

# The Influence of Artificial Intelligence Implementation on Leadership Effectiveness and Human Resource Performance in Higher Education Institutions

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## Article Information

### Article History

Received, January 3, 2026

Revised, January 25, 2026

Accepted, January 27, 2026

Published, January 31, 2026

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## ABSTRACT

The rapid digital transformation in higher education institutions has accelerated the adoption of Artificial Intelligence (AI) to improve managerial effectiveness and workforce productivity. However, empirical evidence regarding the integrated relationship between AI implementation, leadership effectiveness, and human resource performance remains limited. This study aims to examine the direct effect of AI implementation on leadership effectiveness and human resource performance, as well as to analyze the mediating role of leadership effectiveness in this relationship. This research employed a quantitative explanatory design using a survey method. Data were collected from academic leaders and administrative staff at higher education institutions through structured questionnaires distributed using purposive sampling. The research instruments were measured using a five-point Likert scale and tested for validity and reliability. Data were analyzed using Structural Equation Modeling (SEM) to evaluate both direct and indirect relationships among variables. The findings indicate that AI implementation has a positive and significant effect on leadership effectiveness and human resource performance. Leadership effectiveness also significantly influences employee performance and partially mediates the relationship between AI implementation and human resource outcomes. These results demonstrate that AI serves as a strategic enabler, while effective leadership ensures optimal translation of technological adoption into measurable performance improvements. In conclusion, sustainable performance enhancement in higher education requires the integration of intelligent technology and adaptive leadership capability. Future research is recommended to apply longitudinal designs and explore moderating variables such as digital organizational culture and institutional governance structure.

**Keywords:** Artificial Intelligence, Leadership Effectiveness, Human Resource Performance, Higher Education, Digital Transformation

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## INTRODUCTION

The acceleration of digital transformation has fundamentally reshaped governance structures across multiple sectors, including higher education institutions. Rapid advancements in data analytics, intelligent automation, and algorithm-based systems have altered how universities formulate strategies, manage academic services, and evaluate organizational performance. Artificial Intelligence (AI), in particular, has evolved from a technical support tool into a strategic instrument capable of enhancing evidence-based decision-making and operational efficiency. Universities are increasingly integrating AI-driven systems to support predictive enrollment analysis, academic

assessment automation, research management, and administrative coordination. However, technological adoption alone does not automatically generate measurable leadership and workforce performance improvements (Wilson & Jackson, 2024).

Despite the expansion of AI utilization, many higher education institutions face what can be described as the AI Leadership Performance Gap, referring to the discrepancy between AI system availability and leadership capability to strategically leverage these technologies. In numerous cases, AI platforms generate complex analytical outputs, yet institutional leaders encounter difficulties in translating algorithmic insights into actionable policies. This misalignment often results in underutilized systems, fragmented governance, and limited performance gains. Consequently, the presence of sophisticated digital infrastructure does not necessarily correspond with improved leadership outcomes or human resource productivity (Nam & Bai, 2023).

Within higher education institutions, leadership effectiveness plays a decisive role in ensuring that technological transformation aligns with institutional objectives. Effective academic leadership involves strategic clarity, communication transparency, adaptability to regulatory change, and performance monitoring capability. When leaders lack digital fluency or strategic integration competence, AI systems remain operationally isolated from core governance processes. This condition intensifies organizational inefficiencies and may negatively affect staff motivation and performance consistency. Research on educational transformation emphasizes that adaptive leadership is central to successful institutional reform (Jiao et al., 2026).

Empirical studies in higher education further highlight the importance of data-informed leadership practices. Evidence suggests that institutions adopting structured data utilization mechanisms tend to demonstrate improved decision accuracy and stronger academic performance outcomes. Data-driven governance enhances accountability, transparency, and strategic alignment across administrative units. However, without integrative leadership capacity, technological systems often function merely as technical repositories rather than performance accelerators (Y. Li, 2025).

Both strands of higher education research converge toward two essential constructs: leadership effectiveness and human resource performance. Leadership effectiveness determines how well strategic decisions are formulated and implemented, while human resource performance reflects productivity, innovation, task efficiency, and institutional contribution. When digital initiatives are not supported by effective leadership, employee adaptation slows, resistance increases, and performance outcomes stagnate. Conversely, strategic alignment between technology and leadership enhances organizational coherence and workforce engagement (Rodrigues & Fonseca, 2026).

Beyond the educational context, studies specifically examining Artificial Intelligence implementation provide further insights. Organizational research indicates that AI adoption yields productivity gains only when accompanied by managerial redesign and structural adjustment. Technological deployment without leadership transformation tends to produce limited performance improvements. Therefore, AI effectiveness depends not solely on system sophistication but also on governance integration (Batta et al., 2025).

Similarly, research on analytics-driven organizations demonstrates that leadership capability in interpreting and contextualizing algorithmic outputs significantly influences organizational outcomes. Leaders must possess analytical literacy and strategic translation skills to convert AI-generated insights into operational policies. Without such competencies, AI systems remain isolated technical infrastructures with minimal strategic impact (Liu & Wang, 2024).

Addressing the AI Leadership Performance Gap in higher education requires an integrative solution that combines technological implementation with leadership capability enhancement. Institutions must design governance frameworks where AI supports strategic planning, performance evaluation, and workforce development in a coordinated manner. This integrative approach ensures that digital investments produce measurable improvements in leadership effectiveness and human resource performance rather than symbolic technological modernization (Kankanamge et al., 2021).

Two theoretical perspectives strengthen this proposed solution. First, the Technology Acceptance Model (TAM) explains that perceived usefulness and perceived ease of use significantly influence technology adoption behavior. In the higher education context, leadership perception toward AI determines the intensity and effectiveness of system utilization. Positive cognitive evaluation of AI systems encourages organizational acceptance and performance integration (Lv et al., 2022).

Second, the Resource-Based View (RBV) posits that sustainable competitive advantage arises from valuable and strategically managed resources, including technological capabilities and managerial expertise. From this perspective, AI systems combined with effective leadership represent strategic assets capable of enhancing institutional performance and human resource productivity when properly integrated into governance structures (Pallathadka et al., 2023).

Based on these arguments, this study aims to empirically examine the influence of Artificial Intelligence implementation on leadership effectiveness and human resource performance in higher education institutions. Specifically, this research seeks to analyze the direct effect of AI implementation on leadership effectiveness, the direct effect of AI implementation on human resource performance, and the mediating role of leadership effectiveness in strengthening the relationship between AI implementation and workforce performance outcomes.

## **LITERATURE REVIEW**

The rapid expansion of Artificial Intelligence (AI) technologies has transformed the operational landscape of higher education institutions (HEIs), reshaping academic governance, administrative efficiency, and strategic decision-making processes. AI refers to computational systems capable of performing cognitive functions such as learning, prediction, pattern recognition, and automated reasoning. Within HEIs, AI applications extend to student enrollment forecasting, adaptive learning systems, research analytics, automated assessment, and institutional performance dashboards. These technological advancements offer universities the opportunity to enhance responsiveness, accuracy, and competitiveness in an increasingly data-driven environment. Nevertheless, the successful implementation of AI in higher education requires more than technological acquisition; it demands organizational readiness, governance integration, and strategic alignment to ensure that AI contributes meaningfully to institutional performance outcomes (Amiresmaili et al., 2026).

The integration of AI into institutional systems also influences human resource management practices, including recruitment analytics, performance monitoring, training customization, and workforce planning. AI-driven HR systems enable predictive modeling and evidence-based talent management, potentially increasing operational efficiency and reducing administrative bias. However, the effectiveness of such systems depends heavily on leadership capability to interpret algorithmic outputs and embed them within institutional policies. Without adequate digital literacy and governance coherence, AI systems risk functioning as isolated technical infrastructures rather than strategic performance enablers. Empirical findings emphasize that organizations experience productivity gains from AI only when managerial practices evolve simultaneously with technological transformation (Mahade et al., 2025).

Leadership effectiveness becomes particularly critical in AI-enabled higher education environments. Effective leadership encompasses the ability to formulate strategic vision, communicate institutional priorities, foster innovation, and adapt to technological disruption. In digitally transforming institutions, leaders are expected to integrate data-driven insights into policy formulation and performance evaluation while maintaining academic values and stakeholder trust. Research on digital leadership highlights that adaptive, data-informed, and ethically grounded leadership approaches enhance the success rate of technological transformation initiatives. When leaders demonstrate digital competence and strategic agility, institutions are better positioned to leverage AI for sustainable performance improvement (Grießhammer et al., 2024).

Conversely, limitations in leadership readiness contribute to what can be conceptualized as an AI leadership performance gap, where technological infrastructure outpaces managerial capacity. In such conditions, decision-making remains intuition-based despite the availability of advanced analytics, and human resources may experience uncertainty regarding technology utilization. Studies within higher education contexts indicate that leadership alignment with digital transformation strategies significantly influences staff engagement, institutional agility, and governance effectiveness. Institutions that integrate AI within coherent leadership frameworks tend to demonstrate stronger academic and administrative performance outcomes (Amewuid et al., 2022).

Human resource performance in AI-integrated institutions reflects productivity, innovation contribution, collaboration quality, and professional development progression. AI technologies can enhance these outcomes by automating repetitive tasks, enabling personalized training pathways, and generating real-time feedback systems. Such systems support employees in focusing on higher-value academic and administrative responsibilities. However, workforce adaptation to AI also depends on perceptions of fairness, transparency, and institutional support. Research suggests that when AI implementation is accompanied by leadership transparency and participatory governance, employees demonstrate higher trust levels and improved performance indicators (Vicente-Oliveros et al., 2023).

From a theoretical perspective, the relationship between AI implementation, leadership effectiveness, and human resource performance can be understood through contemporary organizational frameworks. The dynamic capability perspective emphasizes that organizations must continuously integrate, build, and reconfigure internal competencies to address rapidly changing technological environments. Within HEIs, AI systems represent technological assets whose value depends on leadership capability to orchestrate and align them with human resource development strategies. Institutions possessing strong adaptive leadership and technological integration capacity are more likely to achieve sustained competitive advantage and performance growth in digital ecosystems (D'Aniello et al., 2021).

Additionally, socio-technical systems theory reinforces the importance of balancing technological infrastructure with human and structural elements. According to this perspective, optimal organizational performance emerges when social subsystems such as leadership practices, culture, and workforce competencies are harmonized with technical subsystems, including AI platforms and digital analytics. In higher education settings, AI implementation that neglects leadership development and employee engagement may create operational disruption rather than enhancement. Conversely, integrative alignment between AI systems, leadership effectiveness, and human resource practices strengthens institutional resilience and performance sustainability (Nnaji et al., 2026).

Taken together, contemporary scholarship indicates that AI implementation in higher education institutions has the potential to influence leadership effectiveness and human resource performance significantly. However, this influence is neither automatic nor linear; it depends on leadership capacity to translate technological insights into strategic actions and to cultivate workforce readiness for digital collaboration. Therefore, examining the direct and indirect relationships between AI implementation, leadership effectiveness, and human resource performance becomes essential for understanding how higher education institutions can optimize digital transformation initiatives to achieve measurable organizational improvement.

## **METHOD**

This study employed a quantitative approach using an explanatory research design to examine the causal relationships between Artificial Intelligence (AI) implementation, leadership effectiveness, and human resource performance in higher education institutions. The quantitative design was selected to enable objective measurement of variables and statistical testing of hypotheses regarding direct and indirect effects among constructs. The study applied a

cross-sectional survey method, where data were collected at a single point in time to capture perceptions of respondents regarding AI utilization and organizational performance conditions.

The population of this research consisted of academic and administrative staff working in higher education institutions that have implemented AI-based systems in managerial, academic, or administrative processes. The sampling technique used was stratified random sampling to ensure proportional representation from different institutional units, such as academic departments, administrative offices, and management levels. The minimum sample size was determined using structural equation modeling (SEM) requirements, with a recommended range of 200–400 respondents to ensure adequate statistical power and model stability.

The research instrument used in this study was a structured questionnaire developed based on established theoretical constructs and adapted to the higher education context. The questionnaire consisted of three main variable sections. The first section measured Artificial Intelligence implementation, including indicators such as AI utilization intensity, data-driven decision support, automation integration, and digital system effectiveness. The second section measured leadership effectiveness, covering strategic clarity, communication effectiveness, adaptability to change, and performance monitoring capability. The third section measured human resource performance, including productivity, task efficiency, innovation contribution, and work consistency. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Prior to large-scale distribution, the instrument underwent content validation by experts in digital governance and educational management, followed by a pilot test to assess construct validity and reliability.

Data collection was conducted through online survey distribution using institutional communication channels to ensure broad participation. Respondents were informed about the purpose of the study and assured of confidentiality and anonymity to minimize response bias. Participation was voluntary, and informed consent was obtained prior to questionnaire completion. The use of digital data collection methods facilitated efficient data management and increased response accessibility across different institutional units.

The data analysis technique employed in this study was Structural Equation Modeling (SEM), specifically using the Partial Least Squares (PLS-SEM) approach. PLS-SEM was selected due to its suitability for predictive research models, its flexibility with non-normal data distributions, and its effectiveness in analyzing complex mediation relationships. The analysis consisted of two main stages: measurement model evaluation and structural model evaluation. The measurement model assessment included convergent validity (outer loading  $> 0.70$ , Average Variance Extracted  $> 0.50$ ), discriminant validity (Fornell–Larcker criterion and cross-loading analysis), and reliability testing (Cronbach's Alpha and Composite Reliability  $> 0.70$ ).

The structural model evaluation examined path coefficients, coefficient of determination ( $R^2$ ), effect size ( $f^2$ ), and predictive relevance ( $Q^2$ ). Hypothesis testing was conducted using bootstrapping procedures with 5,000 resamples to determine the significance of direct and indirect effects. The mediating role of leadership effectiveness in the relationship between AI implementation and human resource performance was assessed using indirect effect significance and variance accounted for (VAF) analysis.

Through this quantitative methodology, the study aims to provide empirical evidence regarding the extent to which Artificial Intelligence implementation influences leadership effectiveness and human resource performance within higher education institutions. The structured design ensures statistical rigor, measurement reliability, and theoretical alignment, supporting the contribution of this research to digital transformation and organizational performance literature.

## **RESULTS AND DISCUSSION**

### **1. Descriptive Statistics**

This study involved 286 respondents consisting of academic and administrative staff from higher education institutions that have implemented Artificial Intelligence (AI)-based systems in

managerial and operational processes. Descriptive analysis was conducted to examine the general perception of respondents regarding the research variables.

Table 1. Descriptive Statistics

Variable	Mean	Std. Deviation
AI Implementation	4.12	0.56
Leadership Effectiveness	4.05	0.61
Human Resource Performance	4.18	0.52

Table 1 shows that all variables have mean values above 4.00, indicating that respondents perceive AI implementation, leadership effectiveness, and human resource performance to be at a high level. The relatively low standard deviation values suggest consistent perceptions across respondents.

## 2. Measurement Model Evaluation

The measurement model was evaluated to assess convergent validity, discriminant validity, and reliability.

Table 2. Validity and Reliability Assessment

Variable	Outer Range	Loading AVE	Composite Reliability	Cronbach's Alpha
AI Implementation	0.72–0.88	0.64	0.91	0.88
Leadership Effectiveness	0.74–0.90	0.67	0.92	0.89
HR Performance	0.76–0.89	0.69	0.93	0.90

All outer loading values exceed 0.70, AVE values are above 0.50, and both Composite Reliability and Cronbach's Alpha are greater than 0.70. These results confirm that the measurement model satisfies the criteria for validity and internal consistency reliability.

## 3. Structural Model Evaluation

The structural model was analyzed using bootstrapping procedures with 5,000 resamples.

Table 3. Path Coefficients

Hypothesis	Relationship	Path Coefficient	t-value	p-value
H1	AI → Leadership Effectiveness	0.61	11.42	0.000
H2	AI → HR Performance	0.34	5.87	0.000
H3	Leadership Effectiveness → HR Performance	0.49	8.15	0.000

All path coefficients are positive and statistically significant ( $t > 1.96$ ;  $p < 0.05$ ). AI implementation significantly influences leadership effectiveness and human resource performance. Leadership effectiveness also significantly affects human resource performance.

The coefficient of determination ( $R^2$ ) shows that AI implementation explains 37% of the variance in leadership effectiveness, while AI implementation and leadership effectiveness together explain 58% of the variance in human resource performance. This indicates moderate-to-strong explanatory power.

#### 4. Mediation Analysis

Table 4. Indirect Effect Analysis

Relationship	Indirect Effect	t-value	Mediation Type
AI → Leadership → HR Performance	0.30	6.74	Partial Mediation

The indirect effect is statistically significant, confirming that leadership effectiveness partially mediates the relationship between AI implementation and human resource performance.

The empirical findings confirm that Artificial Intelligence implementation significantly enhances leadership effectiveness in higher education institutions. AI-driven systems provide leaders with structured analytics, predictive insights, and real-time performance dashboards that strengthen strategic planning and monitoring capabilities. The availability of institutional data supports evidence-based decision-making and reduces reliance on intuition-based governance. This finding aligns with digital leadership research emphasizing that intelligent technologies expand managerial capacity and strategic responsiveness in complex organizational environments (Saychenko, 2026; Zhang et al., 2023).

The direct effect of AI implementation on human resource performance further demonstrates that digital integration improves productivity, task efficiency, and innovation contribution among employees. Automation reduces administrative redundancy, while data analytics enhances performance evaluation accuracy. These improvements enable staff to allocate more effort toward academic and strategic functions. The result supports prior evidence that AI adoption contributes to productivity gains when embedded within operational systems and aligned with organizational objectives (Härkänen et al., 2021; Yi, 2021).

Leadership effectiveness also exerts a significant influence on human resource performance, highlighting the central role of managerial capability in digital transformation contexts. Effective leaders foster clarity, encourage collaboration, and guide technological adaptation processes, thereby improving workforce outcomes. In higher education settings, adaptive and data-informed leadership strengthens institutional coherence and employee engagement. This finding is consistent with studies indicating that digital-era leadership positively affects organizational performance and innovation outcomes (Hsu et al., 2026; Sharma et al., 2023).

The mediation analysis provides deeper insight into the structural dynamics of digital transformation. Leadership effectiveness partially mediates the relationship between AI implementation and workforce performance, indicating that technology alone is insufficient to generate optimal outcomes. Leadership functions as a strategic enabler that translates AI capabilities into actionable institutional practices. This finding contributes novel empirical evidence by quantitatively demonstrating the bridging role of leadership within an integrated structural model in the higher education context (R et al., 2025; Zhao & Li, 2022).

Compared to earlier studies that examined AI adoption, leadership, or performance outcomes independently, this research offers a more comprehensive framework by simultaneously testing direct and indirect effects. The integrated model clarifies how AI investment influences organizational performance through leadership mechanisms, providing a more nuanced explanation of digital transformation processes in academic institutions. This contribution enriches existing literature on AI-enabled governance in higher education (Laukaitis et al., 2025; Thomas & Arnett, 2025).

From a practical perspective, the findings imply that higher education institutions must combine technological investment with systematic leadership development. Strengthening digital literacy, analytical competence, and strategic integration skills among institutional leaders is essential to maximize the performance impact of AI systems. Without managerial readiness, AI

implementation may yield suboptimal returns (Dec et al., 2022; Jianchun, 2024; D. Li, 2024). Future research is recommended to extend this model using longitudinal designs to capture long-term transformation dynamics, include cross-country samples to enhance generalizability, and examine moderating variables such as organizational culture or digital maturity levels to further deepen theoretical understanding of AI-driven institutional change.

## CONCLUSION

This study aimed to examine the effect of Artificial Intelligence (AI) implementation on leadership effectiveness and human resource performance in higher education institutions, as well as to analyze the mediating role of leadership effectiveness in strengthening the relationship between AI implementation and employee performance. Based on the empirical analysis conducted, several structured conclusions can be drawn.

First, the findings confirm that AI implementation has a positive and significant effect on leadership effectiveness. The integration of AI-based systems, including data analytics, automated decision-support tools, and digital performance dashboards, enhances leaders' capacity to make evidence-based decisions, improve strategic responsiveness, and strengthen institutional governance. The results indicate that AI functions not merely as a technological infrastructure, but as a strategic enabler that enhances managerial capability and institutional coordination.

Second, AI implementation significantly improves human resource performance. The use of intelligent systems contributes to increased efficiency, reduced administrative workload, improved accuracy in task execution, and stronger innovation outcomes among academic and administrative staff. AI-driven automation allows employees to allocate more time toward value-added academic and institutional activities, thereby strengthening overall organizational productivity.

Third, leadership effectiveness has a direct and significant impact on human resource performance. Leaders who demonstrate digital competence, adaptive decision-making, and strategic communication create an organizational climate that supports collaboration, engagement, and performance optimization. Effective leadership ensures that technological transformation is translated into operational improvements rather than remaining at the level of technical adoption.

Fourth, leadership effectiveness partially mediates the relationship between AI implementation and human resource performance. This indicates that the success of AI adoption in higher education institutions depends not solely on technological readiness, but also on leadership capability in managing digital transformation. AI provides analytical capacity and operational support, while leadership determines alignment, direction, and human integration. Therefore, leadership acts as a strategic bridge that transforms technological investment into measurable performance outcomes.

Overall, this study demonstrates that sustainable performance improvement in higher education institutions requires an integrated approach combining technological innovation and leadership capability. AI implementation without effective leadership may produce limited organizational impact, whereas leadership supported by intelligent systems can significantly enhance institutional competitiveness and workforce productivity.

The findings imply that higher education institutions should integrate AI adoption strategies with leadership development programs focused on digital literacy, data-driven decision-making, and change management competencies. Institutional policies should emphasize not only technological infrastructure investment but also human capital strengthening to ensure long-term performance sustainability.

For future research, it is recommended to conduct longitudinal studies to assess long-term impacts of AI integration, incorporate cross-country comparative analysis, and examine moderating variables such as digital organizational culture, institutional governance structure, and technological readiness levels. Expanding the research model to include innovation performance or academic quality indicators may also provide deeper insight into AI-driven transformation in higher education contexts.

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