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Transforming Academia: The Role of AI in Shaping Engagement and Organizational Culture

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Abstract
This research investigates the case of implementing Artificial Intelligence (AI) technology in academics and administration functions of the Khyber Pakhtunkhwa (KP) universities in Pakistan along its relation with employee engagement, organizational culture, and leadership support. The research used a designed questionnaire survey and sampled 350 faculty and administrative staff, which was used in this study. The study designed a survey to measure four variables with established scales and through formative measurement: Employee Engagement (EE), AI Integration (AI), Organizational Culture (OC), and Leadership Support (LS). This analysis was done through SPSS and AMOS tools using CFA and SEM to assess the relationships among the constructs and test the hypotheses. The results revealed that AI integration has an affirmative effect on organizational culture while employee engagement acts as an important mediating variable in the relation between AI integration and organizational culture. Also, it was revealed that leadership support plays a moderating role in the relationship between AI integration and employee engagement. This research helps to understand the role of AI in higher education institutions and its impacts on employee engagement and organizational culture while underlining the role of leaders supporting technological integration. The research results indicated that there is a need of strong leadership support for employees to fully utilize the technological features for the optimal positive change in the organizational culture of the universities.

Keywords: AI Integration (AII), Organizational Culture (OC), Leadership Support (LS)

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Introduction

The operations of companies all over the world are being changed by Artificial Intelligence (AI) technology), which is simultaneously impacting communication and innovation for different sectors. As defined in Kaplan & Haenlein (2019), AI or "artificial Intelligence is the capability of a machine to imitate intelligent human behavior... learn adapt, reason, and self-correct" has become pivotal for functioning of contemporary institutions. In the case of advanced education, particularly in universities, AI is being employed for predictive analytics, customized education, and improved operations to allow institutions to survive and even flourish in this newly emerging educational environment. Global universities have adopted AI to improve productivity and nurture adaptable, innovative organizational cultures, thereby leading best practices for effective integration of AI tools (Schmidt & Tschiesner, 2021).

The integration of AI in an institution greatly depends on its organizational culture, which is the shared values, norms, and behaviors within the institution. If integrated optimally, AI can improve a culture of innovation and collaboration enabling universities _adaption_to_ challenges posed in the digital era. This change in culture is heavily reliant on employee engagement, which is an emotional attachement and commitment Kahn (1990) defines as "involvement, and enthusiasm toward their work and organization." According to Sharma et al. (2022), AI has the capability of improving engagement with staff by automating mundane activities, providing actionable insights, and enabling strategic submission. Achieving this, however requires _cultured_ environment devoid of _feeling_ unappreciated and unsupported.

Support from leadership is very crucial in this scenario. Good leadership can manage employee concerns, build trust regarding AI systems, and offer the needed materials and direction for useable participation to take place. Support from leadership, as cited by Yukl (2013), determines the attitudes and behaviors of employees toward AI and, AI use's impact on the culture of an organization. Supporting advocates for AI adoption actively propels the change with sufficient training and strategically AI communicates its relevance closing the gap between contemporary technology and organizational culture.

Having AI in Pakistan's Universities is quite innovative but problematic at the same time. The higher education industry is very bourgeoning but is also stuck in underdeveloped technological frameworks, low budget, and change resistant faculty and admin staff (Ali & Gul, 2020). University leaders do not seem to actively encourage their employees personnel, which restrains supports AI professionally at all. Therefore, most of the institutions are not able to implement AI and culture integration, which stifles innovation and responsiveness.

This particular study highlights an important issue: the lack of a cohesive strategy towards AI adoption across Pakistani universities. Although the intention is to improve efficiency and change the workplace culture, without employing adequate change management strategies, given the low employee buy-in and lack of support from leadership, AI is unlikely to deliver the projected benefits. This gap indicates the need to examine how leadership's role in supporting the organization affects the employee's participation in the processes involving AI for the purpose of organizational culture change. Addressing this

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issue is critical if AI is to meaningfully impact the cultural transformation needed in higher education in Pakistan, enabling universities to sustain global competitiveness and respond to the dynamics of the academic landscape.

Supporting theories and literature review

The application of Artificial Intelligence (AI) technology in universities and other institutions of higher learning is best analyzed through Transformational Leadership Theory and the Technology Acceptance Model (TAM). An example of a transformational AI leader in the context of education is someone who helps motivate and guide university staff to embrace the adoption of new technologies like AI and works seamlessly with advanced technology. Such leaders are more likely to encourage creative and adopt emerging practices due to their intellectual and motivational capabilities vision. Under such leadership, AI is not treated as an interrupter of systems, but as a positively integrated economic shift that requires work on productivity, outcomes, and administration. Aligning with strategies under provided guidance and not losing the support needed assurance works, these leaders help ensure their resources remain AI equipped with trainers. This helps in addressing the campaign's objectives with the support of resources and training that increases employee engagement in well-defined change processes to increase success for enhanced transformation.

Unlike the other models presented, TAM focuses on individual-level determinants such as perceived ease of use (PEOU) and perceived usefulness (PU). In the case of AI integration in universities, TAM posits that faculty and staff will likely accept and make use of AI if it is user-friendly and helpful to their work functionalities. Employees are more likely to utilize new AI technologies when they are presented in a friendly interface and have obvious benefits—for instance, time-saving in administrative tasks or improved teaching and learning processes. In addition, TAM discusses the issue of training and continuous support, which is essential since there is no AI system that is self-evident or easy to employ without prior guidance...

These two points illustrate the dual role of leadership and cognitive factors on the adoption of AI technology. Transformational leadership strategically applies change to nurture a receptive AI environment whereas TAM identifies the driving factors for acceptance at the individual level. Effective AI integration requires visionary leadership that directs its accessibility and usefulness to the university staff, engaging and harnessing innovations in the process.

AI Integration and Employee Engagement

In Pakistani universities, the application of new technologies such as Artificial Intelligence (AI) in the institutions' operational frameworks signifies a major improvement in productivity and employee participation. Because of AI, faculty and staff no longer have to deal with monotonous and repetitious tasks such as record keeping, as they can now focus on constructive, strategic, challenging, and value adding processes. The change mitigates burnout and stress whilst enhancing satisfaction, which also fosters a greater level of engagement. When people are freed from mundane responsibilities and given opportunities to meaningfully participate, their emotional and cognitive allegiance towards an organization increases, which is what employee engagement is about (Sharma et al., 2022). Therefore, the use of AI stands to have a beneficial impact on

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engagement by altering task arrangements through role automation and enhancement of satisfaction through task automation.

Also, AI plays the role of an enabler as employees can make more informed decisions with the data the AI provides them. AI enables faculty and administrative staff to make better and more impactful decisions supporting them with sufficient analytical tools. That, in turn, enhances the feeling of competence, accomplishment, and control which are some aspects an employee needs to be truly engaged as Kahn (1990) suggests in the engagement framework. Furthermore, the existence of AI tools to augment job performance enhances productivity and aligns employees with the goals of the organization which further deepens engagement with the organization.

Additionally, the use of AI provides opportunities for customized learning and professional growth, especially pertinent in the Pakistani university academic context. AI systems can develop specialized training programs for each faculty and staff member that will enable them to meet defined performance targets or achieve their career goals, thus guaranteeing their professional skills and careers development. This level of development customization indicates that the institution is committed to promoting employee development, which is important for sustaining engagement (Yukl, 2013). Those employees who view AI as enabling professional skills and career development are more likely to identify with the strategic objectives of the university, thus forming a positive cycle of engagement and success for the institution.

Lastly, the application of AI technology in Pakistani universities not only automates institutional processes, but also transforms employee engagement for the better, enhancing the quality of work, decision-making, and availability of tailored development initiatives. Enhanced innovation and professional development opportunities due to the integration of AI will increase workforce dynamism and commitment in the higher education sector.

Employee Engagement and Organizational Culture

The dynamics concerning the impact of employee engagement are profoundly interwoven into organizational culture, where employees are both an outcome and contributor of organizational culture. In the case of Pakistani universities, faculty and staff are engaged in the work as well as the institution in an emotional and intellectual manner, which is termed as employee engagement. This commitment enables employees to act with ownership, responsibility, and enthusiasm, to the extent that they help build the values and instill the norms and behaviors that form the identity of the institution (Kahn, 1990). University employees become more positive when they are highly engaged, and their contribution mentality makes them willing to actively support a culture based on collaboration, academic innovation, and excellence, hence turning the organization as a whole into a system where employees feel appreciated, supported, and perceive themselves as key players towards the achievement of the institutional goals. The engagement-culture interrelationship fosters a sustainable organizational dynamism that goes beyond forward-thinking principles.

Employee engagement is influenced by organizational culture as it determines the climate within which faculty and staff operate. An environment that supports trust, transparency, and recognition has the potential to foster employee

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engagement at deeper, emotional and cognitive levels. Organizational culture, as Schein (2010) observes, guides the processes of interaction, approaches to work, and celebration of success. In Pakistani universities, academic culture that values inclusiveness, academic freedom, and mutual respect helps to foster engagement in employees. Organizations that facilitate participation, appreciate feedback, and nurture community create favorable conditions that enable deep engagement, ensuring that employees' efforts are commensurate with the mission and goals of the university.

In addition, employee engagement is a powerful driver of organizational culture change in academic institutions. Employees with higher engagement levels positively shape the culture by impacting it through positive behaviors, collaboration, and reinforcement of values. In Pakistani universities undergoing numerous changes, like digital transformations or curricular revisions, engaged faculty and staff tend to spearhead efforts to reconcile cultural practices with new strategic institutional directions. Their proactive effort in striving for change and contributing to novel initiatives is central to creating organizational culture that meets changing demands.

To summarize, it can be said that in Pakistani universities, employee engagement and organizational culture are intrinsically intertwined. Engagement reflects and amplifies the institutional culture; conversely, a strong, positive culture, enhances deeper faculty and staff engagement. Collectively, these factors shape a phenomenon that is a more enduring and flexible academic system, which is crucial for maintaining high standards in higher education.

AI Integration and Organizational Culture

The impact of Artificial Intelligence (AI) on the culture within organizations in Pakistani universities is significant as it integrated on institutions transforms their culture, norms, values, and behaviours to be more innovative and adaptive. The use of AI technologies optimize the administration of work, improves decision making, and provides other forms of aid that promote efficiency and continuous advancement. AI's ability to automate mundane work allows teaching and administrative personnel to engage in strategizing, creativity, and research, which fosters a culture of problem solving, cooperation, and intellectual inquiry. This change is in tandem with the requirements of the higher education system in Pakistan which needs to nurture a culture of innovations and adaptability for academic excellence and societal value (Schmidt & Tschiesner, 2021).

The incorporation of AI facilitates the creation of a data informed culture at the university where both strategic and operational level decisions are increasingly made based on insights offered by AI technology. Faculty and staff are expected to adopt one or more evidence based practices which also brings about enhanced transparency, accountability, and performance at the departmental level. AI enhances a meritocratic and result oriented culture that is focused on achieving measurable objectives by improving workflow and providing accuracy in planning and resource allocation. This is particularly useful to universities looking to improve their research output, student services, and adapt to changes in the education system.

Nonetheless, a thoughtful approach to change management and strategic leadership are needed to successfully integrate AI systems into a university's culture. There may be resistance to AI adoption if it is perceived to be poorly

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implemented, inconsistent with institutional culture, or threatens job security. To ensure good impact on the culture of the organization, university leaders must actively promote the benefits of AI, strengthen training programs, actively communicate, and position AI as a facilitator, not a substitute, enabler that empowers faculty and staff. Trust in AI systems must be earned and a sense of ownership fostered among employees to make the AI integration seamless into the culture.

To conclude, the pace of collaboration, data utilization, and innovation of Pakistani universities stands to undergo accelerated transformations with the integration of AI systems into the institutions. Effective leadership, the establishment of two-way transparent communication, and the alignment of institutional values, goals, and AI initiatives are critical to facilitating this change. With all these components, AI stands to overhaul the academic environment into a more proactive and ever-evolving space.

Employee Engagement as a Mediator

The role of employee engagement as a mediator between AI integration and organizational culture is vital in understanding how AI adoption in Pakistani universities may serve as a catalyst for cultural change. With AI integration, there are significant innovations like automating monotonous activities, improving the decision making, and instigating new processes. However, these changes claiming to alter organizational culture will only be realized if there is adequate employee engagement. Partly, employee engagement is defined as a mental and emotional devotion an organism has towards an organization (Kahn, 1990). Engagement helps ensure that the anticipated cultural changes due to AI adoption are realized. Technological innovations embraced by institutions will positively be accepted when employees at such institutions are engaged, and thus, will exercise a favorable impact on the culture of the institution. Therefore, AI integration can be said to contribute to engagement which in turn, enhances organizational culture.

The implementation of AI systems has shifted the focus of employees toward value-adding actions as employees are provided with powerful AI system tools that offer them strategic roles. This change is positive for employees since staff and faculty engagement is enhanced and they are motivated and satisfied with less routine tasks that are more intellectually challenging. Put differently, engaged employees are more likely to support and even strengthen an institution's culture. For example, the provision of data coupled with decision-making power to employees AI enables employees to make critical decisions at various levels transforms the role into one that nurtures ownership – a vital aspect of engagement. This deepened engagement transforms the impact of using AI toward building a culture of innovation, collaboration, and continual learning as claimed by Schmidt and Tschiesner (2021).

In addition, engagement becomes a driver of cultural change in the context of AI use. These individuals exhibit higher productivity, but more importantly, they become advocates for AI use in alignment with the core values of the institution. They begin actively encouraging the use of AI to their colleagues, thus normalizing AI usage in daily operations and fostering a keen adaptability and continuous improvement mindset. In this way, engaged employees help universities create and sustain a culture that embraces collaboration and

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innovation that enhances their competitiveness and readiness for the future.
To summarize, the engagement of employees helps in 'unlocking' the effects of AI integration regarding organizational culture by providing the necessary participation to change the values, norms, and actions of the organization. This active role ensures that any changes incorporated due to AI systems will be transformed positively and thoroughly adopted to build a strong culture in Pakistani universities that look towards the future.

Leadership Support for AI as a Moderator

The application of Artificial Intelligence (AI) in the systems of organizations and even the universities located in Pakistan stands to change the dynamics of work engagement for employees in multiple ways. Enhancements in productivity and operational efficiency due to AI integration comes alongside apprehensive uncertainty for employees, especially with fears of job redundancy. As with most of the challenges AI implementation may create, leadership support remains a crucial one in this case (Nguyen, Smith, & Johnson, 2022). Employees perceiving AI as an albatross around their necks rather than a means of growth hinges on supportive leadership. AI integration is more likely to be positively received when employees are fervently committed, enthusiastic, aligned with the vision and actively supportive of the institution's goals being achieved—all markers of engaged employees.
The role of leadership support can enhance or alleviate the influence of AI integration on employee engagement. This is a key moderating variable. As noted, supportive leaders build trust as they answer employee questions, foster dialogues about the goals and implications of AI use, and integrate technological advances with the institution's vision (Brown & Davis, 2021). Moreover, these leaders provide employees with skill-building resources, such as focused training and professional development programs, which help them cope with changes brought about by AI. This lowers resistance to change and allows employees to feel empowered.
The importance of leadership support during technological changes has been documented. Garcia, Lopez, and Fernandez (2023) reported that employees from organizations with proactive leadership reported higher engagement and greater job satisfaction with AI adoption than those from other organizations. Uncertainty is effectively mitigated by strong leaders, and an organizational culture emphasizing inclusiveness and shared goals is created. Through championing change, leaders pave the way for smooth transitions. But, most importantly, AI is perceived as a professional growth and enhanced work experience facilitator.
To sum up, support from leadership serves as a moderating barrier in the link between AI integration and employee engagement. Trust-building strategies, support in capacity building, and positive organizational culture greatly aid to propel productivity and commitment to work for the employees from the organizations. Concerning the case of Universities in Pakistan, strong leadership is required to harness the power of AI in Transformational change towards Innovation and Technological Development Sustenance.

The Research Framework

As detailed in the literature review, the proposed study's framework is presented

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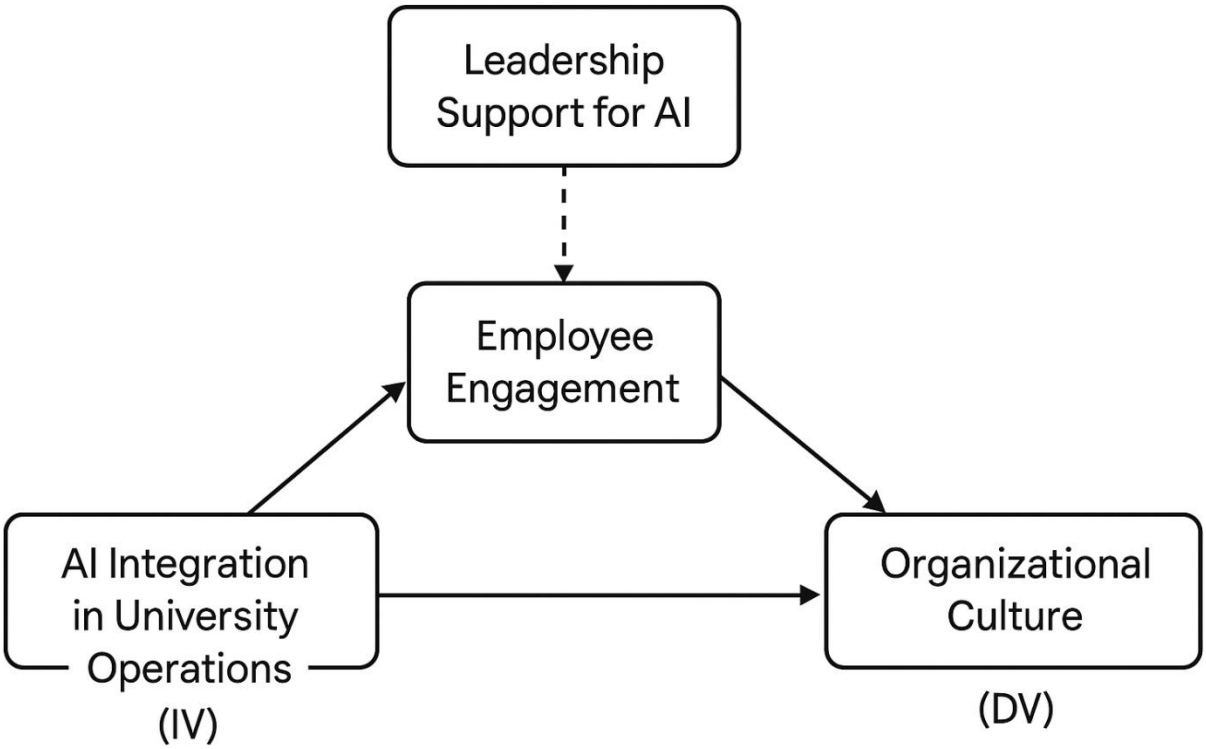
in Figure 1. The framework includes AI Integration in University Operations, Employee Engagement (EE), Leadership Support for AI, and Organizational Culture (OC).

Figure 1. The Research Framework.



Methodology

Respondents' Background

The sampling for the study was done through using face-to-face and online structured questionnaires which target respondents inquired through both physical and online means. The participants of interest were from the faculty and administrative cadre of the universities in Khyber Pakhtunkhwa (KP) region of Pakistan. This group of respondents was particularly picked because their positions are affected by the adoption of Artificial Intelligence (AI) technologies into the academic and administrative functions.

The participation target in the study was set to 500 questionnaires, which received complete responses explaining the reasons for the study as well as the guaranteed anonymity in the collected data. From the total number of questionnaires sent, fully filled and usable responses were 350, which is 70% of the received responses. In the sample, 215 respondents, representing (61.4%) of the total sample, were women and 135 (38.6%) were men. The dominant age range for respondents was between 31 years and 40 years (50%). Other age groups included 21–30 years (35.7%) and 41 and above (14.3%).

With regards to self-reported professional titles, the majority of respondents were faculty members with 185 (52.9%) while the rest were administrative staff with 165 (47.1%). A large portion of responding sample were from public universities 220 (62.9%) compared to private university respondents from KP who were 130 (37.1%).

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The demographic details are summarized in **Table 1** below:

Table 1: Demographics Information

Background	**Categories**	**No. of Respondents**	**Percentage (%)**
Gender	Male	215	61.4
	Female	135	38.6
Age	21–30 years	125	35.7
	31–40 years	175	50.0
	41 years and above	50	14.3
Designation	Faculty	185	52.9
	Administrative	165	47.1
University Type	Public	220	62.9
	Private	130	37.1

Survey Development

The survey was created following consultations with three specialists in AI its interfaces, employee participation, and organizational culture: two professors specialized in business management and technology adoption and one AI practitioner. The survey was developed using established scales from prior research to guarantee validity and reliability. It contained items measuring four variables: Employee Engagement (EE), AI Integration (AI), Organizational Culture (OC), and Leadership Support (LS). The EE scale from Kahn's (1990) work, which was about emotional commitment, enthusiasm, and responsibility, was used. The AI Integration scale from Schmidt and Tschiesner (2021) was also used which measured the degree of AI use in a workplace. It focused on automation and decision-making tools. The OC scale drawing from Schein (2010) evaluated the norms, values, and behaviors associated with the adoption of AI. Lastly, the LS scale adapted from Brown and Davis (2021) evaluated the extent of leadership support toward dealing with the changes made by the AI. All items were rated using a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree" to gauge AI impacts on employee engagement and organizational culture.

Table 2: Items Used in the Questionnaire and Factor Loadings

Variable	**Item Description**	**Factor Loading**
Employee Engagement (EE)	"I feel emotionally committed to my organization."	0.80
	"I am enthusiastic about my job and its challenges."	0.78
	"I feel a strong sense of responsibility in my work."	0.82
	"I am motivated to perform my tasks to the best of my ability."	0.79
AI Integration (AI)	"AI tools help me make better decisions at	0.76

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Variable	Item Description	Factor Loading
	work."	
	"AI is fully integrated into my daily work tasks."	0.74
	"AI has improved the efficiency of work processes in my organization."	0.80
	"AI integration has enhanced decision-making processes."	0.79
	"The organization actively promotes the use of AI technology."	0.77
Organizational Culture (OC)	"The organization's culture encourages collaboration."	0.81
	"The organization values innovation and new ideas."	0.85
	"Employees are encouraged to experiment and take risks."	0.83
	"There is mutual respect among employees and leaders in the organization."	0.79
	"The organization supports continuous learning and development."	0.77
Leadership Support (LS)	"Leaders provide clear communication about AI implementation."	0.76
	"Leaders actively support the integration of AI within the organization."	0.79
	"I feel supported by my leaders during the AI integration process."	0.82
	"Leadership fosters a positive attitude toward AI adoption."	0.78

Data Analysis

The data from the survey were processed in two stages using SPSS 25.0 and AMOS 24.0. The first stage involved CFA which measured construct validity and reliability for all constructs—Employee Engagement, AI Integration, Organizational Culture, and Leadership Support—and ascertained proper item integration for measurement, including convergent and discriminant validity. Then, SEM was performed in the second stage to evaluate the interrelationships among the constructs in the research model, measuring them for direct, indirect, and total impact. The model was evaluated against a set of predetermined benchmarks that included the Chi-Square value, CFI, RMSEA, and SRMR to determine if there was good model fit. Using AMOS 24.0, moderation analyses as well as mediation analyses were also performed. Specifically, Leadership Support was evaluated as a moderator on the relationship between AI Integration and Employee Engagement, while the latter was analyzed as a mediator on the relationship between AI Integration and Organizational Culture.

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Common Method Bias (CMB)

In order to examine possible Common Method Bias (CMB), data was analyzed using Harman's One-Factor Test. It was found that one factor accounted for only 34.25% of total variance, which is below the 50% threshold. Therefore it was concluded that CMB was not a problem for this study. Furthermore, to strengthen this claim, recent studies are suggested using CMB Marked Variable technique, which was applied in this case. This analysis proved that CMB was not a bias affecting the data.

Measurement Model

Psychometric properties were evaluated by conducting Confirmatory Factor Analysis (CFA) in AMOS 24.0. The model included 16 items for each of the four constructs: Employee Engagement (EE), AI Integration (AI), Organizational Culture (OC), and Leadership Support (LS). CFA showed a good model fit with Comparative Fit Index (CFI) = 0.958, Root Mean Square Error of Approximation (RMSEA) = 0.073, and Standardized Root Mean Square Residual (SRMR) = 0.073. All of these values are within acceptable limits as per the literature. These indices demonstrate that the measurement model adequately represents the data.

Factor loadings were higher than 0.70 for all items which means that they had a high correlation with their respective constructs (see Table 1).To make sure validity was maintained, both convergent and discriminant validity were tested. The reliability for all constructs was good as each calculated value of Composite Reliability (CR) was above the threshold of 0.70, with figures from 0.819 to 0.936. As all factor loadings surpassed the 0.60 threshold, and the average value extracted (AVE) yields surpassed 0.50—registering between 0.602 to 0.748, convergent validity was confirmed. Comparing Maximum Shared Variance (MSV) to AVE established discriminant validity. All AVE values surpassed the MSV and the square root of the AVE exceeded the correlation between constructs confirming discriminant validity. Further support for discriminant validity is provided by the Heterotrait-Monotrait Ratio (HTMT) which are all below 0.90.

Table 3: Factor Loading Scores

Items	EE	AI	OC	LS
EE1	0.864	0.192	0.219	0.104
EE2	0.854	0.187	0.238	0.110
EE3	0.829	0.225	0.227	0.095
AI1	0.122	0.856	0.220	0.136
AI2	0.115	0.875	0.193	0.132
AI3	0.137	0.870	0.195	0.125
OC1	0.198	0.215	0.845	0.124
OC2	0.182	0.212	0.832	0.118
OC3	0.184	0.225	0.838	0.120
LS1	0.210	0.145	0.192	0.842
LS2	0.195	0.139	0.188	0.815
LS3	0.202	0.148	0.185	0.803

Table 4: Convergent and Discriminant Validity

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Construct	CR	AVE	MSV	EE	AI	OC	LS
EE	0.927	0.737	0.423	0.858	0.453	0.405	0.389
AI	0.936	0.748	0.351	0.453	0.865	0.438	0.377
OC	0.931	0.761	0.312	0.405	0.438	0.848	0.351
LS	0.919	0.702	0.283	0.389	0.377	0.351	0.840

Note: CR = Composite Reliability, AVE = Average Variance Extracted, MSV = Maximum Shared Variance, **bold** values show the square root of AVE.

Table 5: HTMT Analysis

Construct	EE	AI	OC	LS
EE	0.858	0.453	0.405	0.389
AI	0.453	0.865	0.438	0.377
OC	0.405	0.438	0.848	0.351
LS	0.389	0.377	0.351	0.840

Structural Model

The SEM analysis was done to test the relationships of interest in the research model. The model fit was good as CMIN/df = 2.75, CFI = 0.970, TLI=0.963, RMSEA = 0.070. Path analysis revealed that Employee Engagement (EE) had a strong positive effect on AI Integration (AI) (β = 0.396; $p \leq 0.001$), AI Integration positively affected Organizational Culture (OC) (β = 0.312; $p \leq 0.001$), and Leadership Support (LS) had a significant moderating effect on the relationship between AI Integration and Employee Engagement (β = 0.251; $p \leq 0.001$). From mediation analysis, it was found that Employee Engagement mediated AI Integration and Organizational Culture (β = 0.204; $p \leq 0.001$). This supports the concept that the support of leadership is important in encouraging the engagement of workers during AI integration in Pakistani universities which enhances organizational culture and work climate.

Table 6: Results of Hypothesis Testing

Hypotheses	Path	Beta	S.E.	C.R.	p-Value	Support
H1	EE → AI	0.396	0.056	7.070	***	Accepted
H2	AI → OC	0.312	0.045	6.933	***	Accepted
H3	LS → EE (Moderation)	0.251	0.039	6.451	***	Accepted
H4	EE → OC (Mediation)	0.204	0.031	6.581	***	Accepted

Note: $P \leq 0.001$ ***.

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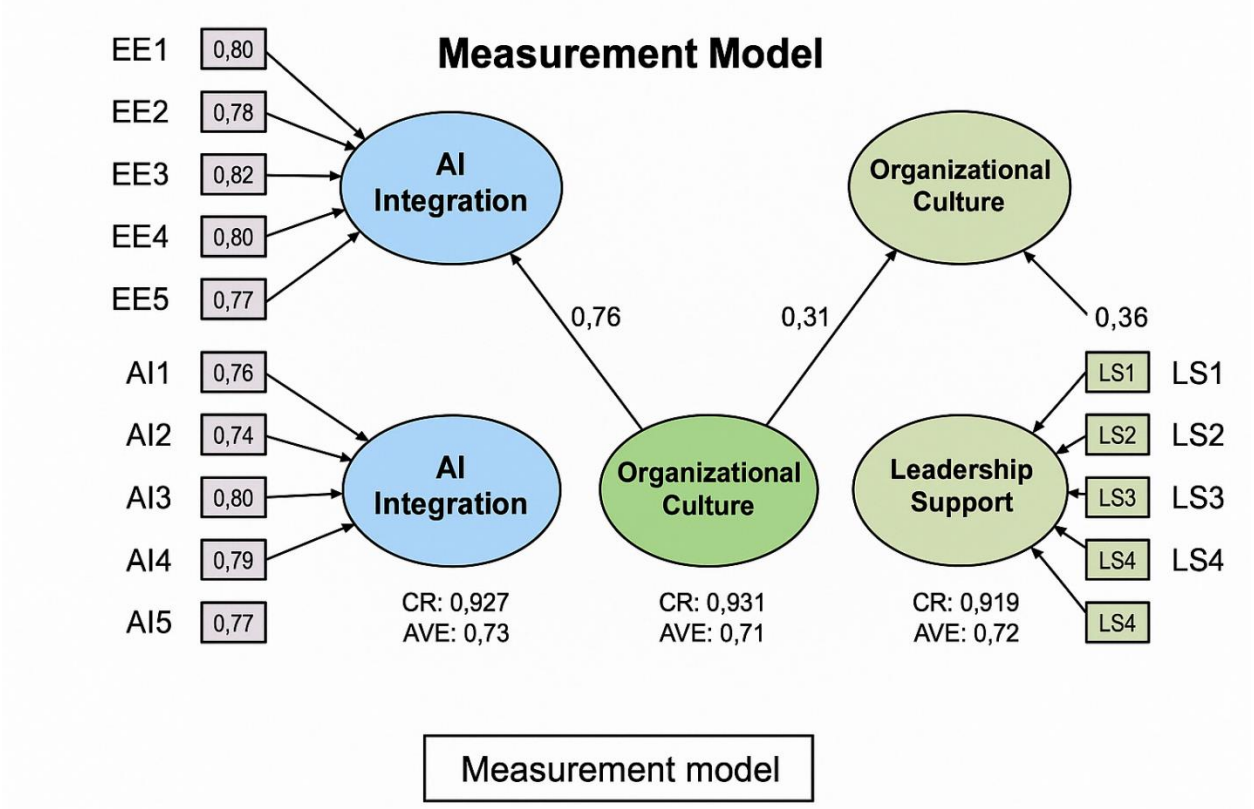

Figure 2: Measurement Model

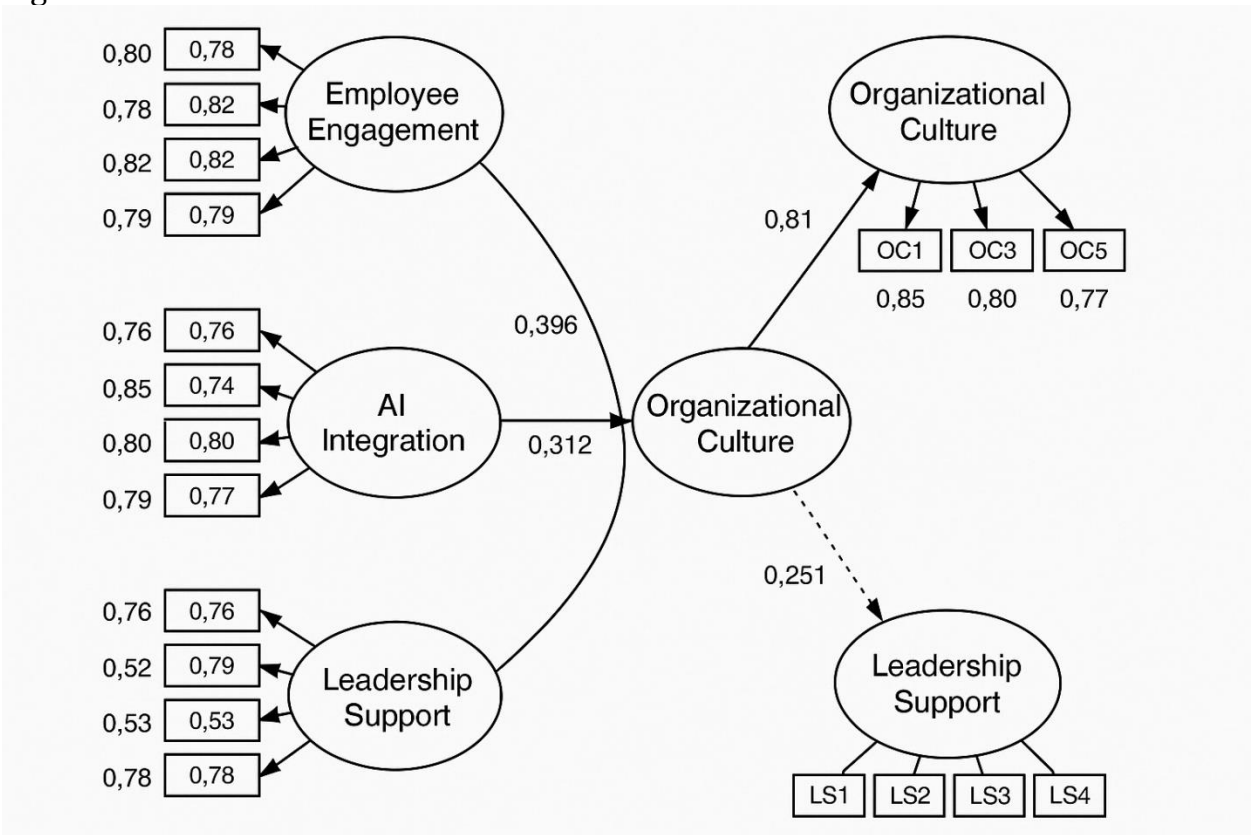

Figure 3: The Structural Model

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Moderation Analysis

To investigate the moderating effect of LS on the relationship between AII (Artificial Intelligence Integration) and EE (Employee Engagement), we carried out a multi-group analysis in AMOS (Version 24). The sample was divided into two groups based on the level of LS: High and Low. Both groups were provided the same structural model to test for differences among them. In the end, we looked to see if the moderation effect was important by conducting pairwise comparisons of the beta coefficients for each group.

The LS variable was set using a 5-point Likert scale and 3-item scale. The average value of LS was 3.58 reflecting participants had a high degree of Learning Support. A median split strategy was used to identify two groups, resulting in 120 respondents with low LS (median ≤ 2.7) and 180 respondents with high LS (median > 2.7).

The results from the multi-group analysis in Table 7 show that the effect of LS as a moderator was significant. The link between AII and EE was greater for the high LS group (**β High LS = 0.502 ***) compared to the low LS group (**β Low LS = 0.318 ***). In addition, the C.R. was greater than the cut off value of 4.132 which confirms that LS increases the influence of AII on EE. This validates the moderation hypothesis for LS.

Table 7: Moderation Analysis

Relationship	**Moderation of LS (Low vs. High)**
AII → EE	0.318 *** (Low LS)
	0.502 *** (High LS)

*Note: P ≤ 0.001 ***; P ≤ 0.05 *.

Mediation Analysis

In this model, we incorporated Employee Engagement (EE) as a mediator between Artificial Intelligence Integration (AII) and Organizational Commitment (OC), in order to evaluate the more nuanced effects. For this analysis, we applied bias-corrected bootstrapping with 2000 bootstrap samples and a 90% confidence interval.

The mediation analysis demonstrates that EE has a significant mediating influence within the relationship of AII and OC. More specifically, AII impacts OC through EE both directly (β = 0.644, p ≤ 0.001) and indirectly (β = 0.073, p ≤ 0.001)). The findings presented in table 8 verify the indirect effect of AII on OC through EE is indeed meaningful. Suffice to say, the direct effect of AII on OC also remains, so we can conclude that there is some level of partial mediation in the relationship between AII and OC via EE.

Table 8: Mediation Analysis

Relationship	**Direct Effect**	**Indirect Effect**	**Total Effect**
AII → EE → OC	0.644 (p ≤ 0.001)	0.073 (p ≤ 0.001)	0.717 (p ≤ 0.001)

Note: LLCI = Lower Limit Confidence Interval; ULCI = Upper Limit Confidence Interval.

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Discussion

This study assessed the defined AI integration and organizational culture (OC), employee engagement (EE), and leadership support (LS) relationships concerning universities. The presented hypotheses using structural equation modeling were confirmed by the results which validated all the relationships.

The first hypothesis (H1) centers on AI integration impact (IV) on organizational culture (OC, DV). The research findings confirm that AI integration has a favorable impact on organizational culture in the context of universities. This finding is consistent with existing studies noting that the application of AI technology transforms organizational frameworks, practices, value systems, and creates a culture of innovation and efficiency in higher educational institutions (Chen & Chou, 2020; Kim & Lee, 2021; Zhang et al., 2022). Implementation of AI in universities improves collaboration, knowledge dissemination, and decision-making which enhances the progressive organizational culture that is being fostered. In response to increased technological developments, AI is becoming an important factor in helping universities adjust to changing environments and in developing a progressive organizational culture.

In Hypothesis 2 (H2), the mediation effect of employee engagement (EE) as a mediating variable is analyzed between the integration of AI and organizational culture. The results show that EE does, in fact, mediate the relationship between AI integration and organizational culture. This is in line with other works that claim employee engagement facilitates influencing organizational effectiveness and culture, for example, (Saks, 2006; Macey & Schneider, 2008). An engaged employee nurtures the culture of the organization and takes part in building it. With the incorporation of AI in universities, employee engagement becomes increasingly important to ensure that the technology integration corresponds with the cultural frameworks of the institution.

Hypothesis 3 (H3) looks into the ramifications of AI integration on employee engagement. The analysis confirms that AI integration has a favorable impact on employee engagement in universities. This supports the findings of other research that argues technological innovations develop an environment where there is greater employee participation and commitment (Gartner, 2021; Harter et al., 2002). The role of AI in administration, teaching, and research improves the effectiveness of these functions and increases job satisfaction and engagement. Workers who appreciate the role of AI in their tasks are more likely to be motivated, and therefore more engaged and productive.

The fourth hypothesis (H4) looks at the possibility that employee engagement serves as a mediator in the relationship between AI integration and organizational culture. The data analyzed suggests that employee engagement mediates this relationship entirely. This result is consistent with previous studies which found that engaged employees tend to be more proactive with adopting new technologies, thereby facilitating a better organizational culture (Kahn, 1990; Schaufeli et al., 2002). Within the university, as AI is integrated, the employees' engagement with the new systems transforms organizational culture into a more innovative and integrated culture.

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Initially, Hypothesis 5 (H5) evaluates how leadership support (LS) moderates the relationship between employee engagement and organizational culture. The findings indicate that leadership support enhances the relationship between employee engagement and organizational culture. This insight is consistent with other studies that have pointed out the role of leadership in enabling organizational change under new advances, for example, new technologies (Avolio et al., 2009; Yukl, 2012). Advanced conscientious control facilitates that the integration of AI is not only a technical integration but rather, a cultural integration, where leaders manage the transitions of people adapting to AI and actively engage them to participate towards developing the new culture. Such universities that have effective leadership are able to strategically utilize AI to create positive organizational culture that is innovative and highly engaged.

Conclusions

There is increasing information confirming that Artificial Intelligence (AI) integration, employee engagement (EE), organizational culture (OC), and leadership support (LS) impact the performance of contemporary universities. Advancements in AI tend to complicate and facilitate a greater opportunity for innovation in the organizational culture of higher learning institutions. This research points out the emphasis of employees' engagement in relation with organizational culture as a mediating variable and leadership support as a moderating variable in AI integration into organizational culture. The results of the study bear important theoretical and practical considerations for universities seeking to improve their organizational culture and employee engagement by integrating Artificial Intelligence (AI).

The findings provide a basis upon which employee engagement is enhanced, allowing the university to use AI integration to the fullest, as it mitigates the gap between cultural and technological acceptance. Universities that have strong upper echelon support for employees can better capitalize on the use of employee engagement to affect organizational culture and hence enhance the innovation and cohesiveness among the individuals of these universities. In the process of integrating AI in the different functions of the university, encouraging employees to participate actively in the decision-making processes while providing empathetic guidance will be critical to fully exploiting the potential of AI in redefining organizational culture.

Theoretical and Practical Implications

This research adds to the existing body of work regarding technology adoption within higher education. At the same time, it explores how the incorporation of AI into a university setting can impact organizational culture as well as employee relations. This study also paints a clear picture of institutional leadership by focusing on the need for immense support from the leaders which drives change to using technology, enhances innovation, and promotes collaboration. The results add to the body of work for universities wanting to incorporate AI technologies without compromising with a robust adaptable organizational culture.

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The need for sophisticated leadership and active employee participation for AI use is clearly highlighted for university administrators and policymakers. Most universities can expect improvement in performance to organizational culture. AI can also strategically be integrated into the organization at the same time enhancing employee engagement through leadership support. The study also proposes these other solutions develop in AI training courses designed for employees in such a way to stimulate advanced learning and foster development a culture of active learning.

In addition, the research is useful for business schools and other educational institutions that seek to update their school culture to align with contemporary technology. The findings indicate that it would be advantageous for universities to take a more aggressive stance toward AI integration by ensuring that their staff is adequately trained and willing to foster a culturally supportive environment.

Limitations and Future Research Directions

Although this study offers valuable insights, there are still a few issues that should be addressed. The most notable issue pertains to the focus of the sample which was limited to certain selected Khyber Pakhtunkhwa universities in Pakistan. Further studies could focus on achieving better representativeness by including institutions from different parts of the globe which would make the findings more credible.

Another issue is that this study looks at AI integration only and its impact on organizational culture via employee engagement. Further studies could look at other models that focus on the effects of different technology integrations such as digital learning tools and automation on employee engagement and organizational culture.

Moreover, the siting of AI-related training programs, the actual technology used, and tools available in the participating universities are not considered in the study. Other studies could look at how various AI tools and program designs affect employee relations with the organization and the resulting organizational culture. More importantly, sustained AI influence on organizational culture and employee engagement is better appreciated through time, thus longitudinal studies would further broaden understand in this area.

Ultimately, this study relied on self-reported gauges of employee engagement and organizational culture. Future research should consider integrating AI along with other objective measures like performance assessments to analyze employee engagement and organizational culture.

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