Evaluating ICT Practices in Higher Education: A Quantitative Study Using the SABER ICT Policy Framework in Pakistan

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Abstract

This study aims to evaluate the integration of Information and Communication Technology (ICT) in the public sector universities of Pakistan using the World Bank's SABER ICT Policy Framework. The research explores institutional practices across eight policy dimensions: vision and planning, infrastructure, teacher development, digital skills, learning resources, education management systems, monitoring and evaluation, and equity. A structured survey was administered to 80 faculty members across universities in the Punjab and Sindh. Descriptive statistics were run to examine patterns of ICT integration. Findings reveal fragmented and inconsistent practices, with weak performance in monitoring systems, professional development, and infrastructure. Institutions in the Punjab scored relatively higher, while universities in Sindh lagged behind. The recommendations direct policy actions to strengthen digital planning, equitable investment, and faculty capacity-building. The SABER ICT policy framework proved useful for benchmarking maturity and guiding reform in higher educational institutions for improvement. Comparative insights and regional disparities underscore the need for locally tailored digital strategies in higher education for future researchers.

Keywords: *ICT integration, SABER framework, higher education, policy evaluation, digital equity, Pakistan*

Introduction

The integration of Information and Communication Technology (ICT) in higher education is widely recognized as a transformative force that can improve teaching quality, expand access to knowledge, and enhance administrative and research efficiency. In the global context, ICT serves as a strategic enabler for academic innovation, capacity development, and data-driven institutional governance. It is expected that universities would embed ICT systematically across their strategic planning, infrastructure, faculty development, digital content management, and evaluation systems to create equitable, modern learning environments. However, the present situation in many public sector universities, particularly in developing countries like Pakistan, deviates from these expectations. While ICT has been introduced in pockets, its integration remains uneven, under-assessed, and often unaligned with institutional or national policy frameworks**.** Issues such as inadequate infrastructure, fragmented planning, lack of professional development, and poor digital literacy among faculty contribute to this persistent gap. Moreover, in public sector institutional readiness to adopt and evaluate ICT integration across core academic and administrative areas has not been comprehensively studied using a structured, evidence-based framework.

The gap between expectations and current practices lies in the absence of a holistic, context-sensitive evaluation of how public sector universities have progressed in adopting ICT. Although policies may exist at the national level (HEC, 2024), institutions often lack internal mechanisms for benchmarking their ICT readiness or impact. Furthermore, there is little clarity on how closely these practices align with international standards or best practices.

Globally**,** researchers have proposed several frameworks to evaluate ICT integration. The Technology Acceptance Model (TAM) and its extensions (TAM2, TAM3) assess perceived usefulness and ease of use among individuals (Davis, 1989; Venkatesh & Bala, 2008), whereas the Unified Theory of Acceptance and Use of Technology (UTAUT) adds dimensions like social influence and facilitating conditions (Venkatesh et al., 2003). The Diffusion of Innovation (DOI) theory (Rogers, 2003) focuses on the adoption process, and Institutional Theory examines external pressures on organizations (DiMaggio & Powell, 1983). While useful, these models mostly emphasize individual behavior or generic organizational dynamics.

In contrast, the World Bank's Systems Approach for Better Education Results (SABER) ICT Policy Framework offers a comprehensive and education-specific evaluation tool. It addresses eight interrelated policy domains: vision and planning, infrastructure, teacher development, skills and competencies, learning resources, EMIS, monitoring and evaluation, and equity and safety**.** Unlike individual-centered models, SABER is designed to assess institutional ICT capacity and readiness across systemic dimensions, making it particularly suitable for evaluating public sector universities in Pakistan.

Recent ICT monitoring reports continue to highlight the slow but ongoing digital transition in Pakistan's higher education sector. According to the HEC Digital Readiness Index (2023), only 42% of public universities maintain comprehensive ICT strategic plans, and less than 35% have

integrated Learning Management Systems (LMS) into routine academic delivery (HEC, 2023). A parallel study by UNESCO (2022) noted that ICT integration in Pakistani universities remains patchy, with significant gaps in institutional governance and faculty capacity. These findings underscore the urgent need for structured evaluation frameworks like SABER to assess readiness and guide ICT policy development. Therefore, this study uses the SABER ICT Framework as the guiding model to assess how ICT has been integrated in Pakistani public universities, and where they stand in relation to expected international benchmarks. For the purpose of this study, ICT refers to the use of digital technologies—including hardware, software, networking, and digital content—for enhancing teaching, learning, administration, and governance in higher education. Evaluation refers to the process of systematically assessing these ICT practices for their alignment with institutional goals and policy standards. The variables under study—based on the SABER framework—include vision and planning, ICT infrastructure, teacher development, skills and competencies, learning resources, monitoring and evaluation, EMIS, and equity and safety**.**

Problem Statement

Despite growing global recognition of ICT's role in transforming higher education, Pakistan's public sector universities lack a systematic evaluation of their ICT integration. While national and provincial education policies mention digital transformation, they seldom define benchmarks or performance indicators for universities. Local studies (Chandio et al., 2019; Ahmed, 2021) confirm that while ICT adoption is increasing, it is largely driven by individual initiatives or short-term projects, not by cohesive institutional planning. Moreover, most available research does not map existing ICT practices against a structured global framework such as SABER.

What remains undone in the local context is a comprehensive, dimension-based analysis of ICT practices across public universities. Previous research has explored ICT access or attitudes, however, it ignored systemic integration into institutional functions such as teacher development, monitoring systems, or digital equity. There is also a lack of comparative insight into regional disparities, such as differences in ICT readiness among Punjab and Sindh.

Globally and regionally, literature suggests using diagnostic models like SABER to assess ICT maturity and guide investment (World Bank, 2016; Alghamdi & Plunkett, 2022). Yet, such a framework-based study remains absent in Pakistan's higher education context. Additionally, no existing research systematically evaluates infrastructure, human capacity, and policy coherence across institutional and provincial lines.

In summary, the research problem lies in the absence of a structured, evidence-based assessment of ICT integration in public sector universities in Pakistan. This study addresses this gap by evaluating university-level ICT practices using the SABER ICT Policy Framework, identifying both strengths and shortcomings, and offering actionable insights to guide policy and planning.

Significance of the Study

This research holds significance for policymakers, university administrators, and stakeholders seeking to enhance ICT integration in higher education. By applying the SABER ICT Framework,

the study provides a comprehensive assessment of ICT practices in public sector universities; insights into gaps between policy and implementation**;** evidence-based recommendations to strengthen teacher capacity, infrastructure, and resource management; a foundation for institutional benchmarking aligned with international standards; and support for more equitable and inclusive digital transformation in higher education. Ultimately, this study contributes to refining ICT policies and strategies, aiming to position Pakistan's higher education institutions for long-term success in the digital era.

Objectives of the Study

- To evaluate the current level of ICT integration in public sector universities in Pakistan using the SABER ICT Policy Framework.
- To identify institutional difference of ICT practices based on university location through the SABER ICT dimensions.

Research Questions

- RQ1: To what extent do public sector universities in Pakistan integrate ICT based on the SABER ICT Policy Framework?
- RQ2: How do public sector universities differ in their levels of ICT integration according to institutional size and location?

Delimitations of the Study

The study was limited to voluntarily participatory public sector universities in Pakistan; private universities and other institutions were excluded. The focus was on the SABER ICT Policy Framework and excluded the evaluation of other ICT policy dimensions and models. Data were collected from university teachers and perspectives of students and IT staff were kept beyond the scope of this study. The research was confined to evaluating existing practices without proposing or testing new technologies from the SABER ICT policy framework lens. The study employed the quantitative research method while excluding other research methods.

Literature Review

The integration of Information and Communication Technology (ICT) has grown in the public sector universities. This ICT integration has brought improvement in the student learning outcomes, efficiency in administrative operations, and teaching methodologies (World Bank, 2018). The current literature review examines accounts of empirical researches, theoretical frameworks, and a critical analysis of ICT use in the public sector universities applying World Bank's Systems Approach for Better Education Results (SABER) ICT Policy Framework. This framework offers structured examination of strategies of ICT policy implementation, and the capacity of the institutions to enhance technological transformation in education (World Bank, 2016). The focus of literature review on theoretical models such as the Unified Theory of Acceptance and Use of Technology (UTAUT), the diffusion of Innovation (DOI) Theory, and

Technology Acceptance Model (TAM) explore the underlying factors that influence uptake of ICT in public sector universities.In addition, the review showcases empirical studies on ICT implementation, highlighting main trends, key findings, and challenges. Moreover, it highlights the strengths and weaknesses of existing research while identifying gaps for future investigations. This study contributes to enrich the ongoing discourse on the role of ICT-driven educational transformation in the public sector universities.

The SABER ICT Policy Framework

In 2011, World Bank launched the Systems Approach for Better Education Results (SABER) which aimed at promoting "Learning for All" and to help countries strengthen education systems systematically (World Bank, 2011). The purpose of the SABER-ICT Policy Framework was to foster a structured approach to support policymakers in making informed decisions about effective integration of Information and Communication Technologies (ICT) into education (Trucano, 2016). The SABER ICT framework is used as an evaluation tool with directions for drafting, reviewing, and evaluating ICT policies, mainly in the primary and secondary education (World Bank, 2016). This framework contains several key components that define effective ICT integration in education:

1. Vision and Planning: To involve stakeholders, secure funding, align ICT use with educational goals, and establish a clear policy vision (World Bank, 2016).
2. ICT Infrastructure: To ensure devices to support digital learning, internet connectivity, and access to reliable electricity (World Bank, 2016).
3. Teachers: To offer technical support, set ICT competency standards, offer professional development opportunities, and provide training to educators (Trucano, 2016).
4. Skills and Competencies: To foster lifelong learning among teachers and students and develop digital literacy (World Bank, 2016).
5. Learning Resources: To create and distribute digital educational materials customized to student needs (Trucano, 2016).
6. Education Management Information Systems (EMIS): To implement data collection and analysis systems for up-to-date decision-making (World Bank, 2016).
7. Monitoring, Evaluation, and Research: To launch mechanisms for assessing the impact of ICT policies and encouraging continuous innovation (World Bank, 2016).
8. Equity, Inclusion, and Safety: To ensure just access to ICT resources and address issues related to student well-being and cybersecurity (World Bank, 2016).

For policymakers, these components serve as benchmarks, allowing a comparison of national ICT policies against international standards (World Bank, 2016). The SABER-ICT policy framework runs on the principle that an evidence-based and systematic approach to ICT policy development can augment digital transformation in education (Trucano, 2016). It classifies policies based on global best practices, making it a useful theoretical tool for understanding ICT practices. However, the framework focuses on policy rather than real application outcomes. This difference

underscores the need for further research and tools to evaluate how these policies are implemented and their impact on teacher effectiveness and student learning (World Bank, 2016).

The SABER-ICT Policy Framework provides a structured, research-informed approach to integrating ICT in education. This framework offers a comprehensive guide for government focusing to reinforce their education technology policies by focusing data-driven decision-making, digital literacy, teacher training, infrastructure, and policy planning. However, research on implementation and impact assessment is necessary to ensure ICT policies translating into meaningful educational outcomes (Trucano, 2016; World Bank, 2016).

Technology Acceptance Models (TAM, TAM2, TAM3)

The perceived ease of use and usefulness of technology make it a valuable tool for understanding faculty and students in public sector universities uptake technological tools comes under Technology Acceptance Model (TAM) introduced by (Davis, 1989). The core constructs of TAM include teacher and students' perceived ease of use, and perceived usefulness of technology, whereby this relationship is the key component that influences a user's intention to use ICT. TAM provides a human lens based on exploring teachers experiences with technology use, and that by using teachers' perceptions about the usefulness and ease of use of new technologies, institutions can identify level of technology adaptation progress and recommend future directions. However, this model lacks accounts of experience, social influence, and cognitive factors.

TAM2 is the extended version of TAM which includes the social influence such as voluntariness, image and subjective norms; cognitive processes like showing results, quality of output, and relevance to job. While TAM focused on individual acceptance of technology, TAM2 adheres to technology adoption in organization and workplace (Venkatesh & Davis, 2000). TAM3 goes a step further to make this model more comprehensive by including interventions that influence technology adoption. This model suggests playfulness, anxiety, and computer self-efficacy as additional determinants of perceived ease of use, while experience serves a moderating role with broad applications in the fields of education, e-commerce, and healthcare (Venkatesh & Bala, 2008). The information of TAM, TAM2, and TAM3 offers different perspectives to better perform evaluation of the exiting ICT practices at the public sector universities.

The Diffusion of Innovation Theory

The Diffusion of Innovation (DOI) Theory is a process to examine practices, new ideas, or products spread to institutions over time (Rogers, 2003). There are factors that influence the decision for adopting innovation like knowledge, persuasion, decision, implementation, and confirmation. This adoption falls under one of the four categories like innovators, early adopters, early majority, late majority, and laggards. Rogers (1962) identified innovation adoption factors such as observability, trialability, complexity, compatibility, and its relative advantage. In education the use of DOI theory is widely used for adopting e-learning platforms like Zoom and Coursera etc.

The Institutional Theory

This theory highlights how external pressures, such as government regulations and funding policies, shape ICT adoption in public sector universities (DiMaggio & Powell, 1983). There are three types of institutional pressures: normative pertains to social norms and professional standards; mimetic refers to imitating others during emergencies; and coercive relates to legal, political or regulations. In other words, organizations follow institutionalized practices which are considered appropriate within workplace environment, even if they do not function efficiently (Meyer & Rowan, 1977). This theory explains similarity of organizations over time, conforming to institutional rules and regulations for gaining legitimacy and organizational behavior, and developing organizations by creating and spreading professions, processes, and structures.

The Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT extends TAM by incorporating social influence, effort expectancy, and facilitating conditions in ICT adoption (Venkatesh et al., 2003). The core constructs include the resources available to support and in facilitating technology use, user's perception about others valuing the use of technology, user's belief of how easy or difficulty to use technology, user's belief of how much technology impact job performance, and all constructs revolve around the central concept of a person's intention to use technology. Researcher widely use the UTAUT to understand factors that affect technology adoption in the public sector universities.

Empirical Evidence

The empirical studies report the impact of ICT adoption in various contexts of higher education. Using SABER ICT framework in Saudi Arabia, e-schools initiatives were evaluated to examine digital transformation. The alignment-check of e-school initiative policy with SABER ICT framework ensured a structured and comprehensive approach to ICT development in education (Alghamdi & Plunkett, 2022). In a case study in Malaysia, the World Bank (2016a) found SABER ICT framework use significant for assessing the government-led Smart School Initiative toward structured public and private partnership which ensured the successful implementation of ICT-based reforms in education. Moreover, this strategy of alignment-check fitted well with the policy dimension of the framework like teacher training, ICT infrastructure, and long-term planning.

More studies reported identification of policy gaps and strategizing educational technology in countries where SABER ICT framework is used. The World Bank (2018) report informed that high learning outcomes and higher level of technology integration are related with the well-structured ICT policies. Similarly, the evolution of national ICT policies for education, helps gradual updating in policy development and implementation to remain at par with the tech-advancements in the dynamic world (World Bank, 2016b).

The literature confirms that SABER ICT framework is a benchmarking tool for evaluating and improving the existing ICT policies in education. The analysis of policy components can help countries review ICT policy initiative and re-direct resources to optimize ICT integration. The higher education institutions have received more acceptance due to the facilitative role technology

has played over the years. Recent studies from South Asia reinforce this trend. For example, Rahman and Hossain (2022) in Bangladesh reported similar barriers to ICT integration, including insufficient teacher training and infrastructure gaps. Chakraborty (2023) found that state-level ICT policies in India lacked institutional follow-through, leading to inconsistent adoption. In Sri Lanka, Perera (2021) emphasized the role of centralized ICT planning in fostering consistent implementation across universities. Nepal has also shown progress through policy coherence and capacity-building programs (Thapa, 2022). These studies echo the regional importance of using diagnostic frameworks like SABER to systematically address ICT integration gaps in higher education.

ICT: A Catalyst for Teaching and Learning

Literature demonstrates that the integration of ICT in education fosters enhanced student performance, offers greater access to variety of educational resources, and increases student engagement. Means et al. (2013) found that in comparison to traditional settings, state-of-the-art environments tend to influence improved academic performance of students (Means et al., 2013). In the same way, digital gadgets enhance retention of knowledge, deepen understanding, and facilitate personalized learning experiences (Organization for Economic Co-operation and Development [OECE], 2021). Moreover, ICT enables interactivity and dynamism in the classrooms through offering opportunity for collaboration and immediate feedback.

Administrative Efficiency

ICT integration has been integral to education systems for fostering efficiency in discharging administrative functions, and providing cost-effective alternatives to paper-based record management. The facilitative facet of digitalization has lightened administrative burdens such as virtual storage option, online assessment and grading tools, automatic student information systems, saving time and energy to focus more on productive activities (European Commission, 2021). Moreover, data security and eco-friendly impact of technology eases the transition from piles of paper to paperless spaces with provision of storing more data.

Infrastructure Development

The foundation of ICT integration lies with infrastructure development to enable high achievement and student success in higher education institutions. Universities with strong advanced technology infrastructure that provides online learning platforms, e-libraries, and high bandwidth internet connectivity tend to show enhanced student achievement and engagement (World Bank, 2016). A reliable ICT infrastructure fosters conducive learning environment to offer seamless access to academic content and increase teacher-student communication.

Difference of Technology Adoption among Faculty and Students

The differences among human beings vary the rate of ICT adoption. Evidence shows that faculty members frequently encounter challenges when using technology into their teaching practices, while students exhibit quick adaptability to technology-based learning environment (Selwyn,

2016). Faculty faces challenges which stem from inadequate trainings, a lack of technical, resistance to change, and insufficient skill set to use technology. To curb these challenges, institutions can equip faculty members with the required ICT competence through continuous professional development programs for effective utilization of ICT gadgets.

Regional Disparities

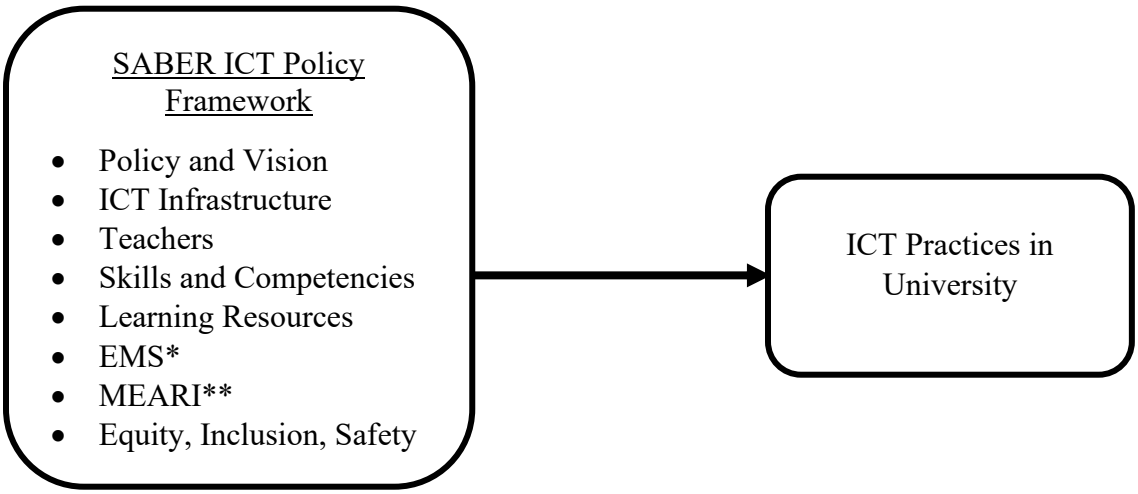
There exists a major disparity of ICT adoption in the educational institutions located in rural and urban areas. Rural institutions face financial constraints, fluctuations of internet connection, and inadequate ICT infrastructure (International Telecommunication Union [ITU], 2020). These disparities aggravate the innovative learning resources, restricts students' access to quality education, and furthers digital divide. The funding initiatives, pollicization, specific budget allocation, and equitable access to ICT address these gaps.Empirical evidence demonstrates the transformative potential of ICT in public sector universities, enhancing teaching, learning, and administrative efficiency. However, challenges such as infrastructural gaps, faculty resistance, and policy inconsistencies persist. The World Bank's SABER ICT framework provides a valuable lens for assessing and addressing these challenges. Future research should explore long-term policy impacts, emerging technologies, and strategies for bridging the digital divide in higher education.

The Conceptual Framework

The conceptual framework involves the SABER ICT policy framework which is further divided into eight dimensions such as vision and mission, ICT infrastructure, teacher, skills and competencies, learning resources, and monitoring, evaluation, research and innovation

Figure 1

The Conceptual Framework



Note. * Education Management System, **Monitoring, Evaluating, Assessing, Researching, Innovation

The main component of the conceptual framework is the unit of analysis, that is the exiting ICT practices of the public sector universities. The arrow suggest that SABER ICT policy framework is used as a benchmarking tool to evaluate the ICT practices of the public sector universities through the surveys.

Critical Summary

The review of the related literature highlights the usefulness of the SABER ICT policy framework in various contexts across world. The developmental assessment of the ICT adoption helps in the identification of the potential gaps in the institutional ICT policy. The available literature suggests advantages and limitations of using SABER ICT framework, however, a contextual gap still exists and necessitates an investigation into ICT policy implementation in Pakistan. Therefore, this study aims at evaluating the existing state of ICT policy through the SABER ICT policy framework.

Research Methodology

The methodological underpinnings stem from the positivist lens which suggests quantitative research method for this descriptive survey design, appropriate for exploring trends, practices, and institutional patterns related to ICT use. Data were collected through a structured adapted questionnaire aligned with the eight dimensions of the SABER ICT Policy Framework, allowing the research to quantify the degree of ICT integration across multiple universities and regions.

Population and Sample

The target population comprised faculty members from public sector universities across Pakistan**.** A voluntary participation random sampling strategy was used to reach respondents from a diverse set of public institutions and regions. A total of 80 complete and valid responses of faculty were received from the Punjab and Sindh provinces, enabling regional comparisons. Respondents represented a variety of disciplines and academic ranks to capture a comprehensive view of ICT practices at the institutional level. While the study includes diverse faculty members across two major provinces, the relatively small sample size (n=80) limits generalizability. The findings should be interpreted as indicative rather than representative, calling for broader studies to validate trends across additional institutions and regions.

Research Instrument

A structured, self-report questionnaire was adapted from the indicators of the SABER ICT Policy Framework (Trucano, 2016; World Bank, 2018). The instrument included items mapped to eight dimensions: vision and planning, ICT infrastructure, teacher development, skills and competencies, learning resources, education management information aystems (EMIS), monitoring and evaluation, and equity, inclusion, and safety. Each item was rated on a 4-point ordinal scale**:** 1 = Basic, 2 = Early stage, 3 = Operational, 4 = Advanced. The questionnaire was reviewed for content validity by ICT experts and researchers in educational technology. It was pilot-tested on 20 university teachers to assess clarity, item relevance, and structure.

Reliability

To determine the internal consistency of the SABER-based survey instrument, Cronbach's Alpha was computed. The resulting score of $\alpha = 0.89$ confirmed that the instrument has high reliability, indicating strong internal coherence across its constructs. This supports the robustness of the tool for evaluating ICT integration in higher education settings. According to George and Mallery (2003), $\alpha \geq 0.9$ is excellent, while $\alpha \geq 0.8$ indicate strong internal consistency across the survey items. Thus, the instrument used in this study was psychometrically sound for educational research. The content validity was ensured through expert review and item refinement. Items with ambiguity or low item-total correlation in the pilot were revised prior to final administration.

Data Collection Procedure

The data were collected using Google Forms distributed through email, WhatsApp, academic networks, and in-person contacts with the university teachers. Formal permission was obtained from each participating teacher where required. All participants were informed of the study's purpose and confidentiality protocols. Participation was voluntary and anonymous**,** with no incentives for participation in the study.

Results

This study had two-fold aims: to determine the level of ICT policy practices, and the comparison of level if ICT policy framework practices as outlined in the SABER ICT policy framework in the public universities of Pakistan. The data were collected from the public sector universities across two provinces of Pakistan: Punjab and Sindh. The obtained data were analyzed on SPSS V. 27, wherein data were checked for missing values and outliers prior to running descriptive statistics.

Table 1
Descriptive Statistics of SABER ICT Policy Framework

SABER ICT Indicator	Mean	SD	Min	Max
Vision and Overall Goal	2.22	1.15	1	4
Linkage of National and Institutional ICT Policy	2.31	0.99	1	4
Public Funding for ICT	2.25	0.93	1	4
Institutional Arrangements	2.49	1.03	1	4
Public–Private Partnerships	2.38	1.16	1	4
Electricity Supply	2.38	1.10	1	4
ICT Equipment and Networking	2.33	1.07	1	4
Technical Support and Maintenance	2.22	1.03	1	4
Teacher ICT Training and Professional Development	2.25	1.00	1	4
ICT Literacy or Digital Competency	2.36	0.91	1	4
Digital Learning Resources and Curriculum Integration	2.22	0.90	1	4
Monitoring and Evaluation of ICT Use	2.02	0.93	1	4
EMIS* and ICT Use in Administration	2.38	1.03	1	4
Digital Ethics, Safety, and Citizenship	2.24	0.90	1	4
Pro-equity and Inclusion Provisions	2.11	0.90	1	4

Note. *Education Management Information Systems

Higher mean scores (close to 4) suggest greater institutional maturity, while lower scores (near 1–2) reflect significant underdevelopment. Overall, the data shows most universities operate at a basic to early operational level in nearly all SABER dimensions.

Dimension-Wise Analysis of ICT Practices

Each SABER indicator was categorized into broader dimensions, and mean scores were aggregated. The following table details with summary for each dimension of SABER ICT policy framework:

Table 2

Mean Score Summary by SABER Dimension

SABER Dimension	Mean	Summary Interpretation
Vision and Planning	2.2 – 2.5	Fragmented strategic direction; varying levels of policy coherence.
ICT Infrastructure	2.2 – 2.4	Consistently low across equipment, electricity, and maintenance support.
Teacher Development	≈ 2.3	Underdeveloped; limited ongoing professional development for ICT integration.
Skills and Competencies	≈ 2.2	Basic digital literacy; need for structured competency frameworks.
Learning Resources	≈ 2.3	Some strength in digital content, but access and integration are uneven.
EMIS*	≈ 2.4	Mixed adoption of digital systems; some universities rely on manual processes.
Monitoring and Evaluation	≈ 2.1	Weakest area overall; most institutions lack systematic ICT assessment mechanisms.
Equity, Inclusion and Safety	≈ 2.2	Limited attention to inclusivity, accessibility, and digital citizenship.

Note. * Education Management Information Systems

The mean scores across SABER ICT dimensions reveal that most institutions in Punjab and Sindh remain at the Early to Operational levels of ICT integration. The dimension of Vision and Planning, while slightly stronger, remains uneven, reflecting fragmented or partially implemented ICT strategies at the institutional level.

ICT Infrastructure and Teacher Development both show persistent gaps—suggesting that faculty readiness and technological resources are insufficient to meet digital transformation goals consistently across provinces.

Notably, Skills and Competencies and Equity, Inclusion, and Safety fall near the lower end of the scale, emphasizing limited attention to digital literacy, inclusive practices, and digital safety in higher education environments.

EMIS and Learning Resources are slightly stronger but still reflect inconsistent adoption, with some universities relying on manual systems or limited digital repositories. Monitoring and Evaluation, with the lowest mean scores, stands out as the most underdeveloped area, indicating an urgent need for institutional accountability and ICT impact assessment mechanisms.

Taken together, these patterns suggest a pressing need for coordinated provincial and national efforts to address policy gaps, strengthen capacity, and ensure equitable access to ICT tools and practices in public universities. ICT integration in public universities is uneven and fragmented. While some institutions demonstrate isolated excellence, many lags behind, particularly in evaluation, infrastructure, and equity.

Provincial Comparison of ICT Integration

To explore regional disparities in ICT integration, the study compared SABER dimension scores across three provinces—Punjab and Sindh—based on responses from faculty in public sector universities. Institutions with unclear or unverified provincial affiliations were excluded from this analysis to maintain accuracy and interpretive clarity. As such the analyses based on the available data were as follows:

Table 3
Mean Scores of Provinces for SABER Dimensions

Dimension	Punjab	Sindh
Vision and Planning	2.32	2.05
ICT Infrastructure	2.26	2.25
Teacher Development	2.31	1.75
Skills and Competencies	2.38	2.00
Learning Resources	2.21	2.25
EMIS*	2.44	2.00
Monitoring and Evaluation	2.04	1.75
Equity, Inclusion and Safety	2.17	2.38

Note. * Education Management Information Systems

Punjab, with the largest number of institutions in the dataset, showed moderate performance overall. It led in *Skills and Competencies* and *EMIS*, though with noticeable variability across institutions. Moreover, Sindh scored consistently lower, particularly in *Monitoring and Evaluation* and *Teacher Development*, indicating gaps in capacity-building, infrastructure support, and implementation monitoring.

These disparities suggest an urgent need for regionally tailored ICT strategies that account for differing institutional capacities, resources, and governance structures. This provincial comparison underscores not only the disparity in ICT integration across institutional dimensions, but also the geographical inequities that shape the digital transformation of higher education in Pakistan. These

results call for policy differentiation and decentralization, where provincial higher education bodies adopt localized ICT improvement roadmaps aligned with both SABER benchmarks and regional needs.

Discussion and Conclusion

Discussion

This study evaluated ICT integration in public sector universities in Pakistan using the SABER ICT Policy Framework, a globally recognized tool for benchmarking educational technology implementation. The findings provide a detailed account of institutional performance across eight dimensions: vision and planning, ICT infrastructure, teacher development, skills and competencies, learning resources, EMIS, monitoring and evaluation; and equity, inclusion, and safety.

Fragmented Progress in ICT Integration

The overall analysis reveals that ICT integration in higher education remains fragmented and uneven**.** While a few institutions exhibit operational strengths in areas like *digital learning resources* and *EMIS*, most universities perform at basic or early operational levels**,** particularly in *monitoring and evaluation*, *infrastructure*, and t*eacher development*. This uneven progress suggests that many institutions are still navigating the early phases of digital transformation without a cohesive institutional ICT strategy (UNESCO Institute for Information Technologies in Education, 2022).

Capacity Gaps in Infrastructure and Faculty Development

Two of the weakest performing dimensions—ICT Infrastructure and Teacher Development—highlight systemic challenges. Despite increasing policy emphasis on digital education, many institutions struggle with limited bandwidth, inadequate hardware, and minimal technical support systems. Additionally, faculty digital competence remains underdeveloped, with few institutions offering structured, ongoing professional development aligned to ICT pedagogical integration. These findings are consistent with national-level observations from Ahmed (2021) and Chandio et al. (2019), who note that infrastructure and human capacity bottlenecks hinder ICT adoption in Pakistan's higher education sector.

Monitoring, Evaluation, and Policy Implementation Gaps

The monitoring and evaluation dimension recorded the lowest average scores, signaling the absence of formalized tracking systems to measure ICT use, performance, or impact. Without such mechanisms, institutions cannot assess progress, identify gaps, or make evidence-based decisions. This lack of monitoring also reflects a disconnect between ICT policy formulation and its institutional implementation**.** Moreover, while the SABER framework emphasizes planning and institutional arrangements**,** the data show that strategic planning in many universities lacks alignment with national ICT goals, such as those outlined in the HEC Vision 2025 Digital Agenda

(Planning Commission of Pakistan, 2014). This underscores the need to develop institution-specific ICT strategies with measurable goals and cross-stakeholder ownership.

Regional Disparities and Unequal Readiness

The provincial comparison revealed significant differences in ICT performance across regions. Institutions in Punjab scored higher in critical areas like v*ision and planning*, *teacher development*, and *infrastructure*. These results may reflect recent project-based interventions or donor-supported digital initiatives. In contrast, Sindh lagged in nearly all domains, particularly *monitoring* and *faculty capacity*, suggesting a need for targeted provincial-level planning and investment.

These findings are consistent with studies in other developing contexts. For example, a comparative study of ICT in higher education in Sri Lanka (Perera, 2021) noted that effective ICT integration correlated strongly with provincial-level ICT investment plans. Similarly, Nepal's universities have demonstrated more uniform progress due to centralized monitoring systems (Thapa, 2022). In contrast, Pakistan's ICT integration appears more fragmented due to decentralized planning and inconsistent institutional readiness.

Implications for Policy and Practice

The findings point to several policy implications. National and provincial higher education authorities must align institutional planning with global ICT benchmarks, such as SABER, while tailoring them to local capacity. There is an urgent need to strengthen institutional infrastructure through targeted investments in hardware, connectivity, and digital management systems. Faculty readiness must be addressed through structured professional development programs**,** informed by digital competency standards. The implementation of robust ICT monitoring systems (EMIS, digital dashboards) should be institutionalized and linked to performance indicators. Regional disparities call for equity-focused strategies, including special resource allocations to underserved provinces or rural campuses.

Conclusion

This study provides the first comprehensive, SABER-based assessment of ICT practices in Pakistan's public sector universities. The results reveal a fragmented and uneven implementation landscape. While some institutions have made strides in digital content development and monitoring systems, many continue to struggle with foundational challenges such as infrastructure, planning, and faculty readiness.

The analyses confirm that systemic barriers—not isolated technical issues—are the primary constraint to ICT integration in Pakistan's higher education system. These include underdeveloped policy alignment, inadequate faculty development, and regional disparities in access and implementation capacity. The use of the SABER ICT Framework allowed for a structured and comparative evaluation. However, translating diagnostic insights into institutional change requires strong leadership, targeted resource allocation, and sustained policy support at both national and provincial levels.

Policy Recommendations

- **Mandate ICT Strategic Planning**: Require all public universities to develop and publicly share institutional ICT strategies aligned with national policy goals, with clear implementation timelines and periodic review mechanisms.
- **Ensure Dedicated ICT Infrastructure Funding**: Establish a ring-fenced annual budget line—no less than 10% of institutional development funding—specifically for ICT infrastructure, connectivity, and maintenance, especially for rural and underserved regions.
- **Implement a National Faculty Digital Competency Framework**: Develop and roll out a standardized national framework for faculty ICT skills. Mandate annual ICT training hours as part of performance evaluations and CPD requirements.
- **Accelerate Development of Open Educational Resources (OER)**: Launch a national OER initiative with seed funding to support public universities in creating, translating, and curating digital learning content in local languages.
- **Institutionalize ICT Monitoring and Accountability**: Link public funding allocations to EMIS reporting. Require universities to submit annual digital performance reports using standardized ICT dashboards integrated with the HEC portal.
- **Embed Inclusion and Digital Safety in ICT Policies**: Make it compulsory for universities to adopt inclusive ICT policies that address access for marginalized groups. Integrate digital ethics and safety modules into student and staff orientations.
- **Localize ICT Reform through Provincial Digital Roadmaps**: Empower provincial higher education bodies to lead the creation of region-specific ICT action plans, guided by SABER diagnostics and linked to provincial budgetary allocations and donor engagements.

Pakistan's higher education system stands at a critical juncture in its digital transformation journey**.** While ICT is widely seen as a lever for quality and access, its true potential will only be realized through system-wide readiness, institutional alignment, and region-sensitive implementation. This study offers both a diagnostic template and a policy blueprint for moving toward an equitable, digitally enabled, and globally competitive higher education landscape**.**

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