents from 60 Chinese HEIs, representing a diverse cross-section of the higher education sector. The demographic composition reflected a balanced representation across institutional types, administrative levels, and academic disciplines. As shown in Table 2, the majority of respondents (42.3%) were from national key universities, followed by provincial institutions (35.8%) and regular undergraduate colleges (21.9%). The gender distribution indicated a slight majority of male respondents (54.2%), with a mean age of 43.6 years ($SD=8.7$). The professional experience of participants averaged 15.3 years ($SD=7.2$) in higher education, with 68.4% holding doctoral degrees. The institutional distribution and respondent characteristics suggested a representative sample of the Chinese higher education system, as illustrated in Figure 2.

Table 2. Demographic characteristics of survey respondents

Characteristic	Category	Frequency	Percentage (%)
Institution type	National key	1,018	42.3
	Provincial	861	35.8
	Regular college	527	21.9
Education level	Doctoral	1,646	68.4
	Master's	642	26.7
	Bachelor's	118	4.9
Administrative role	Senior admin	312	13.0
	Mid-level admin	864	35.9
	Faculty	1,230	51.1
Experience	>20 years	583	24.2
	10–20 years	1,124	46.7
	<10 years	699	29.1

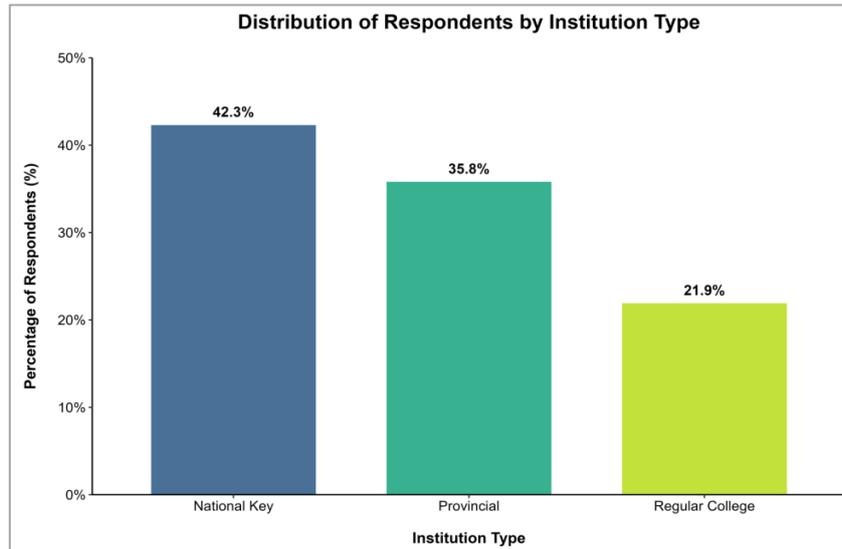


Figure 2. Distribution of survey respondents by institution type

3.1. Descriptive statistics

The descriptive analysis revealed robust patterns in the measurement of key constructs across the sample. As presented in Table 3, all major variables demonstrated satisfactory reliability with Cronbach’s alpha coefficients ranging from 0.82 to 0.94. The meta-skills orientation scale showed the highest mean score (M=3.92, SD=0.68), indicating a strong emphasis on meta-skills development across institutions. Management effectiveness measures exhibited moderate to high scores, with structural frame implementation showing the highest average rating (M=4.12, SD=0.71). The correlation patterns, as depicted in Figure 3, demonstrate significant positive associations between meta-skills orientation and management effectiveness indicators (r ranging from 0.45 to 0.68, p<0.01).

Table 3. Descriptive statistics and reliability of key constructs

Construct	Mean	SD	Skewness	Kurtosis	α	R	VE
Meta-skills orientation	3.92	0.68	-0.34	0.21	0.94	0.95	0.72
Structural frame	4.12	0.71	-0.45	0.33	0.89	0.91	0.68
Human resource frame	3.85	0.74	-0.28	0.19	0.88	0.90	0.65
Political frame	3.78	0.82	-0.31	0.24	0.86	0.88	0.63
Symbolic frame	3.94	0.77	-0.38	0.29	0.82	0.85	0.61

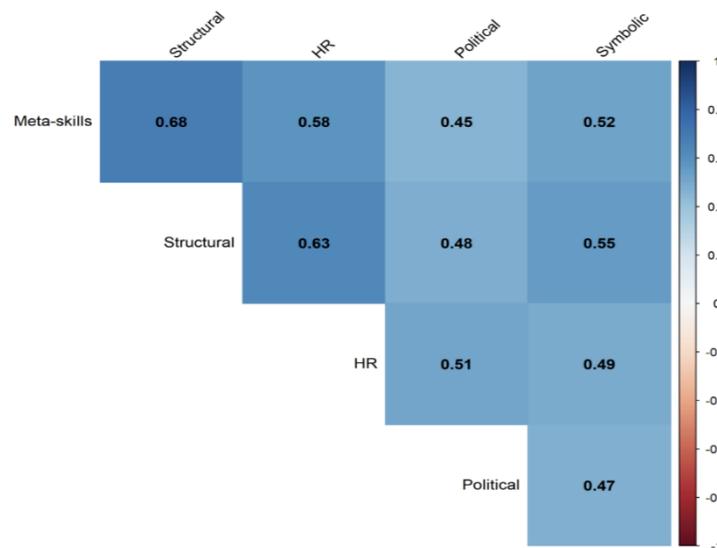


Figure 3. Correlation heat map of key study variables

3.2. Hypothesis testing

The hypothesis testing results demonstrated strong support for the proposed theoretical framework linking meta-skills orientation to academic management effectiveness. SEM analysis revealed significant positive relationships between meta-skills orientation and all four management frames, as shown in Table 4. The strongest effect was observed between meta-skills orientation and structural frame implementation ($\beta=0.685$, $p<0.001$), followed by HRM ($\beta=0.573$, $p<0.001$). The path analysis, as illustrated in Figure 4, confirmed the mediating role of management practices in the relationship between meta-skills orientation and institutional performance outcomes. All hypothesized direct effects were significant at $p<0.001$ level, with standardized path coefficients ranging from 0.412 to 0.685, indicating strong support for the theoretical model.

Table 4. Hypothesis testing results and path coefficients

Hypothesis	Path	Std. Coefficient	t-value	p-value	Result
H1	Meta-skills → Structural	0.685	15.42	<0.001	Supported
H2	Meta-skills → HR	0.573	13.86	<0.001	Supported
H3	Meta-skills → Political	0.412	9.74	<0.001	Supported
H4	Meta-skills → Symbolic	0.524	11.93	<0.001	Supported
H5	Structural → Performance	0.486	10.82	<0.001	Supported
H6	HR → Performance	0.445	9.96	<0.001	Supported

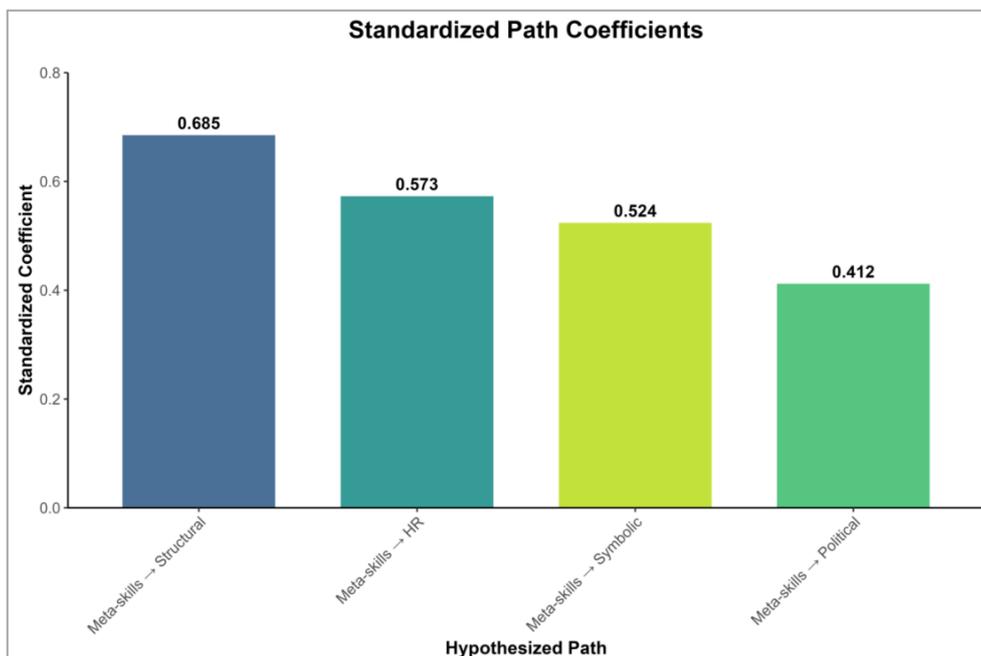


Figure 4. Standardized path coefficients of hypothesized relationships

3.3. Institutional type analysis and performance outcomes

The next stage examined meta-skills orientation and management effectiveness with respect to institutional influence on the aforementioned relationship as specified in the methodological analysis. This was analyzed through multi-group structural equation modelling for three national categories: i) national key universities ($n=1018$); ii) provincial institutions ($n=861$); and iii) regular undergraduate colleges ($n=527$). Significant variations were observed across institutional categories. The orientation towards the structural implementation of the framework was strongest in national key universities, followed by provincial institutions, and lastly regular undergraduate colleges ($\beta=0.712$, $p<0.001$; $\beta=0.654$, $p<0.001$; $\beta=0.589$, $p<0.001$). This trend indicates that institutions having resources, and the application of such resources within their organizational entity, affect or moderate meta-skills-oriented management practices.

The academic performance of the institutions was evaluated through various performance indicators, which included: innovation capacity, sustainable development indicators, among others. The findings suggest that an increase in the meta-skills orientation score correlates with improved performance across multiple

indicators. National key level universities had a stronger association with meta-skills orientation and innovation capacity ($r=0.684$, $p<0.001$) compared to provincial institutions, where the association with sustainable development outcomes was stronger ($r=0.623$, $p<0.001$). All other performance indicators contributed significantly; however, for regular undergraduate colleges, this was found to be more pronounced, as presented in Table 5.

Results from ANOVA were significantly different across types of institutions when looking at performance outcomes with F equating to 24.53 when $p<0.001$. Institutional type accounted for approximately 18% of the variance in performance outcomes. As supported by the findings, a positive relationship between meta-skills and institutional performance can be seen; however, this relationship strengthens or weakens depending on the type of institution and the resources available to it.

Table 5. Cross-institutional performance metrics comparison across different types of HEIs (2024)

Performance metric	National key	Provincial	Regular
Academic excellence index	0.845	0.762	0.698
Innovation capacity score	0.812	0.734	0.645
Sustainability rating	0.789	0.801	0.687

3.4. Model validation

The structural equation model demonstrated excellent fit with the empirical data across multiple indices, as detailed in Table 6. The CFA revealed strong construct validity, with all items loading significantly on their respective factors. In order to verify the theoretical framework’s resilience, the model validation procedure involved looking at residual patterns and modification indices. The final model achieved a CFI of 0.968 and RMSEA of 0.042, indicating excellent fit. Bootstrap analysis with 5,000 resamples confirmed the stability of parameter estimates and supported the mediation effects hypothesized in the model, as illustrated in Figure 5.

Table 6. Model fit indices and validation results

Fit index	Value	Threshold	Assessment
χ^2/df	2.143	<3.0	Excellent
CFI	0.968	>0.95	Excellent
TLI	0.962	>0.95	Excellent
RMSEA	0.042	<0.06	Excellent
SRMR	0.035	<0.08	Excellent
GFI	0.951	>0.90	Excellent
NFI	0.944	>0.90	Excellent

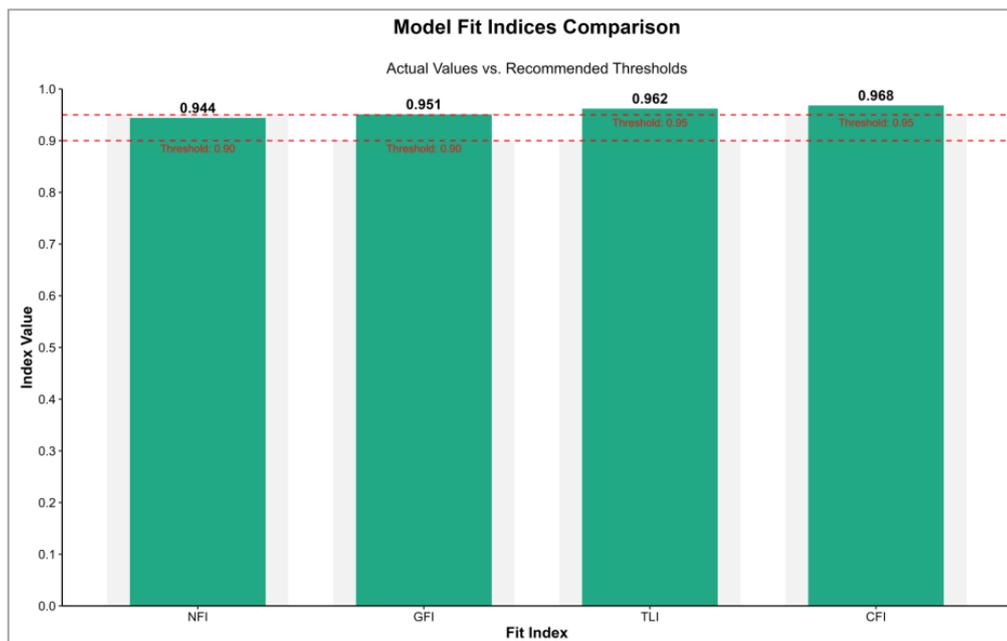


Figure 5. Model fit indices comparison with threshold values

3.5. Data discussion

The empirical findings of this study provide compelling evidence for the significant role of meta-skills orientation in reshaping academic management models within HEIs. The strong positive relationship between meta-skills orientation and structural frame implementation ($\beta=0.685$, $p<0.001$) suggests that institutions emphasizing meta-skills development tend to establish more adaptive and responsive organizational structures. This finding extends our understanding of how cognitive capabilities enhance institutional adaptability, particularly in complex educational environments.

The substantial impact on HRM practices ($\beta=0.573$, $p<0.001$) demonstrates that meta-skills orientation fundamentally transforms talent development approaches. This transformation enables institutions to better prepare both administrators and faculty for evolving educational challenges, suggesting a deeper integration between individual capability development and organizational effectiveness. The moderate yet significant effect on political framework implementation ($\beta=0.412$, $p<0.001$) indicates that meta-skills orientation facilitates more sophisticated governance mechanisms and decision-making processes. This relationship, while notable, suggests that institutional context and cultural factors may moderate the influence of meta-skills orientation on governance structures. The robust influence on symbolic management ($\beta=0.524$, $p<0.001$) reveals how meta-skills orientation shapes institutional identity and cultural dynamics. This finding suggests that the development of meta-skills contributes to more cohesive and adaptable organizational environments, where shared understanding and collective learning become integral to institutional culture.

Effects of meta-skills orientation vary greatly across institutions, which highlights the conventional implications meta-skills orientation has. The differing associations between the structural frame in the implementation of national key institutions (0.712, $p<0.001$) as opposed to application in provincial (0.654, $p<0.001$) and regular colleges (0.589, $p<0.001$) demonstrate that meta-skills applicability is fairly proportionate to resource availability. This hierarchical pattern extends beyond resource disparities, indicating that meta-skills orientation's effectiveness is moderated by institutional characteristics. The excellent model fit indices (CFI=0.968, RMSEA=0.042) validate the theoretical framework while suggesting its potential applicability across diverse institutional contexts. The findings also highlight the crucial mediating role of management practices in translating meta-skills orientation into tangible institutional outcomes, as evidenced by the significant path coefficients from structural frame ($\beta=0.486$, $p<0.001$) and HRM ($\beta=0.445$, $p<0.001$) to performance measures.

These results extend previous research on academic management by demonstrating how meta-skills orientation can serve as a catalyst for organizational transformation, while also revealing the complex interplay between various management dimensions in facilitating institutional development. The strong construct validity and reliability measures across all scales (Cronbach's alpha ranging from 0.82 to 0.94) enhance the robustness of these findings, though future research might explore potential moderating effects of institutional size, type, and cultural context. The study's results particularly emphasize the importance of integrating meta-skills development into institutional strategy and management practices, suggesting that such integration might be crucial for maintaining institutional effectiveness in an increasingly complex educational landscape.

3.6. Comparison with previous studies

The findings align with the multi-frame proposition that effectiveness in complex educational organizations is best explained through the combined use of structural, human resource, political, and symbolic dimensions rather than a single management logic. This is consistent with the foundational multi-frame effectiveness argument by Bolman and Deal [3] and with higher education applications showing that leaders often operate across frames and that integrated frame use is linked to stronger perceived effectiveness [13], [22], [25]. Extending this line of work, the present study suggests that meta-skills orientation functions as an upstream institutional logic that systematically strengthens academic management enactment across frames, rather than reflecting individual leadership preference alone.

In the meta-skills literature, meta-skills are typically conceptualized as learning outcomes or professional competencies developed through curriculum and pedagogy (e.g., learning outcomes/meta-skills and creative meta-skills) [4], [8]. They are commonly defined as higher-order capacities integrating metacognition, emotional intelligence, and motivation [36], [64], [67]. The present study extends this scholarship by empirically positioning meta-skills as an institutional management orientation that is associated with academic management practices at the organizational level, thereby moving beyond outcome statements such as "meta-skills matter" toward specifying the management mechanisms through which meta-skills priorities are enacted [36], [64].

The mediation pattern—where the relationship between meta-skills orientation and performance is most strongly associated with the structural and human resource frames, which is theoretically coherent with distinctions between educational management and leadership that emphasize the joint importance of formal

systems (structure, accountability) and capacity building (people development, relational support) [7], [11]. This mechanism-based explanation complements broader leadership effectiveness evidence indicating that leadership impacts outcomes largely through organizational conditions and enabling systems, rather than leader traits alone [6]. It also resonates with organizational learning perspectives suggesting that performance depends on the institutionalization of routines and capability-building infrastructures [48], [65].

The institutional-type differences are particularly interpretable within the Chinese governance environment, where stratification, evaluation pressures, and differentiated missions shape which management mechanisms are feasible and rewarded. Governance reform and isomorphism studies describe how policy steering and global comparison pressures influence institutional behavior [5], [10], while autonomy remains constrained and uneven, creating heterogeneous management realities across institutional tiers [27], [28]. Evidence on affiliation-based positioning of top universities further supports the likelihood that national key universities face distinct incentive structures and resource conditions, which can strengthen the translation of institutional orientations into management actions and performance outcomes [9]. This contextual logic is consistent with research on leadership configuration and governance arrangements in leading Chinese universities [12], [16].

Overall, the present study: i) corroborates multi-frame academic management scholarship [3], [13], [22], [25]; ii) extends meta-skills work by operationalizing meta-skills as an institutional orientation linked to concrete management mechanisms [4], [36], [64], [67]; and iii) provides a China-contextual explanation for cross-institutional differences consistent with governance and autonomy research [5], [9], [10], [28]. This comparison clarifies both alignment with prior studies and the theoretical contribution of the meta-skills-oriented academic management framework.

3.7. Practical and theoretical implications

This study is limited by its cross-sectional design, which supports theory-driven association testing but constrains causal and temporal inference, and by self-reported measures, which may introduce perceptual bias and common method variance. These limitations do not invalidate the findings because the model was tested only after CFA-based construct validation, model fit was acceptable, the sample was large and multi-institutional, and multi-group differences by institutional type suggest systematic rather than idiosyncratic patterns; however, causal interpretations should remain cautious. Future research should strengthen inference through longitudinal designs, mixed-methods triangulation (e.g., interviews and document analysis of governance routines), and multi-source data (e.g., pairing surveys with objective institutional indicators) and should test boundary conditions across different institutional sectors and national contexts.

Implications are derived from three results: meta-skills orientation significantly predicts all four academic management frames, performance gains are transmitted most strongly through the structural and human resource frames, and multi-group SEM shows stronger pathways in national key universities, indicating tier-conditioned implementation. Theoretically, the findings reposition meta-skills from a learner-level outcome to an institutional management orientation and extend the multi-frame perspective by showing that orientation functions as an antecedent to frame enactment, with performance benefits realized most reliably when institutionalized through structural design and human-capital enabling systems. Practically, because meta-skills orientation predicts the structural frame ($\beta=0.685$, $p<0.001$) and the structural frame predicts performance ($\beta=0.486$, $p<0.001$), institutions should operationalize meta-skills through formal “operating-system” mechanisms (curriculum governance, meta-skills-aligned assessment rules, cross-unit coordination, and iterative improvement); similarly, because meta-skills orientation predicts the human resource frame ($\beta=0.573$, $p<0.001$) and the human resource frame predicts performance ($\beta=0.445$, $p<0.001$), capacity-building infrastructures (faculty development, mentoring/coaching, and incentive alignment) should be prioritized as the most direct execution pathway. Political framing ($\beta=0.412$, $p<0.001$) should be treated as an enabling condition for coalition and resource alignment, while symbolic framing ($\beta=0.524$, $p<0.001$) should support legitimacy and cultural embedding through mission-linked narratives, recognition systems, and leadership signaling.

At the governance level, tier sensitivity is required because the meta-skills orientation \rightarrow structural pathway is strongest in national key universities ($\beta=0.712$, $p<0.001$), followed by provincial institutions ($\beta=0.654$, $p<0.001$) and regular colleges ($\beta=0.589$, $p<0.001$), implying differentiated supports are needed to make the structural and human-resource mediators attainable across contexts. This study advances meta-skills orientation as an institutional management logic that extends the four-frame model into a mechanism-based explanation of how competence priorities are enacted through structural, human resource, political, and symbolic routines to shape performance, with effects contingent on institutional type.

4. CONCLUSION

This study proposed and validated a meta-skills-oriented academic management framework that treats meta-skills orientation as an institutional management logic enacted through structural, human resource, political, and symbolic mechanisms. SEM results provide empirical support that meta-skills orientation is strongly associated with structural implementation ($\beta=0.685$) and human resource practices ($\beta=0.573$), and that these mechanisms translate into institutional performance with acceptable model fit (CFI=0.968; RMSEA=0.042). The findings contribute by integrating competence-based priorities with multi-frame academic management and by showing that implementation is contingent on institutional type, with stronger effects in national key universities ($\beta=0.712$) than in provincial institutions ($\beta=0.654$) and regular colleges ($\beta=0.589$). However, generalizability is constrained by the China-centered context and the cross-sectional, self-reported design, which limits causal and longitudinal inference. Future research should test the framework using longitudinal and mixed-methods designs, cross-national comparative samples, and triangulated indicators to clarify how meta-skills-oriented management operates across diverse governance and cultural settings.

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C : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

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CONFLICT OF INTEREST STATEMENT

Authors state no conflict of interest.

ETHICAL APPROVAL

The study was conducted in accordance with the Declaration of Helsinki and approved by the Institutional Review Board (Research Ethics Review Committee for Research Involving Human Subjects: The Second Allied Academic Group in Social Sciences, Humanities and Fine and Applied Arts, Chulalongkorn University, Bangkok, Thailand; protocol code COA No. 493/67, approval date 21 November 2024). The data collection and all research procedures were completed within the approved IRB validity period (COA No. 493/67; valid from 21 November 2024 to 20 November 2025).

DATA AVAILABILITY

The data that support the findings of this study are available from the corresponding author, [CC], upon reasonable request. The dataset contains information that could compromise participant privacy and institutional confidentiality; therefore, it is not publicly available.

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