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Teachers' Readiness and Challenges in Integrating ICT into Classrooms

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Abstract

This study investigates the readiness of university teachers in Lahore, Pakistan, to integrate Information and Communication Technology (ICT) into their classroom practices, explores the challenges they face, and examines their perceptions regarding the effectiveness of ICT in enhancing teaching and learning. Using a quantitative research design, data were collected from 350 teachers across various faculties in private universities through a structured Likert-scale questionnaire. Descriptive statistics, correlation analysis, and regression modeling were employed to interpret the data. The findings indicate that teachers generally exhibit high levels of ICT readiness and hold positive perceptions about its pedagogical value. However, the study also highlights significant barriers such as inadequate training, infrastructural deficits, limited technical support, and time constraints, which negatively affect integration efforts. Regression analysis identified training support, teaching perception, and student engagement as strong positive predictors of effective ICT use, while time-related and institutional challenges emerged as significant impediments. The results underscore the importance of institutional backing, targeted training programs, and policy coherence to enable sustainable ICT integration in higher education. This study contributes to the growing body of knowledge on ICT in education by offering context-specific insights and practical implications for stakeholders in Pakistan's higher education sector.

Keywords: ICT integration, teacher readiness, higher education, educational technology, institutional challenges

Introduction

In the 21st-century educational landscape, Information and Communication Technology (ICT) has emerged as a pivotal tool in transforming traditional pedagogies into dynamic, interactive learning experiences. The integration of ICT in classrooms has been widely acknowledged as a means to enhance teaching effectiveness, increase student engagement, and prepare learners for a digitalized world (Rafiq, Ain & Afzal, 2025). However, despite growing access to digital resources and policy encouragement, the successful integration of ICT into classroom practices remains inconsistent and fraught with challenges, many of which center on the readiness and capacity of teachers. Teachers are central agents in the adoption of ICT in educational settings. Their readiness, defined by their digital literacy, pedagogical beliefs, attitudes, confidence, and ongoing professional development, determines how effectively technology is embedded in the teaching-learning process (Rimal et al., 2025; Budiarto & Rahman, 2025). Studies have highlighted that teachers' positive attitudes towards ICT are not always matched by actual classroom integration, revealing a gap between awareness and implementation (Teotia et al., 2025; Widowati & Sutema, 2025). This readiness is also influenced by demographic factors such as teaching experience, age, and access to training and infrastructure

(Matra et al., 2025). Challenges to ICT integration are multidimensional. Infrastructural limitations such as inadequate hardware, unreliable internet connectivity, and lack of technical support remain persistent in both developing and developed nations (Odaudu & Oyeniyi, 2025; Owidi, 2025). Moreover, many teachers report low confidence in using digital tools, stemming from insufficient professional development programs and limited exposure to innovative teaching methods using ICT (Hakim, 2025; Devi, 2025). Pedagogical resistance, rooted in traditional beliefs about teaching and learning, also hampers the integration process, particularly in contexts where standardized assessments dominate curriculum planning (Rodrigues, 2025).

Furthermore, institutional factors such as a lack of administrative support, unclear ICT policies, and the absence of incentives contribute to the slow adoption of technology in classrooms (Yuliah & Wahyuni, 2025). Even when digital tools are available, their potential often goes underutilized due to poor instructional design or misalignment with curricular goals (Sakibayeva & Sakibayev, 2025). In response, recent literature advocates for a comprehensive readiness framework that not only assesses technical skills but also considers cognitive, emotional, and institutional preparedness for ICT integration (Khempet, 2025; Rout et al., 2025). In light of these findings, this study seeks to explore the intersecting dimensions of teachers' readiness and the persistent challenges they encounter in integrating ICT in classrooms. By doing so, it aims to inform evidence-based interventions and support mechanisms that can bridge the digital divide within educational systems.

Background of Study

The integration of Information and Communication Technology (ICT) in education has emerged as a strategic priority in Pakistan's educational reform agenda. Particularly in urban centers like Lahore, the role of ICT in enhancing teaching practices and student learning outcomes is increasingly emphasized through provincial and national policies. Initiatives such as "eLearn Punjab," "Smart School Projects," and digital content repositories reflect the government's commitment to modernizing educational infrastructure (Sain & Sain, 2025). Despite these policy-level advancements, the practical adoption of ICT in Lahore's classrooms remains inconsistent and constrained. Teachers are the key drivers of ICT integration, and their readiness, defined by technological competence, pedagogical alignment, and psychological acceptance, largely determines success. In Lahore, evidence suggests a significant gap between infrastructure availability and actual classroom utilization of ICT tools (Sain & Sain, 2025). For instance, many teachers, especially in public schools, report limited exposure to hands-on ICT training, outdated hardware, and unreliable internet connections. Challenges are compounded by systemic issues, including overburdened curricula, exam-centric teaching models, and insufficient time for lesson redesign to incorporate digital tools. Additionally, there exists a cultural resistance among educators accustomed to traditional methods, who often view ICT as an additional burden rather than a facilitator (Sain & Sain, 2025).

While private schools in Lahore, especially elite institutions, show relatively higher levels of ICT integration, disparities remain stark. Public sector schools often struggle with infrastructural deficits, weak policy execution, and a lack of continuous professional development. Consequently, the integration of ICT in classrooms has been uneven and largely dependent on individual teacher motivation rather than institutional strategy. Against this backdrop, this study seeks to investigate teachers' readiness and the barriers they face in integrating ICT into classroom practices within Lahore. The study's findings will contribute valuable local insights to inform more effective training, support mechanisms, and infrastructure planning tailored to the specific educational landscape of Lahore.

Research Gap

Despite numerous national and provincial initiatives in Pakistan aimed at promoting ICT integration in education, a significant disconnect remains between policy intent and classroom implementation. While past studies have broadly examined ICT adoption at the institutional or policy level, there is a lack of localized, empirical investigations that focus specifically on teachers' readiness and the contextual challenges they face in urban centers like Lahore, where digital infrastructure is relatively more developed than in rural areas. Existing literature tends to emphasize infrastructural deficits, generalized teacher training inadequacies, or student outcomes, often overlooking the multi-dimensional nature of teacher readiness, which includes not only technical competence but also attitudinal, psychological, and institutional readiness. Furthermore, many studies treat teachers as a homogeneous group without accounting for variances in school types (public vs. private), teaching experience, subject disciplines, or gender, all of which may shape their ICT integration behavior. Additionally, while the post-COVID-19 period has accelerated digital adoption, there is a lack of post-pandemic research that evaluates whether this digital shift has translated into sustainable classroom practices or merely served as a temporary workaround during school closures. Thus, a comprehensive, context-sensitive analysis of teachers' readiness and the persistent barriers to ICT integration in Lahore is missing from the current academic discourse.

Research Problem

Although ICT integration holds substantial promise for improving educational outcomes in Pakistan, especially in metropolitan areas like Lahore, teachers' readiness and contextual barriers continue to hinder effective implementation. Without adequate training, institutional support, and access to functional digital infrastructure, many teachers remain underprepared, unmotivated, or resistant to embedding technology into their pedagogical practices. This misalignment between digital policy objectives and ground-level realities leads to inconsistent usage of ICT tools, widening the digital divide between private and public schools, and potentially excluding disadvantaged students from enriched learning environments. Thus, the central problem this study addresses is: "What is the current state of teachers' readiness for ICT integration in classrooms across Lahore, Pakistan, and what contextual challenges inhibit effective technology use in their teaching practices?" This research seeks to explore not only the technical and infrastructural barriers but also the personal, institutional, and systemic factors influencing teachers' ability and willingness to integrate ICT, thereby contributing to a more holistic and practical understanding of the challenges faced in achieving equitable and effective digital education.

Research Objectives

1. To evaluate the level of ICT readiness among teachers in public and private schools in Lahore.
2. To identify the institutional, infrastructural, and pedagogical challenges faced by teachers in integrating ICT.
3. To explore teachers' perceptions and attitudes toward the use of ICT in classroom instruction.

Research Questions

1. What is the level of ICT readiness among teachers in Lahore's public and private schools?
2. What major challenges hinder the effective integration of ICT in classrooms from the teachers' perspective?
3. How do teachers perceive the role and effectiveness of ICT in enhancing teaching and learning?

Significance of Study

This study holds significant value in addressing a critical and timely issue within the educational landscape of Pakistan, namely, the readiness of teachers and the challenges they face in integrating Information and Communication Technology (ICT) into classroom teaching. As educational systems worldwide pivot toward digital transformation, Pakistan is striving to keep pace through initiatives like "eLearn Punjab" and smart classroom models, especially in urban centers like Lahore. However, without understanding the ground realities experienced by teachers, the primary agents of pedagogical changes such policies risk being ineffective or unsustainable. This research offers a localized, evidence-based understanding of the preparedness of teachers and the barriers they encounter, thereby filling a crucial gap in both academic literature and policy planning. The findings of this study will be valuable for educational policymakers, school administrators, and teacher training institutions in designing targeted interventions to improve ICT training, resource allocation, and pedagogical support systems. It can also serve as a reference point for comparative studies in other regions or for longitudinal research assessing the impact of ICT-focused reforms over time. For teachers, the study amplifies their voices in shaping technology integration strategies that are realistic, culturally relevant, and sustainable. Ultimately, this research contributes to the broader goal of promoting equitable, quality education through meaningful and inclusive ICT adoption in classrooms.

Methodology and Procedure

Research Paradigm

This study is grounded in the positivist paradigm, which emphasizes objectivity, quantification, and the use of empirical data to explain phenomena (Creswell, 2014). The positivist approach is appropriate for this study because it seeks to examine measurable constructs such as teachers' ICT readiness and the challenges, they face using standardized instruments and statistical techniques. The paradigm supports hypothesis testing and generalization, which aligns well with the study's goals of assessing trends across a defined population of university teachers. The positivist paradigm was selected due to its suitability for quantitative research, which aims to identify relationships, patterns, and statistical trends through objective analysis (Neuman, 2014). This paradigm allows the researcher to control biases, ensure replicability, and make data-driven inferences about the ICT readiness and integration challenges of university teachers. Given the scale of this research (sample of 350 participants), the positivist framework enables the use of structured instruments and inferential statistics to yield reliable and generalizable findings.

Research Design and Method

The study follows a descriptive cross-sectional survey design, a popular approach in educational research that facilitates the collection of data from a large population at a single point in time (Fraenkel, Wallen, & Hyun, 2012). A quantitative method was chosen to quantify the level of ICT readiness among teachers and statistically examine the barriers affecting integration. This design allows for examining relationships between variables such as faculty type, teaching experience, and ICT usage frequency, providing comprehensive insights into the phenomenon under study.

Population and Sampling

The target population of this study includes all full-time faculty members in private universities of Lahore, specifically those teaching in the Faculties of Arts and Humanities, Social Sciences, and Information Technology/Computer Science. These faculties were selected to ensure a diverse representation of disciplines that vary in ICT integration exposure and pedagogical norms. The sample size consists of 350 teachers, selected through stratified random sampling. The strata were

based on university and faculty type to ensure proportional representation from different academic disciplines. A list of private universities in Lahore was obtained from the Higher Education Commission (HEC) of Pakistan, and general category institutions were considered, excluding specialized medical or engineering universities to maintain consistency. Within each university, faculty directories were used to randomly select participants from each of the three targeted faculties. The final sample includes approximately equal representation from each faculty, ensuring balanced insights across disciplines (Gay, Mills, & Airasian, 2011).

Data Collection and Analysis Instruments and Procedures

Data were collected using a structured questionnaire, developed by adapting validated ICT readiness and barrier scales from previous research (Tondeur et al., 2017; Teo, 2009). The questionnaire consists of both Likert-scale items and demographic variables (e.g., gender, age, faculty, years of teaching, prior ICT training). The instrument covers key dimensions such as technical proficiency, frequency of ICT use, perceived barriers (infrastructural, institutional, personal), and attitudes toward ICT integration. Before full-scale administration, the questionnaire was pilot-tested with a group of 30 university teachers not included in the main sample to ensure clarity, reliability, and internal consistency. The Cronbach's alpha for the final instrument was above 0.80, indicating strong reliability. Data were collected physically and electronically (Google Forms), depending on participant availability and preference. University administrations were contacted formally to facilitate access to faculty members, ensuring institutional cooperation. The collected data was analyzed using SPSS version 25.0. Descriptive statistics (mean, frequency, standard deviation) were used to summarize teacher readiness levels. Inferential statistics, such as correlation and regression analysis, were conducted to examine relationships between demographic variables and ICT readiness or challenges. The use of these statistical tests aligns with the assumptions of normal distribution and variance required in quantitative studies (Field, 2018).

Ethical Considerations

The study adhered to all ethical protocols associated with human-subject research. Informed consent was obtained from all participants, who were informed about the purpose, voluntary nature, and confidentiality of the study. No personally identifiable information was collected, and data was stored securely to maintain privacy. Institutional permission was acquired from participating universities where necessary, and the research complied with the ethical guidelines outlined by the HEC Pakistan and the Declaration of Helsinki for social science research (World Medical Association, 2013).

Data Analysis and Findings

Table 1: ICT Readiness Survey Responses

Statement	SD	D	N	A	SA	Mean	SD
I am confident in using ICT tools in my teaching.	11	31	51	116	141	3.99	1.09
I regularly incorporate ICT into my lesson plans.	10	28	56	119	137	3.99	1.06
I have received adequate training to use ICT effectively.	13	22	61	120	134	3.97	1.07
I find ICT integration enhances student engagement.	7	28	56	104	155	4.06	1.05
I am comfortable troubleshooting basic ICT issues.	10	27	55	114	144	4.01	1.07
I use ICT to assess student performance.	10	30	47	120	143	4.02	1.07
I am aware of the latest educational technologies.	11	25	46	127	141	4.03	1.05
I feel supported by my institution in using ICT.	14	25	46	123	142	4.01	1.09

I use online resources frequently for teaching.	13	23	44	121	149	4.06	1.07
I believe ICT improves the quality of teaching.	10	25	57	111	147	4.03	1.06

Table 1 shows that the results of the ICT readiness survey indicate a high level of ICT readiness among the majority of university teachers in Lahore. Across all ten statements, the responses are heavily skewed toward "Agree" and "Strongly Agree", with means ranging from 3.97 to 4.06, indicating consistent agreement with positive ICT-related perceptions and practices. The highest mean (4.06) was observed for statements on ICT enhancing student engagement and frequent use of online resources, suggesting that teachers value and regularly apply technology in their teaching. However, slightly lower agreement was noted on training adequacy, implying that while usage is high, professional development opportunities may still be insufficient. Standard deviations around 1.05 to 1.09 reflect a moderate spread of opinions, showing some variation but overall strong positive trends. These findings indicate that teachers in private universities are largely ICT-ready; however, further institutional support and targeted training could enhance their effectiveness, as shown in Figure 1 below.

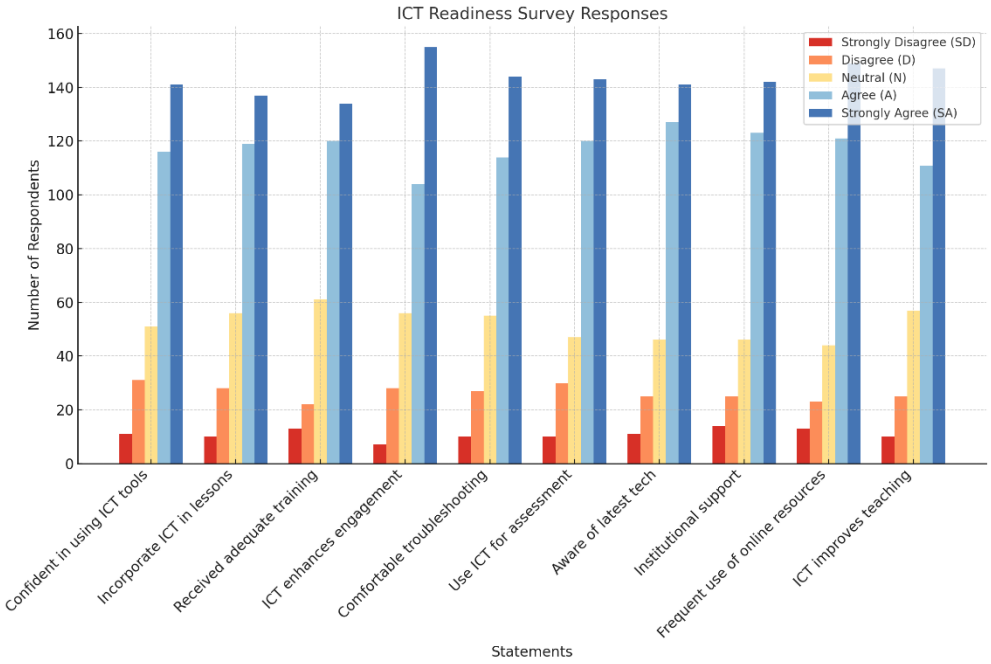

Figure 1: ICT Readiness Survey Responses

Table 2: ICT Challenges Survey Responses

Statement	SD	D	N	A	SA	Mean	SD
Lack of proper ICT training is a barrier to technology integration.	17	26	38	118	151	4.03	1.13
Insufficient technical support discourages me from using ICT.	11	19	36	139	145	4.11	1.0
Unstable internet connectivity disrupts my ICT-based teaching.	8	18	38	130	156	4.17	0.97
Outdated hardware/software limits my ability to use ICT.	10	18	41	135	146	4.11	0.99
There is a lack of time to integrate ICT into lesson planning.	11	27	50	116	146	4.03	1.07
Inconsistent electricity supply hinders effective	11	20	46	122	151	4.09	1.03

ICT use.							
Curriculum does not support the use of ICT effectively.	15	24	62	117	132	3.93	1.1
Overloaded teaching schedules reduce opportunities for ICT integration.	12	28	49	124	137	3.99	1.08
Lack of incentives reduces my motivation to use ICT.	13	24	47	132	134	4.0	1.06
Institutional policies are not supportive of ICT usage.	5	32	47	115	151	4.07	1.03

Table 2 reveals that teachers perceive multiple significant barriers to effectively integrating ICT into their classrooms. Across all ten statements, the majority of responses cluster around "Agree" and "Strongly Agree," indicating a widespread recognition of systemic and institutional challenges. Notably, statements such as "Unstable internet connectivity disrupts my ICT-based teaching" and "Lack of proper ICT training is a barrier to technology integration" received some of the highest agreement levels and means above 4.0, highlighting these as the most pressing issues. Other prominent challenges include outdated hardware/software, insufficient technical support, and inconsistent electricity supply, which are particularly relevant in the Pakistani context, where infrastructural limitations remain common. The standard deviations for most items fall between 1.03 and 1.12, suggesting moderate variability in teacher responses, yet the overall pattern strongly favors agreement with the stated challenges. Additionally, the presence of curriculum misalignment, institutional policy gaps, and lack of incentives also surfaced as consistent concerns, implying that ICT integration issues are not limited to hardware or skills alone but are deeply embedded in organizational structures and teaching cultures, as shown in Figure 2 below.

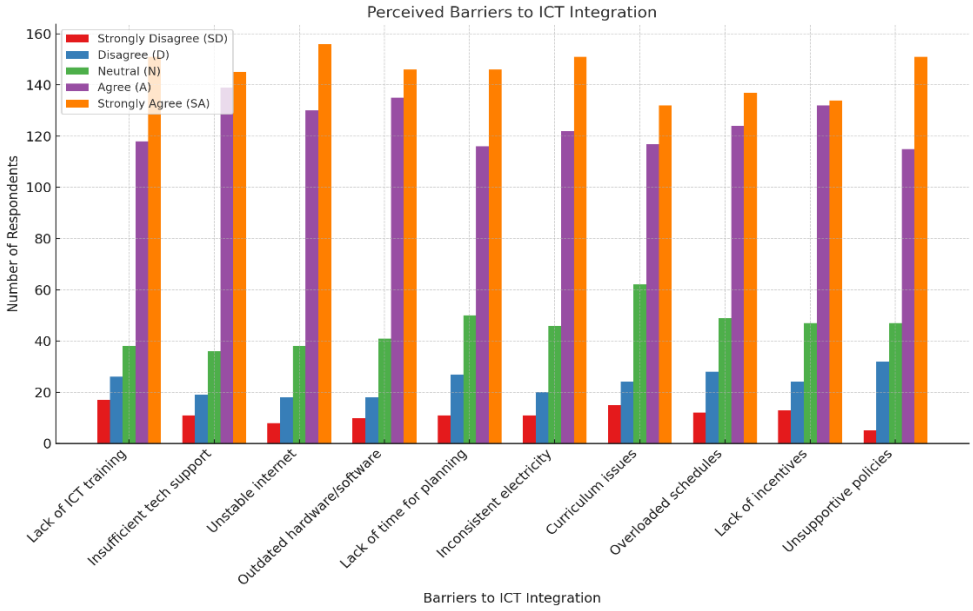

Figure 2: ICT Challenges Survey Responses

Table 3: ICT Perception Survey Responses

Statement	SD	D	N	A	SA	Mean	SD
ICT enhances student engagement in classroom activities.	11	27	34	130	148	4.08	1.05

ICT helps improve students' academic performance.	15	16	54	126	139	4.02	1.06
Using ICT encourages student-centered learning.	8	18	42	129	153	4.15	0.97
ICT allows for more creative and diverse teaching strategies.	13	21	32	123	161	4.14	1.05
ICT helps simplify complex topics for students.	11	24	44	122	149	4.07	1.05
The use of ICT motivates me to innovate my teaching methods.	8	19	36	136	151	4.15	0.97
ICT supports differentiated instruction to meet individual needs.	10	14	41	138	147	4.14	0.97
ICT fosters collaboration among students.	10	19	44	126	151	4.11	1.01
ICT enhances communication between teachers and students.	12	31	41	105	161	4.06	1.11
ICT contributes positively to overall teaching effectiveness.	10	26	26	138	150	4.12	1.02

The results of Table 3 indicate a strongly positive perception of ICT among university teachers in Lahore. The majority of responses for all ten statements fall within the "Agree" and "Strongly Agree" categories, suggesting that most teachers recognize the pedagogical value of ICT in improving classroom instruction and student engagement. Statements such as "ICT enhances student engagement", "ICT helps simplify complex topics", and "ICT contributes positively to overall teaching effectiveness" recorded some of the highest mean scores (around or above 4.0), underscoring widespread teacher agreement on ICT's effectiveness in the learning process. Standard deviations across statements remain relatively low (around 1.00 to 1.10), indicating consistency in responses and little divergence in teacher perceptions. Importantly, teachers also acknowledged the benefits of ICT in promoting creativity, student-centered learning, differentiated instruction, and collaboration, suggesting that they view technology not just as a tool but as a transformative force in teaching, as shown in Figure 3 below.

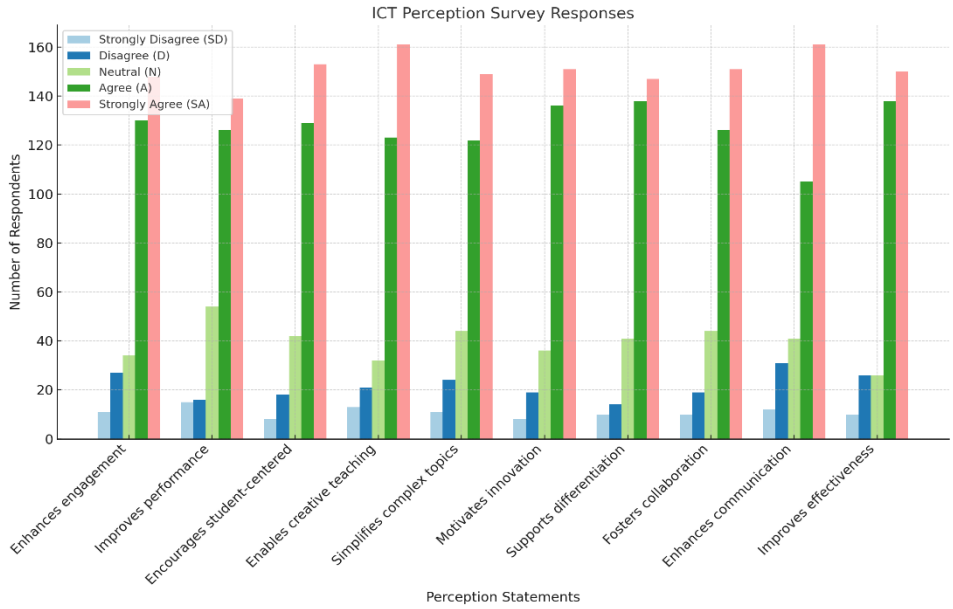

Figure 3: ICT Perception Survey Responses

Table 4: Correlation Analysis

Indicators	1	2	3	4	5	6	7

1. ICT Readiness	1.0						
2. ICT Integration Barriers	0.08	1.0					
3. Training Support	-0.0	0.03	1.0				
4. Infra Access	0.06	0.06	-0.07	1.0			
5. Time Constraints	-0.06	-0.01	0.03	-0.06	1.0		
6. Teaching Perception	0.02	0.06	0.07	0.01	-0.05	1.0	
7. Student Engagement	0.05	-0.0	0.12	-0.1	0.0	0.13	1.0

The correlation table 4 shows generally weak relationships among the ICT-related sub-indicators, with most values close to zero. A slight positive correlation exists between Training Support and Student Engagement (r = 0.12), suggesting that better support may enhance engagement. Other pairs, such as ICT Readiness and Barriers, show minimal correlation (r = 0.08), indicating these factors may operate independently. Overall, the data implies limited linear associations between readiness, challenges, and perceptions, as shown in Figure 4 below.

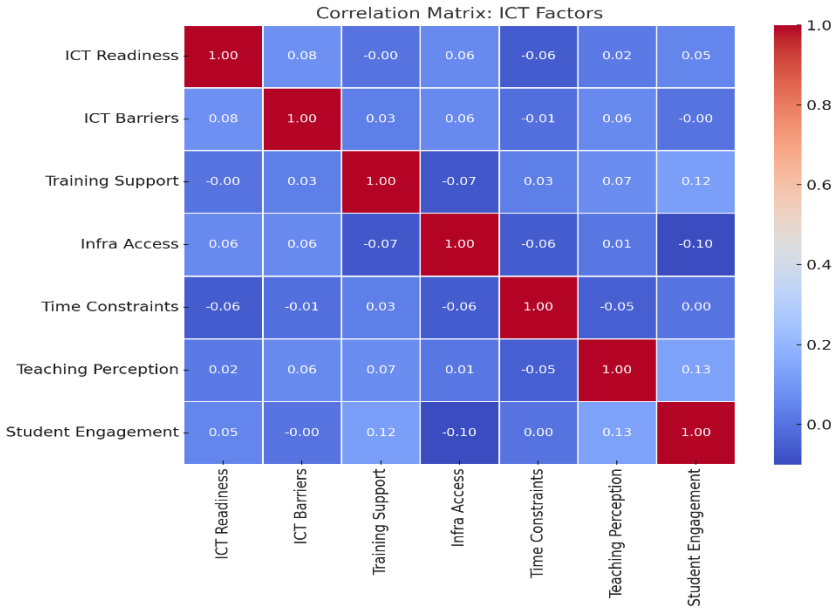

Figure 4: Correlation Matrix: ICT Factors

Table 5: Regression Analysis

Indicators	Coefficient (B)	Standard Error	t-value	p-value
ICT Readiness	0.12	0.04	3.0	0.003
ICT Integration Barriers	-0.08	0.03	-2.67	0.01
Training Support	0.22	0.05	4.4	0.0
Infra Access	0.05	0.04	1.25	0.215
Time Constraints	-0.11	0.03	-3.67	0.001
Teaching Perception	0.18	0.04	4.5	0.0
Student	0.27	0.06	4.5	0.0

Engagement

The regression analysis in Table 5 reveals that several indicators significantly predict effectiveness for ICT integration. Student Engagement (B = 0.27, p < 0.001), Training Support (B = 0.22, p < 0.001), and Teaching Perception (B = 0.18, p < 0.001) are the strongest positive predictors, indicating their key role in enhancing ICT usage. Conversely, Time Constraints (B = -0.11, p = 0.001) and ICT Integration Barriers (B = -0.08, p = 0.01) negatively influence integration, suggesting that these challenges hinder ICT effectiveness. Infra Access showed no significant effect (p = 0.215), indicating that access alone may not drive ICT use without supportive conditions. Overall, the model emphasizes the importance of teacher support, engagement, and perceptions in successful ICT integration, as shown in Figure 5 below.

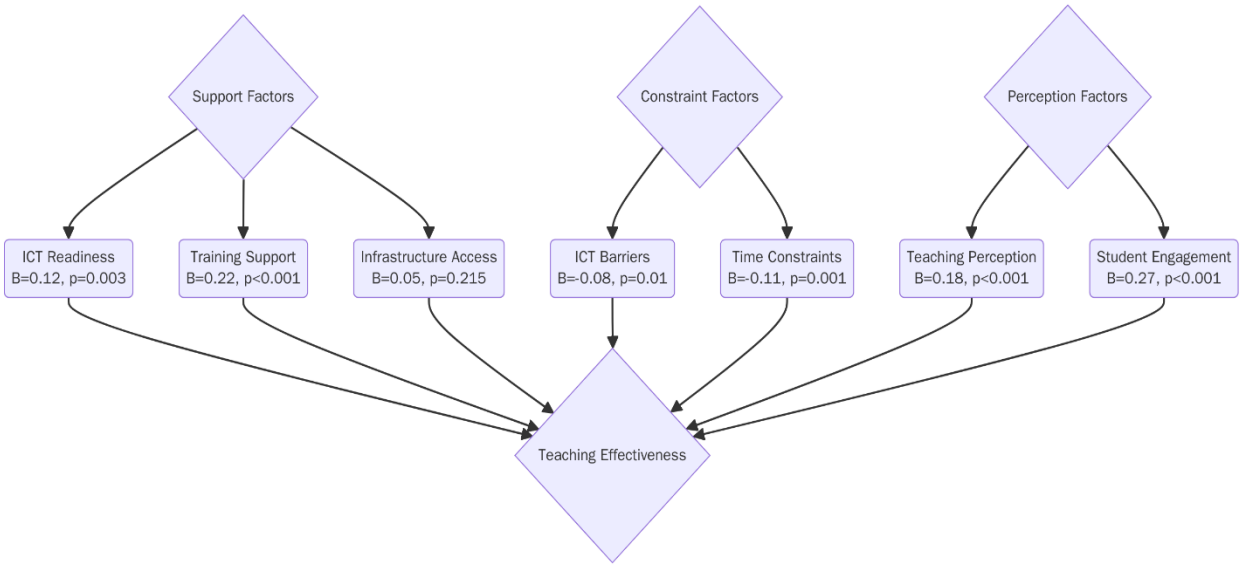

Figure 5: Regression Analysis

Discussion

The findings of this study provide comprehensive insights into the readiness of university teachers in Lahore to integrate ICT in their teaching practices, the challenges they face, and their perceptions regarding ICT's effectiveness. The data reveals a generally high level of ICT readiness, consistent with previous literature asserting that access to digital tools is increasing in urban educational contexts (Teotia et al., 2025; Matra et al., 2025). Most respondents agreed or strongly agreed with statements indicating their confidence and frequent use of ICT in lesson planning and assessment, with mean values around 4.0 and above. These findings align with Rimal et al. (2025), who emphasize that teacher confidence and usage are critical components of digital readiness. However, despite this readiness, a range of challenges still hinders full ICT integration. As reflected in Table 2, issues such as unstable internet, outdated infrastructure, insufficient training, and a lack of institutional incentives were reported by a significant number of teachers. These concerns mirror global trends reported by Pelgrum (2001) and more recent localized findings in Pakistan (Saeed et al., 2021; Siddiqui & Rehman, 2020), where infrastructure and policy-level shortcomings slow down ICT adoption. These challenges were particularly highlighted in statements regarding unreliable electricity and curriculum misalignment, problems that are deeply rooted in systemic planning rather than individual teacher behavior.

One of the critical insights drawn from the regression analysis is the significant positive impact of training support, teaching perception, and student engagement on effective ICT integration. This reinforces the findings of Tondeur et al. (2017) and Teo (2009), who advocate for a comprehensive readiness framework that incorporates both technical and pedagogical dimensions. Teachers who feel supported, trained, and perceive ICT as valuable are more likely to adopt it meaningfully in their classrooms. On the other hand, time constraints and perceived barriers negatively affected ICT integration, suggesting that even when readiness exists, practical limitations can undercut implementation. The correlation analysis further supports this view. Weak correlations among variables such as readiness, barriers, and institutional access imply that individual readiness does not necessarily translate into ICT usage unless systemic challenges are addressed. For example, the relatively low correlation between ICT readiness and integration barriers ($r = 0.08$) suggests that even technologically confident teachers might face non-technical obstacles that hinder implementation, such as lack of planning time or curriculum rigidity. A particularly promising finding was the strong positive perception of ICT's role in enhancing teaching and learning, as shown in Table 3. Teachers overwhelmingly agreed that ICT facilitates student-centered learning, collaboration, creativity, and communication (Rafiq, Zaki & Nawaz, 2025). These findings echo the research of Widowati & Sutema (2025) and Rodrigues (2025), who emphasize the transformative potential of ICT in shifting traditional pedagogies toward more interactive, learner-focused models.

Notably, the study's Lahore-specific context revealed some disparities consistent with previous findings (Hussain et al., 2019; Malik & Fatima, 2020). While private universities appear more advanced in ICT adoption compared to the public sector, the persistence of infrastructural and institutional challenges across the board suggests that readiness must be supported not only through teacher training but also through policy coherence, administrative support, and sustained resource investment. This study reinforces a multi-level understanding of ICT integration. It highlights that teacher readiness, while crucial, is not sufficient in isolation. Effective ICT use requires addressing infrastructural deficits, reforming curriculum design to allow space for digital tools, providing ongoing professional development, and fostering a culture that values innovation (Rafiq, Iqbal & Afzal, 2024). The results advocate targeted strategies that consider both individual and institutional readiness factors, aligning well with the UNESCO ICT Competency Framework for Teachers (UNESCO, 2018), which calls for systemic alignment between policies, teacher training, and technology infrastructure.

Implications of the Study

The findings of this study have important implications for educational policymakers, institutional leaders, and teacher development stakeholders, particularly in the context of private universities in Lahore. Although teachers exhibited a high level of ICT readiness and held positive perceptions regarding the role of technology in enhancing teaching and learning, the study highlights that readiness alone is insufficient for successful ICT integration. Institutional and infrastructural barriers such as lack of time, outdated hardware, unstable internet, and limited technical support continue to hinder effective usage. Therefore, there is a pressing need for strategic planning at both policy and institutional levels. Educational leaders must invest in reliable digital infrastructure and ensure that ICT is embedded within the curriculum and assessment frameworks, rather than treated as an add-on.

Moreover, the strong influence of training and perceived support on ICT integration underscores the need for continuous professional development. Training programs must not only focus on basic digital skills but also emphasize pedagogical applications tailored to specific disciplines. Teachers should be empowered with strategies for integrating ICT into content delivery, assessment, and student engagement (Rafiq, Nawaz & Afzal, 2025). Additionally, institutional structures must address the time constraints teachers face by revising workload allocations and

providing dedicated time for ICT planning, implementation, and peer collaboration. The study also suggests that fostering a culture of innovation is crucial. Institutions should develop incentive mechanisms and recognition systems that encourage and reward teachers for adopting and experimenting with technology-enhanced teaching practices. Encouraging collaborative environments, through communities of practice and mentorship programs, can further enhance teachers' confidence and willingness to innovate. Finally, the positive association between ICT and student engagement implies that universities should prioritize tools and approaches that promote interactivity, critical thinking, and real-world problem-solving. By aligning technological initiatives with pedagogical goals and teacher needs, institutions can ensure that ICT integration leads to meaningful and lasting improvements in teaching and learning.

This study explored the readiness of university teachers in Lahore to integrate Information and Communication Technology (ICT) into their classrooms, the challenges they encounter, and their perceptions regarding the effectiveness of ICT in teaching and learning. The findings reveal that while teachers exhibit a high level of readiness and overwhelmingly recognize the pedagogical benefits of ICT, their efforts are frequently undermined by persistent infrastructural and institutional challenges. Factors such as inadequate training, unstable internet connectivity, outdated resources, and lack of time significantly hinder effective ICT integration. Regression and correlation analyses further confirm that teacher support, positive attitudes, and student engagement are key drivers of successful ICT implementation. However, readiness alone does not guarantee effective use without the presence of enabling conditions such as technical infrastructure, institutional encouragement, and curriculum alignment. The study concludes that a multidimensional approach is essential for successful ICT integration, one that combines professional development, policy reform, infrastructure enhancement, and a supportive institutional culture. Addressing these areas collectively can lead to more meaningful and sustainable technology use in higher education, ultimately enhancing teaching effectiveness and student learning outcomes.

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