

Transformational Leadership and AI Integration in Higher Education Institutions: Evidence from Guangdong Province

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Abstract

The rapid integration of Artificial Intelligence (AI) in higher education institutions (HEIs) has transformed teaching, learning, and administrative processes, requiring leadership approaches that support innovation and organizational change. Transformational leadership, characterized by vision, inspiration, intellectual stimulation, and individualized consideration, has been identified as a critical driver of successful technological adoption. This study investigates the role of transformational leadership in facilitating AI integration in higher education institutions in Guangdong Province, China. Employing a mixed-methods case study approach, quantitative data were collected through structured questionnaires administered to academic and administrative staff, while qualitative insights were obtained from semi-structured interviews with institutional leaders. The findings indicate that transformational leadership significantly influences the effectiveness of AI integration by fostering a supportive organizational culture, enhancing staff readiness, and encouraging collaborative innovation. However, challenges such as disparities in AI competencies, resistance to change, and ethical concerns related to data governance continue to affect implementation outcomes. This study contributes to the literature on leadership and digital transformation in higher education by providing empirical evidence from a regional context. The findings offer practical implications for higher education leaders and policymakers seeking to promote effective AI integration through transformational leadership practices.

Keywords: AI integration, Artificial Intelligence, Guangdong Province, Higher Education Institutions, Transformational Leadership

Introduction

The 21st century has witnessed unprecedented advancements in Artificial Intelligence (AI), which has reshaped industries and societal systems globally, with higher education being no exception (Bass & Riggio, 2006; Northouse, 2021). AI technologies have transcended experimental applications to become integral to core functions of HEIs, including teaching and learning innovation, learning analytics, administrative streamlining, and research management (Zhang & Li, 2023). In China, national strategies such as the New Generation Artificial Intelligence Development Plan have positioned HEIs as key actors in digital educational transformation, and Guangdong Province—an economic and technological pioneer in southern China—has made substantial investments in AI infrastructure and educational digitalization, emerging as a leading

region for AI integration in higher education (Guangdong Provincial Department of Education, 2024).

Leadership is widely recognized as a cornerstone of successful organizational change and technological adoption in higher education (Leithwood *et al.*, 2020; Hallinger, 2022). As AI integration requires fundamental shifts in institutional practices, cultures, and competencies, traditional transactional leadership models—centered on reward and punishment mechanisms—have proven insufficient (Burns, 1978; Bass, 1985). In contrast, transformational leadership, which emphasizes vision-building, inspiration, and collective growth, has been identified as a critical framework for guiding HEIs through AI adoption challenges (Avolio & Bass, 2004; Jones *et al.*, 2023). Despite growing attention to AI in higher education, the interplay between transformational leadership and effective AI integration remains underexplored, particularly in Chinese HEIs where institutional structures and cultural contexts differ significantly from Western counterparts.

Theoretically, this study extends transformational leadership theory—originally developed in Western contexts—to China’s AI-driven higher education landscape, providing empirical evidence to validate the theory in a non-Western setting. It also bridges the gap between educational leadership and AI integration research, shifting focus from technology to human and organizational factors.

Practically, the findings offer actionable guidance for HEI leaders, policymakers, and educational developers in China and emerging economies. Recommendations can inform leadership development programs and institutional/regional policies for sustainable AI integration. For Guangdong, the study provides insights to leverage existing investments and policy support, solidifying its position as a national hub for educational digitalization.

While numerous HEIs in China and globally have invested heavily in AI technologies, many struggle to translate these investments into sustainable and effective integration (Selwyn, 2021; Williamson, 2022). A primary barrier is the lack of leadership readiness and a clear strategic vision for digital transformation (Baxter & Ankrah, 2020; Li & Wang, 2024). Many HEI leaders lack necessary AI and digital competencies, and institutional AI strategies are often ad hoc rather than embedded in long-term planning. Additionally, resistance to change among staff, compounded by uneven AI literacy, undermines AI adoption (Fullan, 2020; Parry & Winston, 2021). Ethical concerns, including data privacy, algorithmic bias, and inadequate AI governance, further complicate integration efforts (Floridi *et al.*, 2018; OECD, 2021).

Notably, there is a paucity of empirical research examining transformational leadership’s role in AI integration within Chinese higher education (Han & Zhang, 2023; Zhao *et al.*, 2024). Most existing studies focus on Western settings, and research on AI in Chinese HEIs often centers on technological implementation rather than human and organizational factors like leadership. Guangdong Province, with its strong policy support, technological innovation, and institutional diversity, provides a valuable context to address this gap and generate context-specific evidence.

Review of Related Literature

Transformational Leadership Theory

Transformational leadership was first conceptualized by Burns (1978) in *Leadership*, distinguishing between transactional and transformational styles. Transactional leadership relies on an exchange relationship, with leaders providing rewards or sanctions based on follower performance (Bass, 1985). In contrast, transformational leadership inspires followers to transcend self-interests, embrace shared vision, and strive for collective improvement (Burns, 1978; Avolio & Bass, 2004). Bass (1985) refined the theory by identifying four core dimensions—the Four I’s—which form the foundation of empirical research:

Idealized Influence: Leaders act as role models with high ethical standards, credibility, and commitment, fostering trust and admiration among followers (Northouse, 2021).

Inspirational Motivation: Leaders articulate a clear, compelling vision and use motivational language to foster optimism and commitment (Bass & Riggio, 2006).

Intellectual Stimulation: Leaders encourage creativity and critical thinking by challenging assumptions and supporting new problem-solving approaches (Leithwood *et al.*, 2020).

Individualized Consideration: Leaders recognize individual needs and provide personalized support, coaching, and mentorship (Hallinger, 2022).

Subsequent research has validated the Four I’s framework across educational contexts, linking transformational leadership to improved teacher motivation, organizational culture, and student outcomes (Day *et al.*, 2016; Leithwood *et al.*, 2020). In digital transformation, it has emerged as a key driver of technological adoption, addressing both technical and human dimensions of change (Bersin, 2019; Jones *et al.*, 2023).

AI Integration in Higher Education

AI integration in HEIs refers to embedding AI technologies into core processes: teaching and learning, administration, research management, and student support (Siemens & Baker, 2012; Dede, 2018). AI tools include adaptive learning systems, learning analytics dashboards, intelligent tutoring systems, automated workflows, and AI-driven research tools (OECD, 2021; Selwyn, 2021). Core goals include enhancing teaching quality, improving administrative efficiency, enabling data-driven decision-making, and supporting innovative research (Williamson, 2022; Floridi *et al.*, 2018).

Research identifies technological factors (infrastructure, access, technical support) as essential for basic adoption (Bates, 2021; Han, 2023), but human and organizational factors—staff AI literacy, culture, leadership, strategy—are primary determinants of sustainable integration (Selwyn, 2021; Zhang & Liu, 2024). Without supportive culture, effective leadership, and clear strategy, even advanced AI fails to deliver meaningful outcomes (Williamson, 2022; Baxter & Ankrah, 2020).

In Chinese higher education, AI integration is driven by strong national and regional policy support (Ministry of Education of China, 2023; Guangdong Provincial Government, 2024). The Ministry of Education has prioritized AI for educational digitalization, funding research and upgrading infrastructure. Guangdong has aligned regional policy with national strategy, investing heavily in AI in HEIs. Despite this, many HEIs face challenges: uneven AI literacy, resistance to change, and lack of context-specific strategies (Wang *et al.*, 2023; Yang, 2024).

The Intersection of Transformational Leadership and AI Integration

The intersection of transformational leadership and AI integration is a nascent research area, with most studies focusing on Western contexts (Jones et al., 2023; Parry & Winston, 2021). These studies confirm transformational leadership as a critical enabler of AI integration, addressing human and organizational barriers (Baxter & Ankrah, 2020; Bersin, 2019). Transformational leaders articulate AI visions aligned with institutional goals, inspire staff to embrace AI, and build AI literacy capacity (Leithwood et al., 2020; Hallinger, 2022). They also foster innovation cultures and address ethical concerns through governance frameworks (Floridi et al., 2018; OECD, 2021).

Transformational leadership influences AI integration through direct and indirect mechanisms (Jones et al., 2023). Directly, leaders develop AI strategies, allocate resources, and set adoption expectations. Indirectly, they shape culture and staff attitudes toward technology (Baxter & Ankrah, 2020). A culture of trust and collaboration mediates the relationship between transformational leadership and AI integration success (Fullan, 2020; Parry & Winston, 2021).

Notably, empirical research on this intersection in Chinese HEIs is scarce (Li & Zhang, 2024; Wang et al., 2023). Existing Chinese studies focus on general digital transformation rather than AI, lacking context-specific evidence on transformational leadership practices. This study addresses this gap by analyzing transformational leadership and AI integration in Guangdong HEIs.

This study aims to systematically investigate the role of transformational leadership in facilitating AI integration in Guangdong HEIs. The specific objectives are:

1. To examine key transformational leadership practices in Guangdong HEIs actively implementing AI technologies.
2. To analyze how transformational leadership influences AI adoption across core institutional functions (teaching, administration, governance).
3. To identify primary challenges faced by HEI leaders in AI integration.
4. To provide evidence-based recommendations for developing effective AI-driven transformational leadership practices in Chinese HEIs.

Research Questions

To address the objectives, the following research questions guide the study:

1. What specific transformational leadership practices support AI integration in Guangdong HEIs?
2. How does transformational leadership shape AI integration effectiveness in Guangdong HEIs' core functions?
3. What key challenges do Guangdong HEI leaders face in leading AI integration, and how do these impact outcomes?

Methodology

Conceptual Framework

Based on the literature, a conceptual framework is developed (Figure 1), positing relationships between transformational leadership (independent variable, operationalized via Bass's Four I's), AI integration (mediating variable, across teaching, administration, governance), institutional effectiveness (dependent variable, measuring AI's impact on

pedagogical quality, administrative performance, etc.), and contextual moderators (organizational culture and staff readiness).

Organizational culture—characterized by collaboration and innovation—moderates the relationship, as transformational leadership thrives in cultures supporting shared vision (Fullan, 2020; Hallinger, 2022). Staff readiness—AI literacy, competencies, and attitudes—also moderates, as transformational leadership can only drive AI integration if staff have the capacity and willingness to adopt AI (Jones et al., 2023; Parry & Winston, 2021). This framework guides the study’s design and analysis.

Note: Figure 1 is a structural model depicting transformational leadership influencing institutional effectiveness via AI integration, with organizational culture and staff readiness as moderators.

Research Design

This study adopts a mixed-methods case study design (Creswell & Clark, 2017; Yin, 2018), combining quantitative and qualitative methods to explore transformational leadership and AI integration in Guangdong HEIs. The case study design is suitable for investigating complex phenomena in real-world contexts (Yin, 2018). An explanatory sequential design is used: quantitative data is collected first to identify patterns, followed by qualitative data to explain these patterns (Creswell, 2014). Findings are integrated for comprehensive interpretation.

Research Setting

The research is conducted in Guangdong Province, a national leader in technological innovation and educational digitalization. Guangdong’s diverse HEIs—top research universities, comprehensive universities, vocational colleges, and private institutions—represent China’s higher education landscape (Guangdong Provincial Department of Education, 2024). The province’s substantial AI investments and policy support make it ideal for this study.

A purposive sample of 6 HEIs is selected based on: (1) formal AI integration strategy; (2) AI implementation across at least two core functions; (3) representation of different HEI types. Selected HEIs are located in Guangzhou, Shenzhen, and Zhuhai—key technological hubs.

Participants

Two participant groups from the 6 HEIs (all with direct AI integration experience) are included:

1. Quantitative participants: 350 academic and administrative staff selected via stratified random sampling (Cohen et al., 2018), stratified by job role and institutional type. After excluding incomplete questionnaires, 322 valid responses (92% response rate) are used.
2. Qualitative participants: 20 senior leaders (presidents, vice presidents, deans, IT directors) selected via purposive sampling (Patton, 2015), ensuring insight into AI leadership decision-making.

Data Collection Methods

Quantitative Data: Structured Questionnaires

Structured questionnaires measure transformational leadership, AI integration, and institutional effectiveness. The questionnaire, adapted from validated scales and translated into Chinese (with back-translation for accuracy; Brislin, 1970), includes four sections:

1. Demographic information (age, gender, job role, AI experience).
2. Transformational leadership: Measured via the Multifactor Leadership Questionnaire (MLQ; Bass & Avolio, 1995), 20 items on a 5-point Likert scale.
3. AI integration: 15-item scale (based on Siemens & Baker, 2012; OECD, 2021), 5-point Likert scale.
4. Institutional effectiveness: 12-item scale (based on Bates, 2021; Selwyn, 2021), 5-point Likert scale.

Questionnaires are distributed online over four weeks in Spring 2025, with reminder emails sent to non-respondents.

Qualitative Data: Semi-Structured Interviews

Semi-structured interviews explore leadership practices, AI integration experiences, and challenges (Patton, 2015; Kvale & Brinkmann, 2015). An interview protocol (pilot-tested with two senior leaders) includes open-ended questions on leadership practices, AI influence, and challenges.

Interviews (45–60 minutes each) are conducted face-to-face or via video conference (March–May 2025), audio-recorded with consent, and transcribed verbatim. Field notes capture non-verbal cues.

Analysis

Quantitative Data Analysis

SPSS 28.0 (IBM, 2021) is used for analysis:

1. Descriptive statistics (mean, SD, frequency) describe sample characteristics and key variables.
2. Reliability (Cronbach's $\alpha \geq 0.7$) and validity (EFA, factor loadings ≥ 0.5) are tested (Nunnally, 1978; Hair et al., 2019).
3. Inferential statistics: Pearson correlation (bivariate relationships) and multiple regression (mediating role of AI integration; Baron & Kenny, 1986), $p < 0.05$.

Qualitative Data Analysis

Thematic analysis (Braun & Clarke, 2006) is used, supported by NVivo 12 (QSR International, 2020). Stages include: familiarization, initial coding, theme development, theme review, theme definition, and reporting. Interview excerpts are translated into English, preserving context.

Integration of Findings

Quantitative and qualitative findings are integrated at the interpretation stage (Creswell & Clark, 2017), with quantitative patterns explained by qualitative insights for a nuanced understanding.

Ethical Considerations

All procedures follow APA (2020) and BERA (2018) guidelines: informed consent, anonymity/confidentiality, voluntary participation, and secure data storage. Ethical approval is obtained from Lincoln University College's Research Ethics Committee.

Findings and Discussion

Transformational Leadership Practices in AI-Integrating HEIs

Quantitative findings show moderate to high transformational leadership levels ($M = 3.92$, $SD = 0.61$) on the 5-point MLQ scale, with all Four I's above 3.0. Idealized influence ($M = 4.05$, $SD = 0.57$) and inspirational motivation ($M = 3.98$, $SD = 0.60$) score highest; intellectual stimulation ($M = 3.80$, $SD = 0.66$) and individualized consideration ($M = 3.85$, $SD = 0.64$) score slightly lower. The MLQ scale is reliable (Cronbach's $\alpha = 0.90$).

Qualitative findings identify four key practices aligned with the Four I's:

1. Clear digital vision (Inspirational Motivation): Leaders develop AI visions aligned with national/regional strategies, communicating via staff meetings, newsletters, and workshops to enhance engagement.
2. Ethical role modeling (Idealized Influence): Leaders participate in AI training, use AI tools, and establish ethical guidelines to model commitment and responsible AI use.
3. Innovation support (Intellectual Stimulation): AI innovation funds and sharing sessions create a safe space for trial-and-error, encouraging staff to experiment with AI.
4. Personalized support (Individualized Consideration): Tailored AI training (basic for admins, advanced for academics) and one-on-one coaching address uneven literacy and resistance.

The Influence of Transformational Leadership on AI Integration Effectiveness

Quantitative Findings

Significant positive correlations are found: transformational leadership and AI integration ($r = 0.69$, $p < 0.001$), transformational leadership and institutional effectiveness ($r = 0.73$, $p < 0.001$), AI integration and institutional effectiveness ($r = 0.77$, $p < 0.001$). Multiple regression confirms AI integration mediates the relationship between transformational leadership and institutional effectiveness ($\beta = 0.51$, $p < 0.001$), accounting for 67% of the total effect ($\beta = 0.78$, $p < 0.001$).

Qualitative Findings

Transformational leadership enhances AI integration effectiveness in three key ways:

1. Teaching and learning innovation: Leaders inspire adoption of AI tools (adaptive learning, analytics), fostering personalized learning and collaborative pedagogical innovation.
2. Administrative efficiency: AI automation (enrolment, finance, HR) streamlines tasks, freeing staff for value-added work, with cross-departmental collaboration enhanced.
3. Data-driven governance: AI analytics enable evidence-based decision-making, fostering a data-informed culture aligned with institutional goals.

Transformational leadership also increases institutional innovation capacity, fostering continuous learning and adaptation.

Challenges Faced by Leaders in AI Integration

Four key challenges are identified:

1. Uneven AI literacy: Disparities exist ($M = 3.25$, $SD = 0.88$), with STEM staff having higher literacy than humanities and administrative staff.
2. Resistance to change: 33% of respondents resist AI, due to fear of job displacement, time constraints, and preference for traditional practices (senior staff most resistant).
3. Ethical concerns: Only 46% of respondents report clear AI ethical guidelines, with concerns about data privacy and algorithmic bias.
4. Limited infrastructure/training: 39% report insufficient infrastructure, 43% inadequate ongoing training, due to limited funding and human resources.

Transformational Leadership as a Core Driver of AI-Enabled Change

Findings confirm transformational leadership as a critical driver of AI integration in Guangdong HEIs, aligning with Western research (Jones et al., 2023; Baxter & Ankrah, 2020). All Four I's contribute to effectiveness, with idealized influence and inspirational motivation most prominent. This validates Bass's (1985) theory in China's AI-driven higher education, extending its reach beyond Western contexts (Hallinger & Wang, 2019; Li & Zhang, 2024).

Transformational leadership influences AI integration through technical (strategy, resource allocation) and human (culture, staff readiness) dimensions, addressing both "hardware" and "software" of digital change (Selwyn, 2021; Williamson, 2022). The mediating role of AI integration confirms that transformational leadership enables meaningful AI adoption that delivers tangible institutional outcomes.

Contextual Specificities of Transformational Leadership in Chinese HEIs

Three contextual specificities are identified:

1. Policy alignment: Leadership is closely aligned with national/regional digital strategies, providing a clear framework for AI integration (Ministry of Education of China, 2023; Guangdong Provincial Government, 2024), differing from fragmented Western policy support (Williamson, 2022).
2. Collectivist focus: Leaders frame AI integration as a collective endeavor, fostering cross-departmental collaboration, reflecting China's collectivist culture (Hofstede, 2011), unlike Western emphasis on individual autonomy (Northouse, 2021).
3. Top-down but inclusive decision-making: Leaders set the AI vision (top-down) but involve staff in implementation (inclusive), balancing hierarchical structures with collaborative transformational practices (Yang, 2024; Han, 2023).

Addressing AI Integration Challenges Through Transformational Leadership

Transformational leadership mitigates challenges by: providing personalized training for uneven literacy; communicating AI benefits and involving staff to reduce resistance; establishing ethical frameworks for data privacy; advocating for funding to address infrastructure/training gaps (Jones et al., 2023; Fullan, 2020). It also builds institutional resilience, enabling adaptation to technological change (Leithwood et al., 2020; Hallinger, 2022).

Alignment with Digital and Transformational Leadership Theories

Findings align with digital leadership theory (Bersin, 2019; Baxter & Ankrah, 2020), confirming that effective AI leadership combines transformational practices with digital competencies. They also align with educational change leadership (Fullan, 2020; Kotter, 2012), as leaders use vision, collaboration, and capacity building to drive AI integration as an organizational reform.

Theoretical Implications

1. Extends transformational leadership theory to China's AI-driven higher education, validating the Four I's framework in a non-Western context.
2. Confirms AI integration's mediating role, clarifying the mechanism linking transformational leadership to institutional effectiveness.
3. Identifies cultural adaptations of transformational leadership in Chinese HEIs, contributing to cross-cultural leadership literature.
4. Bridges the gap between educational leadership and AI integration research, emphasizing human/organizational factors.

Practical Implications

1. Develop AI-focused transformational leadership programs, combining leadership training with AI literacy.
2. Formulate strategic, participatory AI integration plans aligned with institutional and policy goals.
3. Implement targeted AI training for all staff, addressing uneven literacy.
4. Establish robust AI ethics and governance frameworks.
5. Increase investment in AI infrastructure and ongoing training support.

Recommendations

Based on findings, recommendations include:

1. Mandate AI-focused transformational leadership training for senior HEI leaders, including peer mentorship.
2. Establish AI integration committees with leader, staff, and student representation.
3. Create a regional network for HEIs to share AI best practices and resources.
4. Integrate AI literacy into mandatory staff professional development, with incentives for AI innovation.
5. Develop a provincial AI ethics framework for Guangdong HEIs.
6. Allocate dedicated, long-term funding for AI infrastructure and training.

Conclusion

This study confirms transformational leadership as a critical driver of AI integration in Guangdong HEIs, with all Four I's contributing to effectiveness. It influences AI integration through technical and human dimensions, fostering supportive cultures and staff readiness. Key challenges—uneven literacy, resistance, ethical concerns, infrastructure gaps—are mitigated by transformational leadership, which builds institutional resilience.

Contextual specificities of transformational leadership in Chinese HEIs—policy alignment, collectivist focus, inclusive top-down decision-making—highlight the need for cultural adaptation of leadership theories. The study extends transformational leadership theory, validates AI integration's mediating role, and bridges leadership and AI research gaps.

Practical recommendations provide actionable guidance for stakeholders to advance sustainable AI integration. As AI reshapes higher education, investing in transformational leadership and AI capacity building will be critical for HEIs to remain agile and effective. For Guangdong, this will solidify its position as a global hub for educational digitalization and AI innovation.

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