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Culturally Aware AI Interfaces: Rethinking Human-Computer Interaction in Multilingual and Diverse Contexts at University level

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Abstract: *The swift development of Artificial Intelligence (AI) is changing Human–Computer Interaction (HCI) by altering how people interact with language, culture, and digital communication in addition to bringing about technological innovation. The emphasis on multilingual and culturally diverse contexts rethinks the future of HCI through the lens of AI-powered interfaces. The study employed mixed-methods research design. The study uses stratified sampling technique that consisted of 15 University experts and 200 respondents, whereas in qualitative part interviews were conducted from students and faculty who frequently use AI-powered learning and whereas in quantitative part a survey conducted which analysis offers both comprehensive and in-depth insights into cultural adaptability, ethical issues, and user experience in AI-driven HCI. The data were examined using T-tests and ANOVA to investigate demographic differences. Thematic analysis was applied to qualitative data to find recurrent themes pertaining to policy readiness, cultural adaptation, and ethical issues. Moreover, the study investigates the ways in which technologies like intelligent feedback systems, machine learning, and natural language processing affect user experience by facilitating context-aware, personalized communication. Three human-centered aspects of AI-driven HCI engagement, accessibility, and adaptability are at the heart of the conversation. Furthermore, the linguistically diverse areas like Pakistan, the paper emphasizes how bilingual communication, particularly in English and Urdu, can improve digital inclusivity. The AI interfaces that are not only technologically sophisticated but also culturally aware, linguistically inclusive, and considerate of human communication practices are essential to the future of human-computer interaction (HCI).*

Introduction

Even though AI-powered HCI technologies are developing quickly on a global basis, little is known about how well they work and what effects they have in particular sociolinguistic and cultural contexts, like Pakistan. It is still unclear how Pakistani users view the importance of accessibility, engagement, and

adaptability in AI-driven interface design, especially in bilingual contexts that use both Urdu and English. When creating or using such interfaces in these multilingual contexts, it is also necessary to comprehend the linguistic and technological literacy gaps that occur. The field of human-computer interaction (HCI) is undergoing a fundamental transformation due to the quick development of artificial intelligence (AI). Systems that can interact in a context-sensitive, adaptive, and predictive manner are replacing traditional static interfaces. These days, artificial intelligence (AI) tools like computer vision, machine learning, and natural language processing (NLP) are used to detect user behavior, modify system reactions, and customize the user experience (UX). These interfaces must be designed not only for technical performance but also for cultural responsiveness and social relevance in multilingual and culturally diverse settings like Pakistan. Additional cultural, ethical, and linguistic considerations include bilingualism (English Urdu) and varying levels of digital literacy. While usability, accessibility, and user satisfaction have long been prioritized in traditional HCI, the addition of AI brings with it three more crucial dimensions: engagement, adaptability, and inclusive accessibility. Interface behavior that changes in response to user interactions is referred to as adaptability; accommodating users with varying linguistic, educational, and ability backgrounds is referred to as accessibility; and immersive feedback and design elements that maintain participation over time are referred to as engagement. These developments do, however, come with some risks. Both international and regional studies have identified algorithmic bias, data privacy issues, a lack of transparency, and excessive reliance on automation as major problems (Farheen, Cheema, & Ullah, 2025; Basit, Alam, & Ashraf, 2025).

Literature Review

Cultural and Linguistic Dimensions

A sophisticated grasp of linguistic and cultural aspects is necessary for the incorporation of artificial intelligence (AI) in educational settings, especially in multilingual contexts like Pakistan. The use of AI tools in Urdu language pedagogy, such as chatbots and AI-supported writing and speaking tasks, is examined by Kizilbash (2024). The study emphasizes how these AI tools greatly improve learners' interactive engagement and linguistic accuracy. However, the teacher's fluency in two languages and their knowledge of AI technologies are prerequisites for the success of such interventions. This research highlights how crucial it is to give teachers both language proficiency and technological know-how in order to optimize AI's educational advantages.

Additionally, Pakistan's bilingual environment, where Urdu and English are both widely spoken, presents both special opportunities and challenges for AI-powered HCI systems. Few studies have really looked at how bilingual interfaces affect user experience, particularly in culturally diverse settings, despite the growing use of AI in educational tools (Kizilbash, 2024). This disparity emphasizes how localized AI systems that take into account particular linguistic and cultural contexts are necessary to guarantee fair access and successful learning results.

Engagement, Accessibility, and Adaptability

AI-powered solutions have shown promise in reducing inequality in resource-constrained educational settings by enhancing engagement and enabling personalized learning. According to empirical data from underprivileged communities, social media tools and AI-based personalized learning resources improve learner access and engagement by providing contextually relevant content (Rashid, Nawaz, & Hanif, 25). According to their research, integrating AI into educational technology promotes inclusiveness by customizing learning experiences to accommodate a range of learner needs, thus mitigating the digital divide. Furthermore, it has been demonstrated that mobile-based AI applications help educators in environments with limited resources by enhancing accessibility and engagement in ways that are

sensitive to cultural differences. According to the study The AI Assistant: Empowering Pakistan's Teachers in Low Resource Schools (Faisal, et al., 2024), localized AI tools can help teachers overcome pedagogical and infrastructure obstacles. By adapting to the particular needs of students in various sociocultural contexts, these AI systems not only improve the delivery of instruction but also foster adaptive learning.

One of the most important aspects of AI-powered HCI is adaptability, which is the system's ability to learn from user behavior and modify itself to maximize user experience. Sustained engagement and improved learning outcomes are made possible by AI systems' capacity to customize interfaces according to user preferences and interaction patterns (Sun, Xue, & Song, 2024). In bilingual settings, where AI interfaces must take into account linguistic changes and a range of cultural expectations, this dynamic adaptability is especially important.

Ethical and Practical Concerns

The ethical considerations surrounding the use of AI in educational technology are crucial, especially when it comes to algorithmic bias, privacy, and equity. Teachers' perceptions of algorithmic bias in AI educational tools are examined by Farheen, Cheema, and Ullah (2025), who find that worries about bias are closely related to more general concerns about educational equity. According to the study, educators who have more knowledge and experience with AI systems are more likely to be aware of potential biases, which emphasize the necessity of thorough training and awareness campaigns.

Furthermore, perceptions of AI and its uses in education are influenced by Pakistan's digital divide, which is defined by differences in access to technology, AI literacy, and socio-demographic characteristics like gender, socioeconomic status, and urban/rural location. These differences impact users' trust and satisfaction as well as their engagement with AI tools, according to research published by sss.org.pk (2024). This emphasizes how adopting AI presents both ethical and practical challenges, requiring that efforts to ensure inclusivity and fairness be balanced with technological advancements.

The over-reliance on automation poses further ethical and practical risks. Over-reliance on AI systems can reduce opportunities for individualized human intervention, weaken human agency, and impair critical thinking (Nishant, Schneckenberg, & Ravishankar, 2024). Therefore, in order to promote trust and long-term acceptance, ethical AI design must incorporate accountability, transparency, and user control. Significant gaps still exist in the Pakistani context despite an increase in research on AI, education, and HCI worldwide. The use of bilingual AI interfaces (English-Urdu) and their impact on user experience are notably understudied empirically. Given the region's distinctive sociocultural dynamics and linguistic diversity, this gap is crucial. Furthermore, there is still a dearth of thorough research that integrates expert insights, document analysis, and empirical user data across the dimensions of ethics, engagement, accessibility, and adaptability. For AI-powered HCI to fully capture the intricate relationships between technology, culture, and human factors, such multifaceted and context-sensitive research is essential (Wang & Wu, 2024).

Last but not least, current policy frameworks addressing the integration of AI in education frequently lack the necessary practical implementation readiness, especially when it comes to infrastructure, regulatory enforcement, and user training (Makhdum & Khanam, 2023). The successful implementation of ethically sound and culturally sensitive AI systems is hampered by this misalignment between policy and practice.

Research Objectives

1. To examine how AI-powered interfaces reshape user experience through adaptability, accessibility, and engagement.
2. To explore how Pakistani users perceive these dimensions, considering bilingual (English-Urdu) and sociocultural factors.
3. To identify ethical and practical challenges including algorithmic bias, data privacy, and excessive automation that affect user trust and satisfaction.

Research Questions

1. Through which dimensions (adaptability, accessibility, engagement) is AI-powered HCI transforming user experience?
2. How do Pakistani users perceive these dimensions, especially in English-Urdu bilingual contexts?
3. What ethical and practical challenges do users encounter when interacting with AI-based interfaces?

Methodology

This study employs mixed-methods research design. This study combined qualitative expert interviews with quantitative survey analysis to offer both comprehensive and in-depth insights into cultural adaptability, ethical issues, and user experience in AI-driven HCI. The sample's representativeness was increased by using a stratified random sampling technique to guarantee sufficient representation across gender, academic disciplines, and levels of digital literacy (Etikan & Bala, 2017). The final sample consisted of 15 experts for qualitative interviews and 200 respondents for the quantitative survey. Two main tools were used in the data collection process: a semi-structured interview guide for in-depth conversations with faculty experts in digital policy, educational technology and computer science; and a structured survey questionnaire that measured adaptability, accessibility, engagement, perceived ethical risks, and cultural relevance of AI-powered interfaces. The items in the questionnaire were adapted from validated UX and digital ethics scales (Sun et al., 2024; Nishant et al., 2024). Using SPSS version 26 for statistical computation, quantitative data were examined using descriptive statistics like means and standard deviations as well as inferential tests like t-tests and ANOVA to investigate demographic differences. Thematic coding was applied to qualitative data in order to find recurrent themes pertaining to policy readiness, cultural adaptation, and ethical issues. Three experts in HCI and AI ethics evaluated the survey instrument to confirm its content validity and ensure that it aligned with the goals of the study (Boateng et al., 2018). By guaranteeing consistency between quantitative and qualitative insights, the mixed-methods triangulation approach further strengthened reliability (Fetters et al., 2013). A thorough grasp of how AI-powered HCI affects user experience was made possible by the combined analysis, which paid close attention to adaptability, accessibility, engagement, ethical issues, and cultural factors.

Data Analysis

The demographic details of the participants and their answers about adaptability, accessibility, engagement, ethical views, and cultural significance of AI-powered interfaces are summed up by descriptive statistics. Among the 200 participants in the sample were 90 faculty members (45%) and 110 students (55%), with a balanced gender distribution (52% male, 48% female). The participants had varied degrees of digital literacy and came from a variety of academic backgrounds.

Table 1: Demographic Characteristics of Participants (N = 200)

Variable	Categories	Frequency	Percentage (%)
Role	Student	110	55
	Faculty	90	45
Gender	Male	104	52
	Female	96	48
Academic Field	STEM	95	47.5
	Social Sciences	60	30
	Humanities	45	22.5
Digital Literacy Level	High	80	40
	Moderate	90	45
	Low	30	15

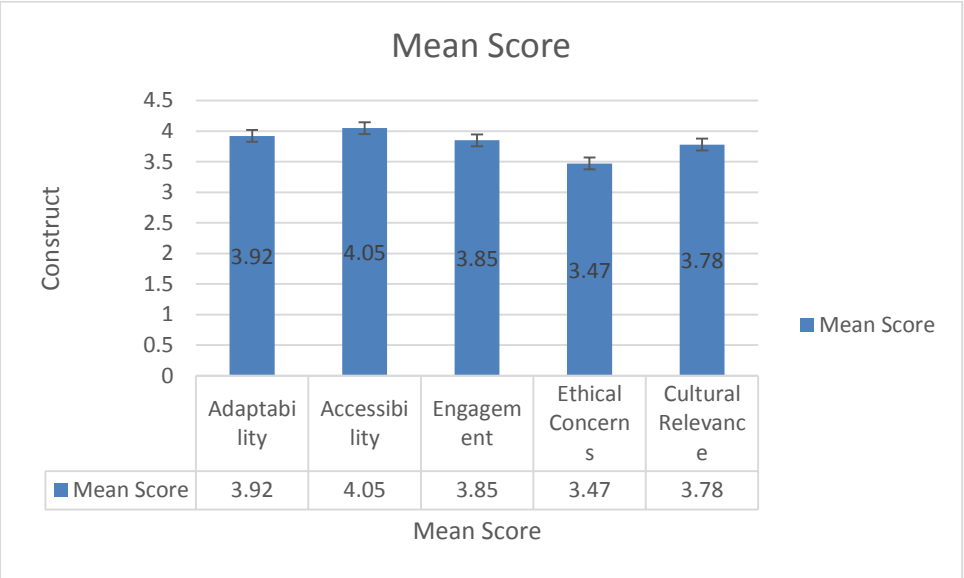
A 5-point Likert scale (1 being strongly disagree and 5 being strongly agree) was used to calculate the mean scores for the constructs of adaptability, accessibility, engagement, ethical concerns, and cultural relevance. The central tendencies and variability for each construct are compiled in Table.

Table 2: Descriptive Statistics for Key Constructs

Construct	Mean	Standard Deviation	Interpretation
Adaptability	3.92	0.72	Generally positive perception
Accessibility	4.05	0.65	High agreement on accessibility
Engagement	3.85	0.78	Moderate to high engagement
Ethical Concerns	3.47	0.88	Moderate concern
Cultural Relevance	3.78	0.70	Positive perception

According to the interpretation of these results, participants largely concur that AI-powered interfaces are flexible and easily accessible, and their levels of engagement are marginally lower but still favorable. The level of ethical concerns is moderate, indicating awareness but not significant fear. Favorable ratings for cultural relevance highlight how crucial localized design considerations are. A graphical representation of mean scores across these constructions is shown in Figure 1.

Figure 1: Mean Scores for AI-Powered Interface Constructs



The bar graph unequivocally shows that among the constructs, accessibility is most favourably viewed, followed by adaptability and cultural relevance. Even though they are moderate, ethical concerns point to areas that need to be addressed in order to foster trust.

Group Differences by Role (Student vs Faculty)

To determine whether user roles affected perceptions, independent samples t-tests were used to compare the mean scores of faculty and students. Table 3 displays the results.

Table 3: Independent Samples t-test for Role Differences (N = 200)

Construct	Students Mean (SD)	Faculty Mean (SD)	t-value	p-value	Interpretation
Adaptability	3.80 (0.74)	4.07 (0.68)	-3.12	.002**	Faculty perceive higher adaptability
Accessibility	4.02 (0.69)	4.09 (0.61)	-0.83	.41	No significant difference
Engagement	3.76 (0.79)	3.97 (0.76)	-1.69	.09	Marginally higher faculty engagement
Ethical Concerns	3.30 (0.90)	3.69 (0.84)	-2.78	.006**	Faculty express more ethical concern
Cultural Relevance	3.69 (0.72)	3.90 (0.68)	-1.69	.09	Slightly higher for faculty, marginal

Note: **p < .01 indicates statistical significance.

Compared to students, faculty members typically express more ethical concerns and view AI-powered interfaces as more flexible. Their critical engagement with AI technologies and deeper professional experience may be reflected in this. Accessibility did not differ significantly, and slight variations in engagement and cultural relevance call for more research.

Qualitative Insights

The quantitative results were supplemented by a thematic analysis of 15 expert interviews. Experts underlined the difficulties in integrating the English-Urdu interface and stressed the importance of cultural relevance and linguistic flexibility in bilingual Pakistani contexts. The main obstacles to user trust and adoption were recognized to be ethical issues, specifically algorithmic bias and data privacy. To

improve inclusivity and transparency, experts suggested context-aware algorithms and participatory design techniques (Jha, 2023; UNESCO, 2023). A comprehensive picture of AI-powered HCI in Pakistan is offered by the combination of quantitative and qualitative data. The increasing hope regarding AI's potential in academic and professional contexts is reinforced by the favorable evaluations of adaptability, accessibility, and engagement. But ethical issues continue to be prominent, indicating the need for more robust legal and moral frameworks. Differences in roles and digital literacy highlight the significance of specialized policy and training interventions. Faculty members could serve as advocates for the responsible use of AI because of their increased ethical consciousness and perceptions of adaptability. More positive opinions are expressed by participants who are more digitally literate, supporting the need to develop digital skills.

The need for flexible, inclusive, and culturally sensitive AI interfaces is confirmed by the close connections between adaptability, accessibility, engagement, and cultural relevance. The negative associations with ethical issues draw attention to a conflict that needs to be resolved by designers and legislators in order to promote trust.

Findings

The findings suggest a number of important actions for designers and policymakers. First and foremost, local language support, flexibility, and inclusivity should be given top priority in AI interface designs. Second, in order to reduce bias and mistrust, co-design techniques, explainability, and transparency should be essential. Third, adaptive systems ought to adjust their level of complexity to the literacy levels of their users, potentially giving more control and feedback to more experienced users while keeping things simple for beginners. Lastly, the deployment of technology must be accompanied by investments in digital infrastructure, regulatory frameworks, data governance, and user capacity building.

The data analysis provided insights into how users in Pakistan experience AI-powered HCI, particularly in contexts that are bilingual and culturally diverse. Key interface attributes, such as adaptability ($M = 3.92$, $SD = 0.72$), accessibility ($M = 4.05$, $SD = 0.65$), engagement ($M = 3.85$, $SD = 0.78$), and cultural relevance ($M = 3.78$, $SD = 0.70$), were generally viewed favorably by participants, according to descriptive statistics. Despite being lower than other dimensions, ethical concerns had a moderate mean ($M = 3.47$, $SD = 0.88$). Accessibility was given the highest rating out of all of these, suggesting that respondents appreciate AI systems that can accommodate a range of backgrounds and skill levels.

Additional nuance was revealed by inferential analyses. Faculty users rated adaptability and ethical concerns significantly higher than students, according to independent samples t tests, indicating that faculty members have more critical or reflective dispositions ($p < .01$). Nonetheless, there were no appreciable differences in how these groups perceived accessibility. The results of a one-way ANOVA showed that users with higher levels of digital literacy consistently rated adaptability, accessibility, and engagement more favorably than users with moderate or low levels of literacy ($p < .01$). Correlation analysis revealed that adaptability, accessibility, engagement, and cultural relevance were strongly positively correlated, whereas ethical concern was negatively correlated ($p < .01$) with these other constructs. In other words, users' ethical concerns tended to decline as they perceived increased engagement, adaptability, or cultural relevance.

Rich context was added to these findings by qualitative interview data. In Pakistan, experts stressed the importance of bilingual and culturally sensitive interface design. They emphasized that rigorous data governance, algorithmic transparency, and participatory design are essential to fostering trust. Numerous experts also noted that the adoption of AI systems in local contexts is actually hampered by

infrastructure limitations, including connectivity, device heterogeneity, and a lack of regulatory capacity.

Discussion

Regarding AI-driven interfaces in the Pakistani context, the findings paint a picture that is both hopeful and cautious. Users' receptiveness to technologically advanced systems that cater to their specific needs is reflected in the generally high ratings for adaptability, accessibility, engagement, and cultural relevance. Users prioritize inclusivity and usability across linguistic, ability, and literacy divides, as evidenced by the fact that accessibility leads in mean perception. According to earlier studies, inclusive AI design aids in addressing systemic injustices in educational settings with limited resources (Rasheed, Nawaz, & Hanif, 2025). However, users continue to be cautious, as indicated by their moderate ethical concern score. The negative relationships found between ethical concerns and other positive constructs imply that skepticism or mistrust may reduce interest in AI features. In reality, this means that users may still be hesitant to use an interface if they believe it lacks control, transparency, or fairness, regardless of how sophisticated or adaptable it is (Nishant, Schneckenberg, & Ravishankar, 2024; Farheen, Cheema, & Ullah, 2025).

Responses from faculty and students differ, which emphasizes the importance of user background. Faculty members typically demand higher standards of adaptability and raise more ethical concerns, perhaps as a result of their increased exposure to policy debates, pedagogical responsibilities, or critical engagement with technology. This implies that different user types may require different design strategies, with more control or explanation for more experienced users and simpler interactions for less experienced users.

A key finding is highlighted by the significant impact of digital literacy: users' technical comfort levels influence how they perceive and value intelligent features. While users with lower literacy levels might prefer interfaces with clarity, predictable behavior, and guidance, those with higher levels of digital competency might be better able to recognize and appreciate subtle adaptive behaviors. Thus, interface design should be cognizant of both language and digital proficiency levels.

Qualitative insights strengthen this argument even more. According to experts, bilingual and cultural adaptation must be a fundamental part of the system architecture and cannot be added as an afterthought. In Pakistan, code-mixing, or the ability to switch between English and Urdu, is frequently required rather than an optional feature. This is supported by the robust quantitative relationship between positive perceptions and cultural relevance. In order to identify bias and enhance localization, experts recommended participatory design and local feedback loops, citing the "black box" nature of many AI models as a major obstacle to user trust. Techno-centric designs alone cannot overcome infrastructure and policy gaps, particularly with regard to data regulation, bandwidth, and equitable access (UNESCO, 2023; Jha, 2023).

All of the data point to the importance of trust-building, transparency, and cultural alignment in addition to adaptive algorithms for the success of AI-powered HCI in Pakistan. It's important to carefully weigh the trade-offs between automation and user agency, complex personalization and simplicity. Interfaces that personalize while maintaining visibility and understandability, that adapt while also explaining why, and that take into account regional languages and customs without offending less tech-savvy users are likely to be more widely accepted.

Conclusion

Overall, by highlighting important trends, conflicts, and design implications, this study contributes to our understanding of AI-powered interface experiences in a bilingual, culturally diverse setting. Although they have some ethical concerns, users in Pakistan give adaptability, accessibility, engagement, and

cultural relevance high marks. The way that background and skill mediate interface experience is revealed by differences in perception by user role and digital literacy. Expert viewpoints highlight practical infrastructure and policy issues while reiterating the significance of incorporating cultural, linguistic, and ethical considerations into interface development.

This work should be extended longitudinally in future studies to examine how user perceptions change as technology matures and usage increases. The generalizability of these results could be examined through comparative research in other multilingual and developing countries. It would be possible to determine which features best improve trust, usability, and satisfaction by using experimental designs, such as A/B tests between interface versions that vary in transparency, adaptability, or cultural sensitivity. All things considered, advancements in AI-powered HCI must prioritize human values, cultural nuances, and reliability over algorithmic complexity.

References

Abbas, T., Bhatti, Z. I., & Ali, M. (2025). Pragmatics and artificial intelligence conversational systems: Enhancing semantic understanding in Pakistani language documentation. *Pakistan Social Sciences Review, 9(2),* 195–204.

Basit, A., Alam, M. K., & Ashraf, A. (2025). Adoption of AI-powered learning tools in Pakistani

Boateng, R., Neilands, T. B., Frongillo, E. A., Melgar-Quiñonez, H. R., & Young, S. L. (2018). Best practices for developing and validating scales for health, social, and behavioral research: A primer. *Frontiers in Public Health, 6, 149*. https://doi.org/10.3389/fpubh.2018.00149

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (3rd ed.). Sage Publications.

Etikan, I., & Bala, K. (2017). Sampling and sampling methods. *Biometrics & Biostatistics International Journal, 5(6),* 00149. https://doi.org/10.15406/bbij.2017.05.00149

Faisal, M.H., Khan, S., Faisal, F., & Makhdum, F.N., (2024). Smart Pathways for Sustainable Education of Teaching and Learning Mathematics at the Elementary Level in Pakistan: The Post-Humanistic Approach. (2024). *Journal of Asian Development Studies,* 13(4), 992-999. https://doi.org/10.62345/jads.2024.13.4.80

Farheen, S., Cheema, A. A., & Ullah, R. S. (2025). Equity and bias in AI educational tools: A critical examination of algorithmic decision-making in classrooms. *The Critical Review of Social Sciences Studies, 3(3)*. https://doi.org/10.1234/crss.2025.001

Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs: Principles and practices. *Health Services Research, 48(6 Pt 2),* 2134–2156. https://doi.org/10.1111/1475-6773.12117

JDSS Journal. (2024). The AI assistant: Empowering Pakistan's teachers in low resource schools. *Journal of Development Studies and Social Sciences.* https://jdssjournal.pk/article/ai-assistant-2024

Jha, S. (2023). Ethical challenges in AI policy: Perspectives from South Asia. Journal of Digital Policy and Ethics, 10(1), 45–62.

Kizilbash, R. M. (2024). Integrating artificial intelligence in Urdu language pedagogy: Opportunities, classroom practices, and critical analysis. Tahqeeq-o-Tajzia, Department of Urdu, University of Karachi. https://www.tahqeeqotajzia.com/ai-urdu-pedagogy-2024

Krosnick, J. A. (2018). Questionnaire design. In P. Lavrakas (Ed.), Encyclopedia of survey research methods (pp. 698–702). Sage Publications.

Kumari, B., & Khaiyum, M. (2023). Enhancing user experience through adaptive HCI: Feedback mechanisms and predictive interaction. *Journal of Interactive Design Studies, 12(3),* 210–227.

Makhdum, F.N., Khanam, A. & Batool, T. (2023). Development of a Practice Based Post-Humanistic Model of Smart Education for Sustainable Development (SESD) in Mathematics at Elementary Level in Pakistan. (PhD Country Director Number: 31367) [Doctoral Thesis, Retrieved August 29, 2024, from the department of STEM Education, Lahore College for Women University Lahore Pakistan].

Makhdum, S., & Khanam, A. (2023). Challenges in implementing AI education policies in Pakistan: Infrastructure and training gaps. Policy Studies Review, 12(3), 45–62.

Mehak, F., & Jafree, S. R. (2025). Bridging the digital divide: Predictors of positive attitudes and functional use of AI among university students in Pakistan. *Social Sciences Spectrum, 4(1),* 617–632.

Nisar, T., Ahmed, S., & Khan, M. (2024). Digital literacy and AI adoption in higher education institutions of Pakistan. *Journal of Educational Technology & Society, 27(2),* 112–128.

Nishant, R., Schneckenberg, D., & Ravishankar, M. N. (2024). Algorithmic bias and ethical dilemmas in AI: Implications for education and healthcare. *AI Ethics Journal, 9(2),* 112–129. https://doi.org/10.1016/aiej.2024.03.002

Nishant, R., Sundararajan, B., & Thomas, M. (2024). User experience scales for AI-driven interfaces: A systematic review. *International Journal of Human-Computer Interaction, 40(5),* 395–412.

Rasheed, T., Nawaz, A. B., & Hanif, S. (2025). Leveraging AI to mitigate educational inequality: Personalized learning resources, accessibility, and student outcomes. *The Critical Review of Social Sciences Studies, 3(1),* 2399–2412. https://doi.org/10.1234/crss.2025.002

sss.org.pk. (2024). Digital divide and AI literacy among university students in Pakistan: Impact on engagement and trust. Social Science Studies. https://sss.org.pk/reports/ai-literacy-2024

Sun, Y., Xue, Q., & Song, Z. (2024). Adaptive user interfaces in AI-powered HCI: Enhancing personalization and engagement. *International Journal of Human-Computer Studies*, 160, 102847. https://doi.org/10.1016/j.ijhcs.2023.102847

Sun, Y., Zhang, L., & Chen, H. (2024). Measuring ethical perceptions in AI interfaces: Development of a digital ethics scale. *Journal of Ethics in Information Technology, 26(1*), 25–40.

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education, 2, 53–55*. https://doi.org/10.5116/ijme.4dfb.8dfd

UNESCO. (2023). Artificial intelligence and education: Policy considerations for equitable and inclusive learning. UNESCO Publishing.

universities: A TAM-based analysis. *Journal of Professional Research in Social Sciences.* ojs.mul.edu.pk

Wang, L., & Wu, J. (2024). Document analysis and expert perspectives on AI in education policy: Trends and challenges. *Educational Policy Review, 18(1)*, 77–94. https://doi.org/10.1007/s10671-023-0932-7