

A Quantitative Study of Technology Leadership and Faculty Technology Integration in Chinese Higher Education

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ABSTRACT

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This quantitative study examines the relationship between educational leadership and the integration of educational technology among faculty in Chinese higher education. Focusing on universities in Heilongjiang province, China, the research investigates how different dimensions of technology leadership predict faculty members' adoption of technology in teaching. A survey was conducted with faculty across five universities (N = 300), measuring faculty perceptions of their leaders' technology leadership competencies and the extent of ICT integration in their instructional practice. Using structural equation modeling, the study finds that leadership support and vision are significant positive predictors of technology integration ($\beta > 0.3$, $p < 0.001$), even after controlling for faculty's age, digital literacy, and institutional type. Notably, the leadership behaviors of providing a clear technological vision and offering professional development opportunities showed the strongest associations with faculty's use of educational technology. The results also reveal that leadership indirectly influences integration through boosting faculty's perceived usefulness and ease of use of technology, consistent with the Technology Acceptance Model. These findings fill a research gap by empirically demonstrating the collective impact of multiple leadership competencies on technology adoption in a Chinese higher education context. The study concludes with recommendations for university leadership development and policy, emphasizing that empowering academic leaders with digital leadership skills can significantly advance the digital transformation of higher education in regions like Heilongjiang.

Contribution/Originality: This study contributes to the existing literature with theory-driven, large-sample evidence from Chinese higher education. Using survey-based measures and SEM, it documents that leadership vision, support, and resources significantly predict faculty technology integration, and shows that leadership effects

are partly mediated by perceived usefulness and ease of use (TAM variables).

1. Introduction

The integration of educational technology into higher education has accelerated worldwide, posing new challenges and opportunities for university leadership. In China, initiatives such as the national Education Informatization 2.0 Action Plan have spurred universities to adopt digital tools in teaching and administration (Jing et al., 2025). However, merely investing in technology is not sufficient and effective leadership is required to guide and support faculty in using these tools to enhance learning outcomes (Zhang & Chen, 2025). Educational leadership, specifically the capacity of academic leaders to influence and facilitate technology use, has emerged as a critical factor in successful technology integration (A'mar & Eleyan, 2022). Prior studies suggest that when leaders articulate a clear vision for ICT, provide necessary resources, and foster a supportive culture, faculty are more likely to incorporate technology into their pedagogy (Celep & Tülübas, 2014; Schmitz et al., 2023). Conversely, weak or absent leadership can lead to underutilization of technology, even in well-resourced environments (Peng et al., 2024; Zhang & Chen, 2025).

Higher education in Heilongjiang province provides a pertinent context for examining these dynamics. Heilongjiang, located in Northeast China, includes a mix of research-intensive universities and teaching-focused colleges that are striving to modernize their educational practices. In recent years, provincial authorities have emphasized that university leaders must become pioneers of educational informatization, highlighting informationization leadership as a core competency for principals and deans (Ministry of Education of the People's Republic of China, 2019). Despite this policy push, there is limited research on how leadership in this region's universities is influencing technology integration on the ground. This mirrors a broader gap in the literature. While the role of school principals in technology adoption has been studied in K-12 settings (Chang, 2012; Zhang & Chen, 2025), far less is known about the impact of leadership in the higher education sector, especially within China (Zhang, 2022). Given this context, the current study aims to quantitatively assess the influence of technology leadership on faculty's technology integration in higher education. The researchers define technology leadership in line with Zhang (2017, 2022) as the ability of educational leaders to guide and support faculty, students, and staff in using information technology to achieve educational goals. This encompasses behaviors such as setting a vision for technology use, providing training and incentives, allocating resources, and driving organizational change for digital transformation (Wang, 2021). Faculty technology integration refers to the extent and effectiveness with which instructors incorporate digital tools into their teaching, research, and student engagement.

There is a lack of empirical evidence demonstrating how specific leadership behaviors affect faculty's use of technology in university settings. Most existing studies focus on single aspects of leadership rather than examining multiple leadership factors together (A'mar & Eleyan, 2022). Moreover, little data exist from Chinese higher education institutions, which operate under different cultural and administrative conditions than Western contexts (Jing et al., 2025). This study addresses these gaps by investigating multiple dimensions of leadership simultaneously and doing so in the context of Chinese universities where such research is scarce (Yuting et al., 2022; Zhang, 2022).

Against this backdrop, the core research problem is that empirical evidence remains limited regarding how specific technology leadership behaviors shape faculty technology integration in Chinese universities, and through which psychological mechanisms these effects unfold. Prior studies often isolate single leadership factors or focus on K-12 contexts; evidence from higher education, particularly in non-Western settings, remains scarce. Addressing this gap, the present study examines multiple leadership competencies simultaneously and tests a mediation pathway via Technology Acceptance Model constructs to explain how leadership translates into integration outcomes in Chinese higher education.

1.1. Research Objectives

This study has two primary objectives: (1) To determine the relationship between university leaders' technology leadership competencies and the level of technology integration achieved by faculty in their teaching; (2) To identify which specific leadership behaviors most strongly influence faculty adoption of educational technology. Through these objectives, the study seeks to inform leadership development and policy decisions for higher education digital transformation.

1.2. Significance of the Study

By quantitatively analyzing leadership's impact on technology use in classrooms, the study contributes to both theory and practice. Theoretically, it provides evidence on the Technology Leadership and Technology Integration, helping build a more holistic model of how various leadership factors interplay to affect outcomes (A'mar & Eleyan, 2022). Practically, the findings can guide university administrators in Heilongjiang and similar contexts on where to focus their efforts, whether investing in leader training on vision-setting or increasing support for faculty development yields greater returns in technology adoption. The study also complements recent qualitative findings (Zhang & Chen, 2025) by adding generalizable data on patterns and strengths of influence, thereby painting a fuller picture of educational leadership in the digital age.

2. Literature Review

2.1. Educational Leadership and Technology Integration

Research consistently underscores that leadership is a key enabler of technology integration in education (Porter & Graham, 2016). In schools, principals who exhibit strong technology leadership, such as championing a clear vision for ICT and actively supporting teachers, see higher levels of technology use among teachers (Priyowidodo, 2021). Hallinger (2011) noted that principals' actions directly influence teacher practices and student outcomes, highlighting leadership as a pivotal factor in instructional innovation. Subsequent studies have identified a range of leadership behaviors that facilitate integration. For instance, providing infrastructure and technical support, organizing professional development on digital pedagogies, and creating an institutional culture open to experimentation (Schmitz et al., 2023). Transformational leadership theory has been applied to this domain, as leaders who inspire and intellectually stimulate their staff tend to encourage more creative uses of technology (Yamamoto & Yamaguchi, 2019; Schmitz et al., 2023).

However, most of these studies concentrate on primary and secondary education. Higher education leadership has its nuances – university leaders often have less direct oversight of classroom practice but can influence through strategic planning and resource distribution. There is evidence that in universities, visionary and strategic leadership is crucial for technology integration; leaders need to align technology initiatives with institutional goals (Porter & Graham, 2016) and articulate how digital tools can enhance the academic mission. A gap in the literature is evident here. Few studies have empirically examined how such leadership at the college level correlates with faculty behavior. Zhang and Fang (2022) suggest that faculty are the grassroots force of educational digitalization, but their success often hinges on higher-level leadership support. This study will expand on existing literature by focusing on the university environment to explore whether the pattern observed in K-12 education that effective principals promote technology use is equally applicable to university leaders and faculty.

2.2. Technology Leadership Competencies

With the rise of digital transformation, researchers have started to delineate what competencies define effective technology leadership. Technology leadership is commonly conceptualized as a subset of educational leadership focused on ICT integration (Dawson & Rakes, 2003). Recent work by Chinese scholars provides insight into relevant competencies. For instance, Wang (2021) studied vocational college principals and identified five key dimensions of technology leadership: awareness, IT ability, planning, organization & implementation, and leadership effectiveness. Similarly, Zhang (2022) approached technology leadership as facilitating organizational change via IT, categorizing leader behaviors into motivational inspiration, support for change, planning or design, project implementation, and outcome assessment. These frameworks, aligned with international standards like the ISTE Standards for Education Leaders (ISTE, 2018), paint a comprehensive picture of the skill set leaders need.

Yet, a research gap exists in testing how these competencies impact actual integration results. Many studies list competencies or self-report leadership practices, but do not connect them quantitatively to metrics of technology usage or improvement in teaching and learning outcomes (Zhang & Chen, 2025). One notable study by A'mar and Eleyan (2022) did examine this link in a school setting, finding that principals' technology leadership had a significant positive effect on teachers' classroom technology integration. This indicates that if the study can measure leadership competencies reliably, the researchers should expect a correspondence with faculty technology use. In China, Zhang et al. (2025b) took a step in this direction by developing the Teachers' Technology Leadership Scale (TTLS) to evaluate teachers' leadership in technology-enhanced learning. Their findings revealed that technology leadership characteristics could be grouped into three broad constructs in the Chinese context, which differ from Western categorization. This underscores that context matters: leadership skills may manifest differently in different cultures or educational levels.

Drawing from these insights, the present study will consider multiple leadership dimensions, such as vision, support, and infrastructure management, rather than treating technology leadership as a monolith. By surveying faculty perceptions, the study aims to see which leadership competencies are most salient and impactful in their experience. This approach addresses recommendations in the literature to adopt a more holistic, multi-factor view of technology leadership effectiveness (Zhang & Chen, 2025). It also responds to calls for more empirical validation of theoretical frameworks: instead of only

defining what leaders should do, the researchers test which leadership behaviors correlate with better tech integration outcomes.

2.3. The Technology Acceptance Model (TAM) and Leadership Influence

To ground the investigation theoretically, the researchers incorporate the Technology Acceptance Model (TAM) as a lens to understand how leadership might influence faculty behavior. TAM posits that two factors – Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) of a technology – largely determine an individual's decision to adopt that technology (Davis et al., 1989). Faculty will integrate educational technology into their teaching if they believe it will enhance learning and if they feel comfortable using it. The study hypothesizes that technology leadership can affect these perceptions. For example, a dean who articulates how a new e-learning platform can improve student engagement may raise the faculty's perceived usefulness of that platform. Likewise, a department head who provides training and engages peer support can increase faculty's perceived ease of using new tools.

Previous research indirectly supports this linkage. Karakose et al. (2021) observed that a lack of supportive leadership often leaves teachers viewing technology as a burden rather than a benefit, hampering integration. Conversely, when leadership frames technology in a positive light and builds teacher confidence, integration is more successful (Hartman et al., 2019). Thus, in this study, the researchers expect that leadership behaviors contribute to creating favorable conditions for technology acceptance among faculty. By measuring faculty perceptions on TAM variables alongside leadership factors, the researchers can explore whether leadership's impact is partly mediated through these cognitive perceptions. This approach is relatively novel in the context of higher education leadership research; it blends a well-established technology adoption theory (TAM) with leadership influence, potentially offering a more nuanced explanation of how leaders affect change.

In summary, the literature suggests that educational leadership is a critical driver of technology integration, with various competencies outlined as important. There is a theoretical basis to expect that leadership influences faculty adoption through shaping their perceptions. However, empirical validation in higher education, especially in the Chinese context, remains limited. This study will build on these insights to quantitatively examine leadership-tech integration linkages, thereby contributing data to an area currently characterized by conceptual assertions more than evidence.

3. Research Methods

3.1. Research Design

This study employs a cross-sectional survey research design with a quantitative approach (Olsen & St George, 2004). The goal is to collect measurable data on faculty experiences and analyze statistical relationships between leadership and technology integration variables. Given the exploratory nature in a new context, the design is correlational, looking for associations and predictive relationships rather than direct causal claims. The focus is on hypothesis testing informed by the literature review. For instance, testing if leadership support positively predicts technology use, and if that relationship is mediated by perceived usefulness of technology.

3.2. Sample and Setting

The research was conducted in Heilongjiang Province, China, involving five universities selected to represent a range of institutional types: two large research-intensive universities, including one Project 211 university, two regional teaching-oriented universities, and one vocational college. This selection captures diversity in institutional missions and resources in the province. The researchers targeted faculty members as the respondents, since they are the end-users of educational technology in teaching and are directly influenced by the institution's leadership policies. A stratified sampling strategy was used to ensure representation from each university and across disciplines. In total, 300 faculty members participated (60 from each university on average). Among them, 48% were female and 52% male. The average age was 40.2 years (SD = 8.5), with an average of 12 years of teaching experience. All participants had at least a master's degree, and 30% held a doctoral degree. Participants were taught in a variety of fields, reflecting a broad spectrum of academic disciplines. Participation was voluntary, and responses were anonymized. The sample size (N = 300) is adequate for the statistical techniques applied (see Section 3.5) and aligns with similar studies examining leadership and adoption (A'mar & Eleyan, 2022).

3.3. Instruments

Data were collected via a structured questionnaire composed of three main parts:

3.3.1. Leadership Perception Scale

This section assessed faculty perceptions of their immediate academic leaders' technology leadership. Based on the literature, the study identified key dimensions of technology leadership to include Vision and Planning, Support and Professional Development, Resource Provision, and Innovative Culture. The researchers adapted items from existing frameworks and studies. For example, items measuring vision were adapted from Chang (2012), which emphasized a clear ICT vision by leaders. Items on support drew from ISTE Standards for Education Leaders and Zhang's (2022) support for change dimension. Each item was rated on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). An exploratory factor analysis (pilot with 50 faculty) confirmed four distinct factors corresponding to the intended dimensions, with Cronbach's alpha for each subscale ranging from 0.82 to 0.90, indicating good internal consistency.

3.3.2. Technology Integration Scale

Faculty's level of technology integration was measured by self-reported usage and integration effectiveness. The researchers used items inspired by the Technology Integration Assessment Instrument (Vannatta & Banister, 2009) and tailored to higher ed. Faculty were asked how frequently they use various technologies in teaching and the extent to which they design learning activities that leverage technology. This section included both frequency scales and agreement scales for statements like "I incorporate technology in ways that significantly enhance student learning". The composite score provides an index of each faculty member's integration of technology into their practice.

3.3.3. Technology Acceptance Measures

To apply TAM, the researchers included items for Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) of educational technology. These were general measures asking faculty to evaluate digital tools for teaching in general. For example, PU was captured by statements like “Using educational technologies improves my teaching effectiveness” and PEOU by “Learning to use new educational technologies is easy for me”. The researchers used a 5-point agreement scale for these, adapting the classic TAM questionnaire (Davis et al., 1989) wording to the education context. Cronbach’s alphas for PU and PEOU scales were 0.88 and 0.85, respectively, showing good reliability.

Additionally, the survey collected demographic and background information (age, gender, years of teaching, discipline, self-rated general tech proficiency) to use as control variables in analysis or to examine subgroup differences.

3.4. Procedure

After obtaining necessary permissions from each participating university and ethical clearance, the survey was administered online using a secure questionnaire platform. Faculty were invited via email and internal notices to participate in the study about “leadership and teaching with technology,” with assurances of confidentiality. The survey was available in both English and Chinese; a translated Chinese version was provided to ensure clarity, given that some faculty might be more comfortable responding in Chinese. Data collection took place over 4 weeks in the Spring semester. The researchers achieved a response rate of approximately 30% of those invited, which is reasonable for voluntary faculty surveys. Reminders were sent twice to improve participation. No incentives were provided aside from a summary report of findings offered to the participating institutions.

3.5. Data Analysis

The analysis proceeded in several steps. First, descriptive statistics and correlations were computed for all key variables (leadership dimensions, technology integration level, PU, PEOU) to understand the basic relationships and check for any anomalies. All leadership perception subscales were significantly positively correlated with faculty’s technology integration (r ranging from 0.40 to 0.55, $p < 0.001$), providing initial support for hypotheses.

To address objective (1), the researchers conducted a multiple regression analysis with faculty technology integration as the dependent variable and the leadership dimensions as independent variables. This assessed which leadership factors have significant unique contributions. To further refine this and account for measurement model issues, the researchers then specified a Structural Equation Model (SEM). The SEM used latent variables for leadership and technology integration, along with TAM constructs as mediators. The researchers evaluated model fit with standard indices (CFI, TLI, RMSEA).

For objective (2), the researchers specifically looked at the regression weights in the SEM to identify which leadership behaviors were strongest. The researchers also tested mediation effects using a bootstrapping method: for example, whether the path from leadership to integration was mediated by PU or PEOU, consistent with the TAM-informed hypothesis.

All quantitative analyses were conducted using SPSS and AMOS. Significance was set at the 0.05 level (with Bonferroni adjustments for multiple comparisons where applicable). The researchers also checked for common method bias (as data came from self-report surveys) using Harman's single-factor test, which suggested no single factor dominated the variance (the largest factor < 30% variance).

4. Results

4.1. Leadership and Technology Integration Descriptive Findings

Faculty generally reported moderate levels of technology integration in their teaching. On a 1–5 scale, the average integration score was $M = 3.47$ ($SD = 0.81$), indicating that most faculty use technology “sometimes” to “often” in their teaching and perceive moderate effectiveness in those uses. In terms of leadership perceptions, the faculty tended to “agree” that their leaders exhibit technology leadership behaviors, but the scores varied by dimension. Vision and Planning had a mean of 3.8 (out of 5), indicating that many faculty see their leaders as having a clear digital vision. Support/PD was slightly lower ($M = 3.5$), suggesting room for improvement in training and encouragement efforts. Resource Provision scored around 3.7, and Innovative Culture was 3.6 on average. These values suggest a generally positive but not overwhelming endorsement of leaders' tech leadership – a finding that provides context when interpreting the impact on integration. These values suggest a generally positive but not overwhelming endorsement of leaders' tech leadership – a finding that provides context when interpreting the impact on integration (see [Table 1](#)).

Table 1: Descriptive Statistics for Leadership Dimensions and Technology Integration (N = 300)

Variable	M	SD	Scale Range
Technology Integration	3.47	0.81	1–5
Vision & Planning	3.80	0.75	1–5
Support and Professional Development	3.50	0.78	1–5
Resource Provision	3.70	0.76	1–5
Innovative Culture	3.60	0.79	1–5

Note. Values are means (M) and standard deviations (SD) based on a 5-point Likert scale. N = 300.

Notably, bivariate correlations showed that all four leadership dimensions had significant positive correlations with the faculty's technology integration level ($p < 0.001$ for each). The strongest correlation was with Support and Professional Development ($r = 0.55$), implying that faculty who felt more supported by leadership tended to use technology more extensively. Vision and Planning were also strongly correlated ($r = 0.50$) (see [Table 2](#)). These correlations foreshadow the regression/SEM results, indicating that leadership factors are indeed associated with how much faculty integrate technology.

Table 2: Pearson Correlations among Leadership Dimensions and Technology Integration (N = 300)

Variable	1	2	3	4	5
1. Technology Integration	—				
2. Vision & Planning	.50***	—			
3. Support and PD	.55***	.62***	—		
4. Resource Provision	.46***	.58***	.54***	—	
5. Innovative Culture	.40***	.50***	.48***	.52***	—

Note. PD = Professional Development. *** $p < .001$; ** $p < .01$; * $p < .05$.

4.2. Regression Analysis

The multiple regression model predicting faculty technology integration from the four leadership dimensions was significant ($F(4, 295) = 32.5, p < 0.001$), with an R^2 of 0.31, meaning roughly 31% of the variance in integration levels was explained by perceived leadership factors – a substantial amount for behavioral research. Looking at individual predictors, three of the four leadership dimensions were statistically significant (see Table 3).

Table 3: Multiple Regression Predicting Technology Integration from Leadership Dimensions (N = 300)

Predictor	β (Std.)	SE	t	p
Support and PD	.28***	0.05	5.60	< .001
Vision & Planning	.22**	0.07	3.20	.002
Resource Provision	.15*	0.07	2.18	.030
Innovative Culture	.10 (ns)	0.06	1.59	.110
Model Statistics	$R^2 = .31$	—	$F(4, 295) = 32.5$	< .001

Note. Std. = standardized coefficient; SE = standard error; ns = non-significant. *** $p < .001$; ** $p < .01$; * $p < .05$.

Support and Professional Development ($\beta = 0.28, p < 0.001$): This had the strongest unique contribution. Faculty who felt their leaders actively supported them (through training, encouragement, mentoring) had significantly higher integration levels. This aligns with existing literature that emphasizes leadership's role in teacher capacity-building (Schmitz et al., 2023).

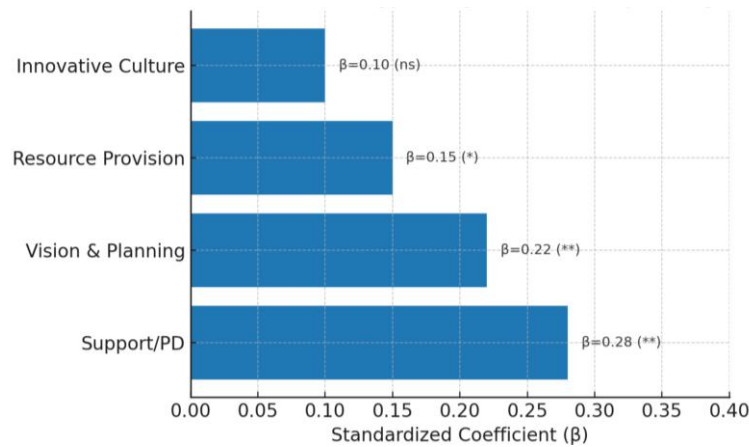
Vision and Planning ($\beta = 0.22, p = 0.002$): A clear strategic vision for technology use (leaders communicating goals and plans) also showed a strong positive effect. This suggests that when faculty understand and buy into a leader's digital vision, they are more likely to implement technology in line with that vision.

Resource Provision ($\beta = 0.15, p = 0.030$): Providing adequate resources (ICT infrastructure, technical support, funding for tools) was a significant predictor, though weaker than the above two. This indicates resources do matter, but perhaps leadership's intangible support matters even more in this context, where baseline resources might already be in place.

Innovative Culture ($\beta = 0.10, p = 0.11$): This factor, which included items about encouraging experimentation and not punishing failure, was positive but not statistically

significant when the other factors were controlled. It is possible that its effect overlaps with the Support dimension, or faculty may not distinctly perceive this aspect (see Figure 1).

Figure 1: Predictors of Technology Integration (Multiple Regression)

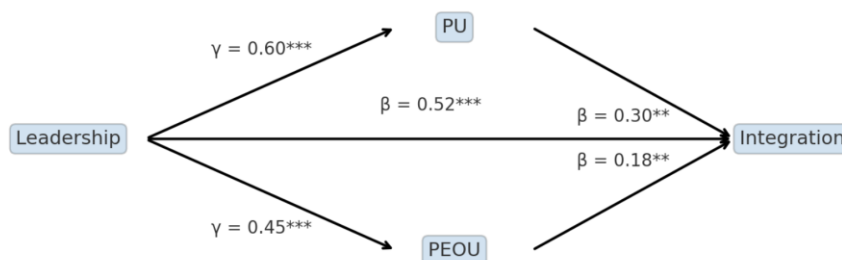


These results empirically confirm that multiple facets of leadership contribute to technology integration. Notably, supportive leadership behaviors had the greatest impact, echoing findings from prior studies in different contexts that highlight the importance of continuous professional support for teachers to adopt technology (Ertmer et al., 2012; Raman & Thannimalai, 2019). The significance of vision also resonates with transformational leadership concepts that faculty may be inspired and guided by a compelling digital vision (Chang, 2012).

4.3. Structural Equation Model and Mediation

The SEM analysis provided a more nuanced picture. The hypothesized model, where leadership predicts technology integration directly and indirectly through PU and PEOU, showed a good fit to the data (CFI = 0.954, TLI = 0.942, RMSEA = 0.045) (see Figure 2).

Figure 2: Structural Equation Model



Model fit: CFI = 0.954, TLI = 0.942, RMSEA = 0.045

The path coefficients largely mirrored the regression findings for direct effects: the latent Technology Leadership construct encompassing all four dimensions had a strong direct effect on Technology Integration (standardized estimate = 0.52, $p < 0.001$). This indicates that overall, better technology leadership, as perceived by faculty, leads to higher

integration, supporting the main hypothesis. Regarding mediation, the study found interesting results:

Leadership had positive effects on both Perceived Usefulness ($\gamma = 0.60, p < 0.001$) and Perceived Ease of Use ($\gamma = 0.45, p < 0.001$). This means faculty who rated their leaders highly also tended to see educational technologies as more useful for teaching and felt more comfortable with them. It suggests that good leadership creates an environment or mindset where technology is valued and not intimidating.

Both PU and PEOU in turn had significant effects on technology integration ($\beta = 0.30$ and $\beta = 0.18$, respectively, $p < 0.01$). Faculty who saw tech as useful and easy were indeed integrating it more into their work, consistent with TAM theory (Davis et al., 1989).

A bootstrap test for indirect effects confirmed that leadership influences integration partly through these TAM factors (see Table 4). The indirect effect via PU was significant (indirect coefficient ~ 0.18 , 95% CI not crossing zero), and via PEOU as well (~ 0.08 , significant). The total effect of leadership on integration was about 0.60 (with the direct being 0.52, the remainder coming through mediation). This partial mediation implies that while a portion of leadership's impact is explained by changing faculty perceptions (making them see tech as useful and easy), there remains a direct effect – leadership likely also affects integration through other routes, such as establishing policies or mandates.

Table 4: Structural Equation Model Path Coefficients, Indirect and Total Effects, and Model Fit (N = 300)

Path	Std. Estimate	SE	z	p
Leadership → Technology Integration (Direct)	.52***	0.06	8.67	< .001
Leadership → Perceived Usefulness (PU)	.60***	0.05	12.00	< .001
Leadership → Perceived Ease of Use (PEOU)	.45***	0.06	7.50	< .001
PU → Technology Integration	.30**	0.09	3.33	.001
PEOU → Technology Integration	.18**	0.07	2.57	.010
Indirect via PU	.18**	0.05	3.60	< .001
Indirect via PEOU	.08*	0.03	2.67	.008
Total Effect	.60***	0.05	12.00	< .001

Note. Std. = standardized coefficient; SE = standard error; PU = perceived usefulness; PEOU = perceived ease of use. *** $p < .001$; ** $p < .01$; * $p < .05$.

In sum, the SEM supports a model where strong technology leadership boosts faculty confidence and positive attitudes towards technology (TAM factors), which in turn drives greater integration. This finding is theoretically valuable: it empirically links leadership actions to an established model of individual technology adoption, bridging a gap between organizational leadership research and educational technology acceptance research.

4.4. Additional Findings and Subgroup Analysis

This study also explored whether the impact of leadership varied across different types of faculty or institutions. Faculty from the research-intensive universities reported slightly higher leadership scores on average than those from teaching-oriented colleges. However, the effect of leadership on integration was consistent across institutions – no significant interaction effect was found. This suggests the findings are robust across different university settings within Heilongjiang.

There was a minor trend that younger faculty (under 35) showed a higher baseline of tech integration than older faculty, which is not surprising given digital nativity. But importantly, leadership's positive effect held for both younger and older faculty groups. Similarly, the study did not find gender differences in responses to leadership or integration.

Faculty who self-rated higher in general tech skills unsurprisingly used more technology. The study included tech proficiency as a control in some models; leadership still significantly predicted integration above and beyond personal tech skill. This is notable that even tech-savvy educators benefit from strong leadership support, and conversely, leadership can encourage even less tech-savvy faculty to try new tools.

5. Discussion

The findings of this quantitative study provide empirical evidence for the vital role of educational leadership in advancing technology integration within higher education, using the example of universities in Heilongjiang, China. Consistent with global research trends, the results confirm that leader's matter: faculty who perceive their leaders as strong "technology leaders" are markedly more likely to use educational technologies effectively in their teaching. This supports and extends earlier work in K-12 settings to the university context ([A'mar & Eleyan, 2022](#); [Zhang & Chen, 2025](#)), affirming that the influence of leadership on technology adoption is not confined to schools but is also present in higher education institutions.

One key contribution of this study is identifying which aspects of leadership are most influential. The quantitative approach allowed us to compare multiple leadership factors simultaneously. The study found that providing support and setting a clear vision are two leadership behaviors with the strongest impact on faculty technology use. This aligns with the qualitative findings of [Zhang and Chen \(2025\)](#), who noted that in Chinese colleges, effective leadership strategies included setting clear technology goals and offering professional development. The study reinforces those insights with statistical evidence: a leader who can inspire a shared vision for digital innovation and back it up with tangible support systems creates an environment where technology integration flourishes.

Another important discussion point is the mechanism by which leadership exerts influence. By integrating the Technology Acceptance Model, this study demonstrated that part of leadership's effect is psychological. Good leadership makes faculty more convinced of the value and ease of technology, which in turn motivates them to integrate it. This mediating role of PU and PEOU is a novel finding in the context of leadership. It suggests that one way leaders work is by shaping positive mindsets towards change ([Hartman et al., 2019](#)). For instance, a dean in the study who championed a new online

learning system likely helped faculty see the system as beneficial, which then led them to incorporate it in their classes. This insight contributes to theory by linking organizational leadership with individual adoption theories. It also has practical implications that training for academic leaders might emphasize not just providing resources but also communicating the benefits of technology in a way that resonates with faculty values and needs (Zhao et al., 2024).

The study also has implications specific to the Chinese higher education context. The study's focus on Heilongjiang is significant because much prior research on digital leadership in China has focused on either basic education or on top-tier universities in more developed regions. Heilongjiang's universities face certain challenges – resource constraints and the need to catch up with more affluent regions in China's east in terms of digital infrastructure, which makes leadership especially critical (Tim et al., 2021). The positive relationships the researchers observed suggest that even in a resource-limited context, effective leadership can drive meaningful integration of technology. This is encouraging for similar regions or institutions. Strong leadership can compensate to some extent for limitations by motivating faculty and creatively leveraging what resources are available (Matos & Kasztelnik, 2021). It also resonates with policy signals from provincial authorities who have stressed the importance of principals and university leaders being informatization leaders (Ministry of Education of the People's Republic of China, 2019). The study's data provides evidence that leadership's focus on informatization is indeed yielding results at the faculty level, thus supporting the direction of these policies.

Research Contributions and Theoretical Implications: This study contributes to filling the identified research gaps. It provides data from the higher education sector, answering calls for more research beyond K-12 (Yuting et al., 2022) and does so in a non-Western context, adding to the understanding of culturally contextualized leadership models (Jing et al., 2025). The relatively high variance explained (31%) in faculty tech integration by leadership factors underscores that including leadership in models of technology adoption in education is theoretically important. Many technology integration models focus on teacher characteristics or infrastructure. The findings suggest adding leadership as an upstream variable could significantly improve the explanatory power of such models. Additionally, by testing multiple competencies together, the researchers address the gap noted by A'mar and Eleyan (2022) and others about interactive effects. The study found that different leadership competencies reinforce each other. Vision and support both matter, and lacking one might not be fully compensated by the other. This implies future theoretical frameworks should consider a composite of leadership behaviors rather than siloed traits.

From the perspective of practical implications, for university administrators and policymakers in China and similar contexts, investing in developing technology leadership capacity among academic leaders can pay off in greater technology integration by faculty (Zhang et al., 2025a). Concretely, this could mean leadership training programs focusing on how to craft and communicate a clear digital strategy, how to mentor and support faculty in technology use, and how to build a supportive culture for innovation. The results show that faculty respond to these leadership inputs. Institutions might also consider assessing their leaders on these dimensions as part of performance evaluations or needs assessments. Using adapted survey tools to gather faculty feedback on leadership effectiveness in technology integration (Dexter &

[Richardson, 2020](#)). If certain dimensions score low, the institution can take corrective steps such as strategic planning workshops or better communication channels.

For regions like Heilongjiang, where digital transformation is a priority, but resources may be tighter, the findings highlight leveraging human factors. While it is always necessary to upgrade infrastructure and provide equipment, those alone do not guarantee usage. The human element of leaders championing and guiding the tech integration is crucial. Provincial education authorities might support inter-university forums or communities of practice for leaders to share successful strategies ([Peng et al., 2024](#)). This peer learning could amplify the impact of effective leadership across institutions.

It is important to acknowledge the limitations of this study. The cross-sectional design means causality cannot be definitively established. It is assumed that leadership influences faculty behavior, but it is also possible that in departments where faculty are enthusiastic about tech, they might perceive their leaders more positively ([Zhang et al., 2025b](#)). This study attempted to mitigate common method bias and used robust analysis methods, but future research could strengthen causal claims by using longitudinal designs or experimental interventions. Another limitation is the reliance on self-reported technology integration. It may not perfectly reflect actual classroom practices. Triangulating with student feedback or classroom observations could enrich the findings ([Yuting et al., 2022](#)). Additionally, the study's context is specific to Heilongjiang and Chinese universities, which may limit generalizability to other countries or cultures. The researchers believe many findings are likely applicable in a broad sense, even if magnitudes vary.

For future research, this study opens several avenues for further inquiry. One is to explore leadership at different levels. Also, qualitative research could complement the findings by exploring why certain leadership behaviors are effective or how faculty experience them day-to-day ([Bryman et al., 1996](#)). Given the rapidly evolving tech landscape, continuous research is needed to see how leadership responds to new technologies and shapes adoption ([Saranani et al., 2024](#)). It would be interesting to examine whether leaders who are early adopters or champions of emerging technologies influence faculty to follow suit.

As a summary of this section, this quantitative study underscores the powerful role that educational leadership plays in integrating technology within higher education. By empirically validating this relationship in a Chinese context and identifying key leadership drivers, it contributes to both scholarly understanding and practical guidance for leading digital transformation in universities.

6. Conclusion

This study set out to investigate how educational leadership influences the integration of educational technology among faculty in higher education, using universities in Heilongjiang, China, as a case in point. The findings demonstrate that effective technology leadership by academic leaders is associated with greater technology use in teaching. Leaders who share a compelling digital vision, actively support and train faculty, and ensure necessary resources create an environment where instructors are more inclined to adopt and utilize educational technologies to enhance learning.

Conversely, without such leadership, even well-intended technology investments may not translate into meaningful educational practice.

The research contributes new evidence to the field, addressing noted gaps by focusing on a higher education context and a non-Western setting. It confirms that multiple leadership competencies collectively matter – reinforcing the idea that technology leadership is a multifaceted construct that requires a balanced skill set. By linking leadership with the Technology Acceptance Model, the study offers a conceptual bridge between organizational leadership and individual technology adoption, highlighting that part of a leader's influence is in shaping faculty attitudes and confidence towards technology.

In conclusion, educational technology integration in higher education is not just a technical issue but fundamentally a leadership challenge and opportunity. As higher education enters deeper into the digital age, the role of educational leaders will only grow in importance. This study provides evidence-based insight that empowering and equipping those leaders is a wise strategy to achieve sustained, impactful integration of technology in education.

Ethics Approval and Consent to Participate

Institutional research approval from universities was obtained before data collection. All participants provided informed consent before participating in the study. The research complied with ethical guidelines for educational research involving human subjects.

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Conflict of Interest

The authors declare there are no conflicts of interest.

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