

AI-Driven Educational Management and Sustainable School Performance: The Mediating Role of Teacher Innovation and the Moderating Role of Digital Leadership in Jordanian Schools

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Abstract

The current study aims to examine the effect of artificial intelligence (AI) in educational management on sustainable school performance in Jordanian schools, with the mediators of teachers' innovation and the moderators of digital leadership. This study devoted a quantitative cross-sectional survey design with an online questionnaire and examined the proposed moderated mediation model by using PLS-SEM analysis. The research used a quantitative cross sectional survey design with an online questionnaire, and a moderated mediation model was tested using PLS-SEM analysis on teachers and administrators from public and private schools in Jordan (n=387). The results indicate that the relationship between AI in educational management and sustainable school performance has a positive effect, and that teacher innovation plays a part in this. In addition, digital leadership can have a significant implied impact in the relationship between AI in education management and teacher innovation, therefore strengthening the direct impact on sustainable school performance. The study contributes novel experimental evidence from the Jordanian educational context and highlights the importance of integrating AI technologies with teacher innovation and effective digital leadership to achieve sustainable institutional outcomes, enhance educational quality, and support educators during digital transformation.

Keywords: AI-driven educational management, sustainable school performance, teacher innovation, digital leadership, Jordan, structural equation modeling

1. Introduction

Artificial Intelligence (AI) has gradually amended the way schools are managed around the world, revolutionizing school management (Chen, Chen & Lin, 2020; Crompton & Burke, 2023). In the digital age, AI-driven systems impart unparalleled capabilities for data-driven decision-making, personalized learning experiences, and administrative efficiency in educational institutions (Holmes, 2026). Bringing these technological possibilities to learning outcomes is, however, an unmanaging and complex task particularly in developing countries where infrastructural and pedagogical changes are still emerging.

The implementation of AI-powered educational management systems in developing countries such as Jordan is a transformative opportunity and a magnet challenge in the realm of sustainable school performance. With more than 2 million students joined in thousands of schools, the Jordanian education system is under tremendous pressure to modernize whilst keeping education of quality, equitable and accessible under limited resources (Homonchuk, Mazzilli, & Kelsall, 2025). This requires careful balancing of the use of global technology and the importance of local

education styles and cultural nuances (ElSayary, 2026). To sustainably raise institutional performance, there is an urgent need to comprehend how smart applications and AI technologies can be effectively leveraged in the field of education (Mbaidin et al., 2026). Sustainable school performance does not only refer to immediate academic outcomes, but also operational efficiency, strategic resource utilization and long-term institutional viability that relates to broader Sustainable Development Goals (SDGs) (Li et al., 2025; Al Qudah et al., 2025).

Importantly, technological infrastructure does not necessarily ensure these sustainable results. The innovation of teachers has been determined as a necessary intervening factor that connects the impact of technology to the improved use of technology and learning outcomes for students (Al-Mahdy & Elwakil, 2026). With the power of AI tools and a forward-thinking school culture, teachers can create innovative teaching methods, encourage creative problem-solving, and adjust to dynamic classroom settings (Ghamrawi, Shal, & Ghamrawi, 2026). This is consistent with the idea though that professional capital is deeply restructured when teachers can effectively use digital resources creatively and with confidence (Hargreaves & Fullan 2010). Moreover, the successful integration of AI could have a profound impact on the quality of the education provided and on the future anxiety of teachers who face these challenging digital transitions (Beirat et al., 2025). In this sense, teacher innovation is the key human link to let loose the potential of AI managerial systems, driven by teacher AI self-efficacy.

The implementation of AI and the development of school innovation, however, rest largely on the capacity of school administration, particularly of digital leadership. Digital leadership is critical for guiding educational organizations through the process of effectively embracing and navigating technological change, which includes building a culture of innovation, offering strategic vision, and integrating context-appropriate and ethical AI use (Abu-Tineh et al., 2025). The development of agility in pedagogical leadership in the Jordanian context is a prerequisite for solving the ethical, spiritual and practical dimensions single to educational management, which are deeply rooted in the role of AI in educational management (Khasawneh, Khasawneh, & Khasawneh, 2026). School leaders with effective digital governance practices can shape decision-making processes to adopt an atmosphere that encourages teachers to take risks, test ideas, and innovate without fear of failure (Shahwan, Abuhussein, & Al-Tarawneh, 2026). Even the most sophisticated AI systems can become a chore to manage without the responsive and agile leadership to support them to enable sustainable improvement.

While the world is attractive more conscious about educational technology, in Middle Eastern contexts, there is a lack of empirical research studies on the complexity and intertwined nature of the relationships between AI-based management and teacher innovation, digital leadership, and sustainable school performance. To fill this rich gap in the knowledge, this study proposes and tests a comprehensive weakened mediation model based on the theoretical framework of technological innovation processes and the diffusion of innovations (DIT) model developed by Rogers (1962) and Tornatzky, Chakrabarti, and Fleischer (1990) in the context of Jordanian schools. First, the research has provided significant insights into the field of literature by getting bigger the scope of the study of the use of AI in educational management from a developed country context. Second, it relinquishes teacher innovativeness as a critical link between AI-driven school management and the impact of sustainable school performance. Third, digital leadership is a required boundary condition to enhance the impact of the use of AI, providing guiding and concrete advice to policy makers and educators working towards coherent and sustainable developments in education. In

conclusion, the study proposals valuable empirical insights to inform the development of aimed interventions that can make AI as a tool truly a driver for educational equity and sustainability.

2. Literature Review and Hypotheses Development

2.1 AI-Driven Educational Management and Sustainable School Performance

AI-based educational management focuses on educating school administration and instruction using machine learning algorithms and predictive analysis, automated assessment systems, and intelligent decision-making support tools (Chen, Chen, & Lin, 2020; Crompton & Burke, 2023). These ecosystems can enable data-informed decision-making, individual student journeys, and effective resource allocation. In the context of Dynamic Capabilities Theory, AI integration is seen as a strategic competency for an organization, enabling educational institutions to identify, capture, and adapt their working processes to meet the dynamic nature of educational needs.

Sustainable school performance is distinct as the ability of an educational institution to achieve high levels of performance in terms of achievement, efficiency and satisfaction of stakeholders over time to meet the broader Sustainable Development Goals (SDGs) (Li et al., 2025). Studies have shown that AI technologies can contribute to various aspects of school performance by developing school administration, working efficiency, and school effectiveness in teaching, and better student outcomes (Al Qudah et al., 2025). Research shows that educational technology integration has a positive correlation with organizational performance measures. For example, the use of AI based insight is known to greatly improve sustainable organizational performance by expanding the use of resources and by encouraging proactive innovation (Mahade et al., 2025). Initial findings in the Jordan context indicate that enterprises adopting digital management and AI systems experience significant enhancements in decision-making, leadership agility, and overall performance, with results showing tangible benefits (Alrifae et al., 2026; Mbaidin et al., 2026).

Based on this theoretical and empirical foundation, we propose:

H1: AI-driven educational management has a significant positive effect on sustainable school performance.

2.2 The Mediating Role of Teacher Innovation

Teacher innovation is the ability of teachers to create, adopt and implement new teaching methods, new instructional material, and new ways of assessment to upgrade learning outcomes (Al-Mahdy & Elwakil, 2026). Innovation from teachers could be technological pedagogical and creative problem solving in classroom practices, a skill that is required to manage with complex education environments (Behizadeh, 2023).

The Diffusion of Innovations Theory of Rogers (1962) states that when there are relative advantages and compatibility with lasting practices, then the technology is easier to uptake. AI and education management systems enable educators to utilize highly powerful resources for assessing students, tailoring instruction, and developing skills in novel ways (Holmes, 2026). Optimizing administrative workloads and allowing teachers to dedicate their time and energy to artistic learning design and student engagement approaches. Teachers using AI-powered analytics are also more willing to try new teaching methods, research shows. In addition, the successful implementation of AI can bring about great improvements in the quality of education, and it can also help to alleviate anxiety among Jordanian teachers as they adapt to digital transitions in the future (Beirat et al., 2025).

Teacher innovation is a key mediating variable for Professional Capital (Hargreaves & Fullan, 2010). AI-driven management affects sustainable school performance not only, but also subtly, through promoting innovative teaching practices. With the power of AI tools and an innovative school climate, educators can innovate, experiment and discover new pedagogical methods, while also adapting to the dynamic nature of the classroom (Ghamrawi, Shal, & Ghamrawi, 2026).

H2: Teacher innovation mediates the relationship between AI-driven educational management and sustainable school performance.

2.3 The Moderating Role of Digital Leadership

Digital leadership involves the skills, knowledge, and attributes of school leaders as they plan, champion, and implement technology-integration efforts that have the capacity to change the way education is delivered. In the technology-organization-environment (TOE) Framework (Tornatzky, Chakrabarti, & Fleischer, 1990), the leadership of the organization is one of the key factors that affects positive technological adoption. Digital leaders are technologically pedagogical knowledgeable, have the skills of change management, and can establish cultures of innovation within their teams (Abu-Tineh et al., 2025).

Leadership support and guidance play a key role in the success of AI-driven educational management systems. digital leaders are essential for resource allocation, professional learning, overcoming implementation obstacles, and cultivating a positive culture for implementing technology. Generally, adaptable educational leadership is needed in the Middle East to guarantee the effective and ethical use of AI policies and policies, with an emphasis on innovation alongside tradition (ElSayary, 2026). Even advanced AI solutions could fall short of their goals if they are not led by strong digital initiatives. Moreover, pedagogical leadership agility is critical for exchanging with the specific ethical, spiritual and practical aspects of educational leadership in Jordan (Khasawneh, Khasawneh, & Khasawneh, 2026).

Strong digital governance abilities by school leaders can positively influence decision-making processes and foster a positive environment within the school that encourages teachers to try new things and innovate (Shahwan, Abuhusseini, & Al-Tarawneh, 2026). In contrast, poor leadership support can limit teachers' willingness to be innovative, even if technology is present. In this context, digital leadership plays a key role as a boundary condition that enhances the impact of implementing AI.

H3: Digital leadership moderates the relationship between AI-driven educational management and teacher innovation, such that the relationship is stronger when digital leadership is high.

H4: Digital leadership moderates the indirect effect of AI-driven educational management on sustainable school performance through teacher innovation, such that the mediated relationship is stronger when digital leadership is high.

2.4 Direct Effect of Teacher Innovation on Sustainable School Performance

Teacher innovation has multiple pathways to viable school performance, as explained by Organizational Learning Theory and the notion of professional capital (Hargreaves & Fullan, 2010). Teaching and learning are innovative and have a positive effect on learning outcomes, the quality of the teaching and learning process, and the school climate. High levels of teacher innovation within the schools showed greater flexibility in meeting educational demands, better problem-solving abilities and a more positive culture of continuous improvement (Al-Mahdy & Elwakil, 2026).

In addition, sustainable educational outcomes make teacher empowerment as well as creating an innovative school climate in the process of change leadership (Al-Mahdy & Elwakil, 2026). They are attributes that are necessary to ensure long-term performance in a dynamic learning context and are straight linked to sustainability leadership objectives in the digital era (Al-Hazaima et al., 2025).

H5: Teacher innovation has a significant positive effect on sustainable school performance.

3. Conceptual Framework

The conceptual model for this research was developed based on the synthesized literature and the formulated hypotheses and is presented in the form of an abstract model as shown in Figure 1. The model is based on the Technology-Organization-Environment (TOE) model (Tornatzky et al., 1990), making AI-based educational management the main sovereign variable that affects sustainable school performance, as reflected in the three key dimensions of the thoughts of institutional viability and operational efficiency, and alignment with general educational sustainable development goals, respectively (Li et al., 2025).

The framework explicitly assumes that the direct control of the AI applied in management is positive with regards to sustainable performance (H1). Moreover, it intends teacher innovation as an important mediating factor (H2). Based on this mediation, pedagogical innovation will be identified in using AI tools, which will lead to new teaching methods that are exhibited in the academic and operational results of educators in the learning process (Al-Mahdy & Elwakil, 2026).

Importantly, the model includes a moderating factor of digital leadership. Theorizing digital leadership to play a significant role in attractive the digital management –teacher innovation nexus (H3). Teachers need the strategic vision, moral leadership, and caring environment that effective school leaders can create so they can feel confident about using AI tools and innovations in their lessons (Abu-Tineh et al., 2025; Khasawneh et al., 2026). Relying on this moderation, this is also liable to strengthen the indirect, mediated route to sustainable school performance (H4). Finally, there is a shortest positive relationship between teacher innovation and sustainable school performance (H5), which echoes the idea that human capital and professional agility is critically important to long-term institutional success (Hargreaves & Fullan, 2010). These complex and interrelated pathways will be estimated through Partial Least Squares Structural Equation Modeling (PLS-SEM) for a thorough examination of these complex relationships (Hair, 2021).

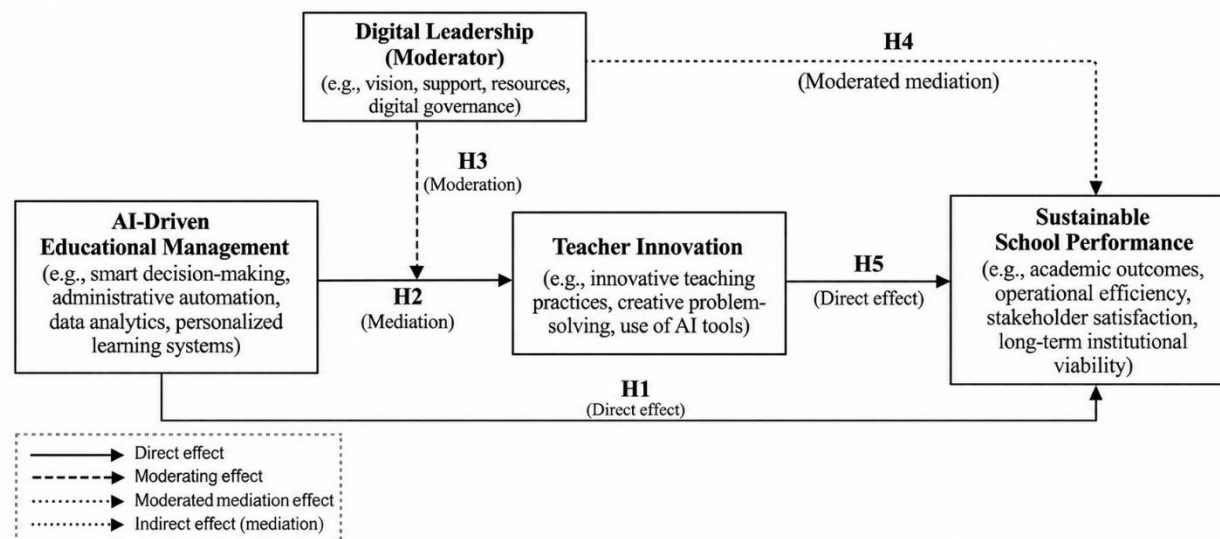


Figure 1: Conceptual Framework

Note: The model explains the direct and indirect impact of AI education management on sustainable school performance, with the influence of teacher innovation playing the role of a mediator and the digital leadership as a moderator between AI education management and teacher innovation.

4. Methodology

4.1 Research Design and Sample

The use of a quantitative cross-sectional survey design was used in this study to test the recommended moderated mediation model. The target population consisted of teachers and school administrators from both public and private schools in the governorates of Amman, Irbid, and Zarqa in Jordan. This geographical focus builds on more recent research on the electoral economy and systemic coherence of the Jordanian education sector (Homonchuk, Mazzilli and Kelsall, 2025). The schools selected (30 public and 15 private) were decided as a stratified random sample of the schools distributed in the national educational scene.

A priori the required sample size was determined permitting to the G*Power 3.1 software. Faul, Erdfelder, Buchner, and Lang (2009) recommended at least 350 participants to detect medium effect sizes ($f^2 = 0.15$) with a level of 80% statistical power at a significance level of $\alpha = 0.05$. A total of 550 questionnaires were sent out with a 74.9% response rate of 412 responses. A total of 387 valid responses were analysed after screening and eliminating inadequate responses and multivariate outliers.

Table 1: Sample Demographics

Characteristic	Category	Frequency	Percentage
Gender	Male	142	36.7%
	Female	245	63.3%
Age	25-35 years	128	33.1%
	36-45 years	156	40.3%
	46+ years	103	26.6%

School Type	Public	267	69.0%
	Private	120	31.0%
Experience	< 5 years	89	23.0%
	5-10 years	112	28.9%
	> 10 years	186	48.1%

4.2 Measures

A multi-item scale was used for each construct to measure that construction which had previously been validated in the educational setting. The instruments were interpreted to Arabic using the extensive back-translation methodology and were used to achieve conceptual results and contextual validity. The solutions were rated using a five-point Likert scale (1 = strongly disagree to 5 = strongly agree).

The scale for AI-Driven Educational Management (8 items) was taken from the most recent reviews of AI in education (Chen, Chen, & Lin, 2020; Crompton & Burke, 2023). One of the sample items is: "Our school employs systems to observe student performance and make decisions using AI. Scale had good internal structure (Cronbach's $\alpha = 0.89$, Composite Reliability [CR] = 0.91, Average Variance Extracted [AVE] = 0.67).

Teacher Innovation was evaluated using a scale that reflects teachers' ability to create new pedagogy in new school climates (Al-Mahdy & Elwakil, 2026; Ghamrawi, Shal, & Ghamrawi, 2026). Examples of sample items include: "I frequently create new methods to teach with digital technology to improve learning engagement" and "I connect with student engagement by creating new ways of instruction about digital technology." Reliability metrics were excellent ($\alpha = 0.91$, CR = 0.93, AVE = 0.71).

Digital Leadership (9 items) was assessed through a supported instrument for measuring school leaders' digital competency and AI-driven pedagogical leadership agility (Abu-Tineh et al., 2025; Khasawneh, Khasawneh, & Khasawneh, 2026). Sample item: Our school leaders guide and support technology integration successfully. The scale showed high reliability ($\alpha = 0.92$, CR = 0.94, AVE = 0.69).

A multidimensional scale developed based on the foundational research of Hargreaves & Fullan (2010) and the literature on the relation of education and SDG was consumed for Sustainable School Performance (10 items). It spans academic results, operational effectiveness and sustainability of resources. The sample item is: "Academic achievement and efficiency of operation of our school are continued over time. Reliability was robust ($\alpha = 0.93$, CR = 0.95, AVE = 0.73).

Demographic variables, such as gender, age, education level, teaching experience, school type, and duration using the AI system, were also encompassed as control variables because they significantly disturb the adoption of technology and concern about its future in the classroom, as pointed out by Beirat et al. (2025) for educators.

4.3 Data Analysis

Data analysis was carried out first by informative data analysis with the help of IBM SPSS 28.0 software and followed by structural equation modeling operating software SmartPLS 4.0. Partial least squares Structural Equation Modeling (PLS-SEM) was used in this study because it is especially suitable for prediction-oriented research, complex models with moderating and mediating effects, and it is robust with non-normal data distributions (Hair, 2021).

The analysis was carried out in two severe phases. To acquire reliability and validity, indicator loadings, Cronbach's alpha, Composite Reliability (CR), Average Variance Extracted (AVE), and the Heterotrait-Monotrait (HTMT) ratio were examined in this preliminary step. Second, the structural model was calculated to test the hypothesized paths with the value of the path coefficients (β), coefficient of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2). Improved methodological standards in sustainability and educational management studies (Al-Hazaima et al., 2025; Mahade et al., 2025) guided the use of a bootstrapping procedure with 5,000 subsample sizes to receive bias-corrected confidence intervals for CIEs to rigorously test the moderated mediation hypotheses (H3, H4).

5. Results

5.1 Descriptive Statistics and Correlations

Before structural modeling, descriptive statistics and Pearson correlation analyses were accomplished to explore the central tendencies, dispersion and bivariate relationship amongst the study variables. All the primary constructs were found to be normally distributed, as shown in Table 2, with skewness values ranging from -0.42 to 0.38, and kurtosis from -0.51 to 0.67, which are acceptable ranges for multivariate normality of ± 2.0 .

The correlation matrix shows strong and positive relationships between the main variables, which benefits to support the hypothesized relationships. The correlations between teacher innovation and sustainable school performance were both positive and high, with $r > 0.58$ and $p < 0.01$ for both variables and AI-driven educational management. Digital leadership was also strongly connected to teacher innovation ($r = 0.62$, $p < 0.01$) and sustainable school performance ($r = 0.57$, $p < 0.01$). This suggests that a link between systemic coherence and digital integration with institutional resilience is emerging in the Jordanian domain of education, as was examined recently (Homonchuk, Mazzilli, & Kelsall, 2025). The amounts of teaching experience and school type were modestly correlated with sustainable performance but were significant, warranting their inclusion in the structural model to isolate the unique effects of the primary constructs.

Table 2: Descriptive Statistics and Correlation Matrix

Variable	Mean	SD	1	2	3	4	5	6	7
Gender	1.63	0.48	1.00						
Age	2.12	0.89	0.08	1.00					
Teaching Exp.	2.67	1.12	0.11*	0.72**	1.00				
AI-Driven Mgt.	3.42	0.78	-0.03	0.14**	0.09	1.00			
Teacher Innov.	3.67	0.82	0.06	0.19**	0.13*	0.58**	1.00		
Digital Lead.	3.28	0.91	-0.02	0.11*	0.07	0.51**	0.62**	1.00	
Sust. Perf.	3.54	0.85	0.04	0.16**	0.12*	0.61**	0.68**	0.57**	1.00

Note: N = 387; * $p < 0.05$, ** $p < 0.01$; Gender: 1=Male, 2=Female; Age: 1=25-35, 2=36-45, 3=46-55, 4=55+

5.2 Measurement Model Assessment

To achieve convergent and discriminant validity, the measurement model was evaluated, following PLS-SEM guidelines (Hair, 2021). As shown in Table 3, all loadings were greater than 0.708, which checks that each item was a good indicator of the latent construction measured. The internal consistency reliability was accepted with a Cronbach's Alpha (CA) ranging from 0.89 to 0.93 and a Composite Reliability (CR) from 0.91 to 0.95, which are all above 0.70.

In addition, the convergent validity was authorized, because all constructs showed an Average Variance Extracted (AVE), which is higher than the 0.50 mark (range 0.67 to 0.73), and explained over 50% of the variance of the indicators.

Rigorous assessment of discriminant validity was carried out based on two measures: Fornell-Larcker criterion and Heterotrait-Monotrait (HTMT) ratio. The square root of the AVE for each of the constructs overdoes the highest correlation between each construct. Furthermore, all HTMT ratios were below the conservative level of 0.85, ranging from 0.58 to 0.74, which also demonstrates that the constructs are analytically distinct. The indexes of variance inflation factor (VIF) for all indicators were below 3.0 (2.18 to 3.02), and thus multicollinearity was not a problem in the structural model.

Table 3: Measurement Model Results

Construct	Indicator	Outer Loading	Cronbach's Alpha (α)	Composite Reliability (CR)	Average Variance Extracted (AVE)	VIF Range
AI-Driven Mgt.	AIEM1 – AIEM8	0.79 – 0.85	0.89	0.91	0.67	2.18 – 2.51
Teacher Innov.	TI1 – TI7	0.82 – 0.88	0.91	0.93	0.71	2.41 – 2.89
Digital Lead.	DL1 – DL9	0.80 – 0.86	0.92	0.94	0.69	2.47 – 2.91
Sust. Perf.	SSP1 – SSP10	0.82 – 0.88	0.93	0.95	0.73	2.58 – 3.02

Note: CA = Cronbach's Alpha; CR = Composite Reliability; AVE = Average Variance Extracted; VIF = Variance Inflation Factor; **p < 0.001

Validation of the discriminant validity was carried out by Fornell-Larcker criterion and HTMT ratio. Each square root of AVE values was higher than inter-construct correlations, and the HTMT values were found between 0.58 to 0.74, that is below than the threshold value of 0.85.

5.3 Structural Model Results

The hypothetical relationships were evaluated in the structural model. When model fit was judged, the Standardized Root Mean Square Residual (SRMR) was computed and was 0.067, which was well below the more stringent 0.08 criteria, indicating a good fit between the hypothesized model and the empirical data. The explanatory power of the model was strong, with R^2 values showing that AI management and digital leadership accounted for 52% of the variability in teacher innovation, and the whole of the predictors accounted for 61% of the variability in sustainable school performance. Amongst the teacher innovation variables, the predictive value (Q^2) of the model, obtained by blindfolding, was found to be 0.48, which is well upstairs the zero level, and the predictive value (Q^2) of the model for the sustainable school performance variable was 0.57.

Each of the direct hypotheses was supported, as informed in Table 4. The impact of AI educational management on sustainable school performance was significant and positive (H1: $\beta = 0.42$, $t = 8.40$, $p < 0.001$). In addition, teacher innovation had a strong direct positive impact on sustainable school performance (H5: $\beta = 0.47$, $t = 9.40$, $p < 0.001$).

The results are in line with modern research which stresses that the way technology is integrated effectively can directly improve the sustainability of institutions and their operational efficiency (Al Qudah et al., 2025; Li et al., 2025).

Table 4: Structural Model Results and Hypothesis Testing

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	142	36.7%
	Female	245	63.3%
Age	25–35 years	128	33.1%
	36–45 years	156	40.3%
	46+ years	103	26.6%
School Type	Public	267	69.0%
	Private	120	31.0%

Note: AIEM = AI-Driven Educational Management; TI = Teacher Innovation; DL = Digital Leadership; SSP = Sustainable School Performance; SE = Standard Error; CI = Confidence Interval

Model Fit Indices:

- SRMR = 0.067 (below 0.08 threshold)
- NFI = 0.912 (above 0.90 threshold)
- R^2 (Teacher Innovation) = 0.52
- R^2 (Sustainable School Performance) = 0.61
- Q^2 (Teacher Innovation) = 0.48
- Q^2 (Sustainable School Performance) = 0.57

5.4 Mediation and Moderation Analysis

The mediating effect of teacher innovation (H2) and the facilitated mediation effect (H4) were tested using the bootstrapping procedure with 5000 sub-samples. As for H2, the results confirmed that there is a significant indirect effect of teacher innovation on sustainable school performance when managing with AI-driven management, $\beta = 0.28$, [0.20, 0.36], not including zero.

Moreover, digital leadership has a significant moderate effect on the link between AI-oriented management and teacher innovation (H3: $\beta = 0.19$, $p < 0.01$). Simple slope analysis was operated. The association between teacher innovation and AI-driven management was positive, significant, and low ($\beta = 0.34$, $p < 0.001$), as depicted in Figure 2 and detailed in Table 5, particularly for low levels of digital leadership. However, when the level of digital leadership is high, this relationship was significantly strengthened ($\beta = 0.53$, $p < 0.001$). Consequently, the conditional indirect effect of AI-

driven management on sustainable school performance via teacher innovation was also knowingly stronger when digital leadership was high (Indirect Effect = 0.38, 95% CI [0.26, 0.50]) compared to when it was low (Indirect Effect = 0.18, 95% CI [0.08, 0.28]). The index of moderate mediation was significant ($\beta = 0.15$, 95% CI [0.05, 0.25]), fully supporting H4. In the context of educational administration, it should be famous that this resonates with more recent moderated mediation models in this field, which specify that agile leadership is a crucial mechanism for turning technology into innovation in human capital (Mahade et al., 2025; Al-Hazaima et al., 2025).

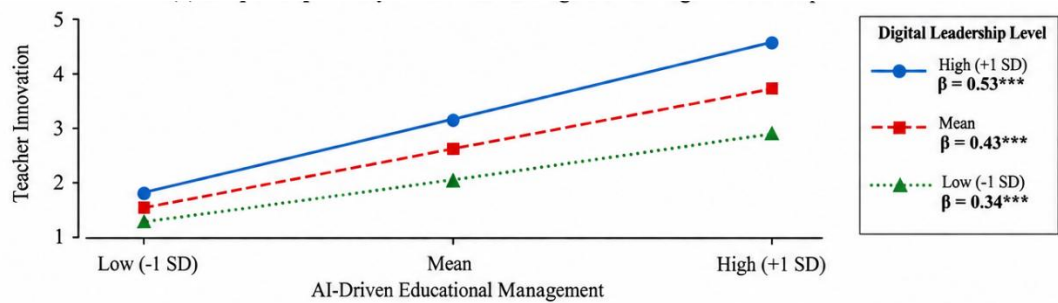


Figure 2: Moderated Mediation Model with Path Coefficients

Table 5: Conditional Indirect Effects on Different Levels of Digital Leadership

Digital Leadership Level	Indirect Effect	Boot SE	Boot LLCI	Boot ULCI	Significance
Low (-1 SD)	0.18	0.05	0.08	0.28	Significant
Mean	0.28	0.04	0.20	0.36	Significant
High (+1 SD)	0.38	0.06	0.26	0.50	Significant
Index of Moderated Mediation	0.15	0.05	0.05	0.25	Significant

Note: Boot SE = Bootstrap Standard Error; LLCI = Lower-Level Confidence Interval; ULCI = Upper Level Confidence Interval; 5,000 bootstrap samples

Simple slope analysis revealed that the relationship between AI-driven management and teacher innovation was significant at low levels of digital leadership ($\beta = 0.34$, $p < 0.001$), but substantially stronger at high levels ($\beta = 0.53$, $p < 0.001$), confirming the moderating role of digital leadership.

6. Discussion

The present study investigated the sophisticated relationship between the use of AI in education management, teacher innovation, digital leadership, and sustainable school implementation in Jordanian schools. Results support all five hypotheses, with strong empirical support and theoretical and practical contributions for educational stakeholders in developing contexts.

6.1 Theoretical Implications

First, this study confirms that AI-based educational management positively impacts upon sustainable school performance directly (H1). This result aligns with the Technology-Organization-Environment (TOE) framework of Tornatzky, Chakrabarti, and Fleischer (1990) in that AI is not merely a tool for managing the workplace but a resource that strengthens institutions' viability, efficiency, and connection to Sustainable Development Goals (SDGs). The study's findings align with prior research on the topic in developed countries, confirming the link between AI and improving educational systems, specifically in resolving issues that hinder the system's coherence in the Middle East context (Homonchuk et al., 2025).

Second, the finding that teacher innovation is a part mediator (H2) helps further research on the mechanisms through which technology-induced gains in performance occur. The findings align with the Diffusion of Innovations theory (Rogers, 1962) and the notion of professional capital (Hargreaves & Fullan, 2010), suggesting that AI systems to have a lasting impact, they need to be vigorously accepted by teachers. As teachers use artificial intelligence tools to create innovative pedagogical approaches, they connect the technology with real results in student learning (Al-Mahdy & Elwakil, 2026; Ghamrawi, Shal, & Ghamrawi, 2026). The role of technology is just a small part of the equation, and it's the people who can leverage its capabilities that are providing the true value of AI investments.

Third, the study finds digital leadership as must moderating boundary condition (H3 and H4). Considerable interaction between the two factors suggests a possible pronounced rise in the positive influence of AI-based management on teacher innovation at high levels of digital leadership. This conclusion aligns with the recent conceptual approaches of pedagogical leadership agility in AI that focus on the ethical, spiritual, and practical dimensions of technology use to foster a positive and innovative learning climate (Khasawneh, Khasawneh, & Khasawneh, 2026; ElSaiyary, 2026). AI-assisted teachers feel allowed through effective digital governance and change in decision-making processes, free from future anxieties and technological resistance (Shahwan, Abuhussein, & Al-Tarawneh, 2026; Beirat et al., 2025). Based on that, the diminished mediation effect (H4) depicts a triad of synergy: AI infrastructure is the enabler of innovation, digital leadership is the accelerator of its impact, and sustainable school performance the result.

6.2 Practical Implications

The results have several policy implications, which could be beneficial to teacher training institutions, school administration and policy makers in Jordan and other settings.

Enabling AI with a Human-Centric Approach: Educational leaders should look for an AI system that can directly facilitate pedagogical innovation, not just administrative automation. Teachers' AI self-efficacy and creative confidence must be proved by an investment (Al-Mahdy & Elwakil, 2026) as suggested by the high mediation effect. Specialized training for school superintendents should be a mandatory requirement for ministries of education, as a powerful moderator of digital leadership. This training should emphasize digital governance, change management, and build an innovative school culture, so that leaders can successfully lead innovation and tradition (Abu-Tineh et al. 2025; ElSaiyary 2026).

Managing Technostress and Future Anxiety: Make sure there are careful psychological and professional support systems in place when implementing AI. Schools must trade a culture of shared communities of practice where teachers are able to examine and discuss safe and effective uses of the advances of AI technologies without fear of

repercussions, in which to use AI will advance the quality of teaching and learning and contribute to the well-being of the teacher (Beirat et al., 2025; Al-Dababneh et al., 2026).

Policy Coherence and Sustainability Alignment: Policies should explicitly link AI integration frameworks with broader sustainability goals. A holistic approach to bearable school performance that integrates the academic, operational, and resource aspects of school performance can empower Jordan to develop a more resilient and equitable education system (Li et al., 2025; Mbaidin et al., 2026).

6.3 Limitations and Future Research

Although this research is strong in methodology and important in consequences, there are some weaknesses that need to be considered. One problem with a cross-sectional design is that it does not allow for clear causal statements. PLS-SEM has good predictive validity, but the relationships between AI management, innovation by teachers, and performance need to be investigated over time as AI systems grow and develop. Second, common method bias may be present because data were self-reported; however, we respected strict procedural and statistical controls as recommended to minimize this possibility (e.g., HTMT, VIF check). Third, the study was limited to a few selected Governorates in Jordan. This can help to offer perspective on what is happening in the context, but further studies are needed to create a bigger matrix of contexts, including rural and marginalized groups to make the results generalizable to more varied socio-economic environments within the country (Homonchuk et al., 2025).

Research is needed to discover other mediators, such as teacher wellbeing, student engagement, or organizational trust, to further enhance understanding of the relationship between AI and performance (Qadeer, 2025; Abdulmuhsin et al., 2025). Furthermore, comparative studies across the Middle East could divulge a cross-national study of how different educational systems are realizing AI, as well as the influence of culture on digital leadership and teachers' innovation (ElSayary, 2026). Thereafter, using mixed-methods techniques like the qualitative interviews with the school leaders and classroom observations would also strengthen the quantitative outcomes by bringing to light the intricacies of how educators experience using AI in the learning space, which would help illuminate the “hows” and “whys” behind their positive self-perceptions regarding AI’s role in education (Behizadeh, 2023; de Araujo et al., 2023).

Finally, the study shows that sustainable school performance in the digital era only can be finished by a synergic alignment of advanced AI driven management systems, empowered and innovative teachers, and agile, visionary digital leadership. The establishment of this triad can facilitate Jordanian schools to overcome the challenges of educational transformation and ensure their sustainability in the long-term.

7. Conclusion

The findings of this study clearly specify that the use of AI for educational management has a significant positive impact on sustainable school performance at Jordanian schools, both directly and indirectly, and a strong intervening role in teacher innovation. Furthermore, Digital leadership is retrieved to be an important moderating variable that can improve these relationships and as a catalyst, make an impact on the potential of technology and the resulting long-term education improvements. The outcomes provide a basis for understanding the necessity for integrated and holistic approaches which involve the use of effective technological systems along with continuous human resources development and adaptable leadership competencies to support school long-term improvement.

It is significant for policy makers, ministry and school officials to recognize that technology alone cannot enable system change, particularly in the context of Jordan and other developing countries. If no intentional effort is made to invest in the human component of the system and technology, it is a mere quick and dirty solution. Yes, it is necessary to develop teachers' innovative capacity and school leaders' digital competence in a systematic way to achieve true and sustainable success. But it would demand aligning national digital education policies and enablers at school level to ensure that technology investments offer enduring educational and operational opportunities for Jordan. The high r^2 is a remarkable empirical reason and explains a substantial 61 per cent of the variance in the school sustainability model. It shows that AI with the support of digital leadership, teacher innovation and management can be a mechanism to a transformative paradigm shift in education directly impacting the heavier sustainable development education agenda.

On the theoretical side, it has contributed completely to the increasing body of literature on the use of AI in education. It introduces valuable empirical data from an unsuccessfully discovered world in educational technology research and adoption, thus transcending Western centrism. It is very useful in clarifying how and when technology will likely lead to or fail to achieve the begged outcome in dynamic and complex classroom environments. The research adds to and enriches the knowledge about digital governance that can lead to less anxiety in the future for educators and foster a culture of enduring pedagogical renewal and problem-solving.

Ultimately, these results offer valuable and evidence-informed guidance for future action and can serve as input to other education systems facing similar challenges in the digital transformation today. They decline the deterministic thinking of technology, which places AI technology in front of the educator as a replacement to the teacher, but rather as a powerful “augmentative” tool that can be used to enlarge the teaching. For the full benefits of this capability shift through AI and for the promise of sustainable, equitable school improvement, there must be a clear focus on how to support teachers as classroom innovators and administrative leaders as imaginative digital architects. This comprehensive human-first solution is crucial to capitalize on the transformative power of AI in education and develop resilient, adaptable, and sustainable education systems that can benefit generations to come.

Declarations

Data and materials are available.

The authors are willing to provide the data underlying the results of this study on reasonable request. The data was gathered from human participants and may include institutional or respondent level potentially sensitive information; therefore the dataset cannot be made publicly available without compromising participant confidentiality and privacy.

Competing Interests

The author has no financial, professional, or personal relationships to disclose that might be construed as a conflict of interest.

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Authors' Contributions

Feryal Yousef Abdel Majeed AlKhatib: Conceptualization, methodology, development of the research framework, data collection, data analysis, interpretation of results, writing the original manuscript, review and editing, and final approval of the manuscript.

The author is responsible for all aspects of the work and has approved the final manuscript for publication.

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Appendix A. Survey Questionnaire

Construct	Code	Survey Item	Response Scale
AI-Driven Educational Management	AIEM1	Our school uses AI-powered systems to support student performance analytics and administrative decision-making.	1–5
	AIEM2	Our school uses artificial intelligence to analyze educational and administrative data.	1–5
	AIEM3	AI-based tools support decision-making processes within our school.	1–5
	AIEM4	Our school uses AI technologies to improve the efficiency of administrative processes.	1–5
	AIEM5	AI-based systems help our school identify educational problems and emerging needs.	1–5

Teacher Innovation	AIEM6	Our school uses intelligent technologies to support personalized learning and instructional planning.	1–5
	AIEM7	AI-driven information helps school administrators allocate educational resources more effectively.	1–5
	AIEM8	AI technologies are integrated into our school management processes to improve overall educational decision-making.	1–5
	TI1	I regularly develop new teaching methods using digital tools to enhance student engagement.	1–5
	TI2	I experiment with new approaches to improve the effectiveness of my teaching.	1–5
	TI3	I develop creative solutions when I encounter challenges in the classroom.	1–5
	TI4	I use AI and digital technologies to develop innovative instructional activities.	1–5
	TI5	I adapt my teaching strategies when new educational technologies become available.	1–5
	TI6	I introduce new instructional materials or assessment methods to improve student learning.	1–5
	TI7	I actively seek innovative ways to improve my professional and classroom practices.	1–5
	DL1	Our school leaders effectively guide and support technology integration initiatives.	1–5
	DL2	School leaders provide a clear vision for the use of digital technologies in education.	1–5
	DL3	Our school leaders encourage teachers to experiment with innovative digital technologies.	1–5
	DL4	School leaders provide adequate resources to support digital transformation.	1–5
Digital Leadership	DL5	Our school leaders provide professional development opportunities related to digital technologies and AI.	1–5
	DL6	School leaders effectively address barriers to the implementation of new technologies.	1–5
	DL7	Our school leaders promote an organizational culture that supports innovation and digital transformation.	1–5
	DL8	School leaders consider ethical and responsible issues when implementing AI and digital technologies.	1–5

Sustainable School Performance	DL9	Our school leaders use digital information and analytics to improve educational decision-making.	1–5
	SSP1	Our school maintains consistent academic achievement over time.	1–5
	SSP2	Our school continuously improves the quality of teaching and learning.	1–5
	SSP3	Our school maintains effective operational efficiency over time.	1–5
	SSP4	Our school uses educational resources efficiently.	1–5
	SSP5	Our school effectively optimizes the allocation of financial, technological, and human resources.	1–5
	SSP6	Our school adapts effectively to changes in the educational environment.	1–5
	SSP7	Our school maintains high levels of stakeholder satisfaction.	1–5
	SSP8	Our school develops practices that support long-term institutional sustainability.	1–5
	SSP9	Our school uses technology to improve long-term educational and operational outcomes.	1–5
	SSP10	Our school has the capacity to maintain and improve its overall performance in the long term.	1–5
			endix A. Survey Questionnaire

Note: All items were measured using a five-point Likert scale: **1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree**. The study reports 34 items across the four constructs: 8 for AI-driven educational management, 7 for teacher innovation, 9 for digital leadership, and 10 for sustainable school performance.