

ROLE OF ICT IN SHAPING THE FUTURE OF PAKISTANI HIGHER EDUCATION SYSTEM

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ABSTRACT

This study examined the challenges faced by the Pakistani higher education system (HES) in integrating information and communication technology (ICT); it aimed at understanding ICT needs, measuring the increase in ICT demand, determining the relationship between ICT and HES performance, and understanding how the HES copes with the challenges of implementing ICT. The results of these analyses were used as the basis to suggest solutions. The normative Delphi method was applied to evaluate a sample of 30 HES experts randomly selected from urban and rural areas of Pakistan by administering a literature-based 35-item questionnaire. The experts revealed significant gaps in ICT demand and supply, ICT use, ICT-based higher education problems, and reasons for delays in ICT integration and provided suggestions for developing ICT-driven HES in Pakistan. This study's findings suggest that an effective and robust HES ICT policy could greatly improve the status of the Pakistani knowledge-based economy, thus helping establish ICT policy and planning, administration, and integration at the higher education level.

INTRODUCTION

In many countries, education is more than a means for enabling progress and preventing poverty; it is also critical for the development of knowledge societies and knowledge-based economies. As suggested by many researchers, the role of higher education institutes (HEIs) within the context of knowledge-based economies and globalization is to give individuals the ability to transform information into socially beneficial knowledge, skills, and values; modernize societies and improve the standard of living; and prepare and produce a skilled workforce (Masood, 2010; Kong, & Li, 2009; Shaikh, 2009; Ng et al., 2006). Amjad (2006) defines a knowledge-based economy as "one that bases its growth not on increasing capital or land or labor inputs, but on knowledge."

The advent and spread of ICT in varying degrees over the last two decades have led to the advent of information societies, which are sometimes called knowledge societies. Today, these societies play a momentous role in the development of knowledge economies (Binghimlas, 2009; Dighe et al., 2009; Allen, 2009; Bhattacharya, and Sharma, 2007). These ICT-driven knowledge societies necessitate a workforce skilled in the use of ICT, as well as government support, transparent and autonomous institutions, progressive attitudes, and a sound ICT infrastructure (see Alev, Altun, and Yiğit, 2009; Chowdhury, and Alam, 2009; Czerniewicz et al., 2005). In another study (Yusuf, & Afolabi, 2010; Shaikh, 2009; Jayson, 2008; Shaheeda et al., 2007) argue that ICT not only helps HESs in less developed countries narrow the global digital divide and produce their own knowledge societies, but that it also helps improve the quality of learning and educational outcomes. They further suggest that the state of any education system is determined through the quality of its HES, because the HES contributes to the development of education at all levels.

Several researchers (e.g., Iqbal, and Ahmed, 2010; Shaikh, 2009; Hameed, 2006; Amjad, 2006; Khan, and Shah, 2004) argue that this century demands confidence and efficiency in ICT use in all fields, at both the academic and industry levels, to achieve success in education, employment, and everyday life. Thus, in order to be successful in this century, Pakistan should improve its HES by implementing effective and robust ICT policies.

This study was aimed to gather the expert opinions of university personnel, students, and parents about what role ICT can play in shaping the future of higher education in Pakistan. A questionnaire (comprising 35 questions) was designed based on globally available literature on five core areas: ICT use in universities, ICT-related problems/integration challenges and their solutions, causes of a low standard of higher education, suggestions for ICT-enhanced higher education, and forecasts for the future of Pakistan's HES.

This research contributes findings in the areas of (i) lack of ICT use during lectures, (ii) ICT-based problems

facing Pakistan's HEIs both today and in the near future, (iii) actions and plans that government should implement to maximize the benefits of ICT, and (iv) predictions for the future of Pakistan's HES if the above-mentioned actions are taken. This future-oriented scholarly research adds some rigor to the discussion of ICT policy and planning, administration, and integration at the higher education level, and examines measures that government should consider when designing future ICT policies for Pakistan's HES.

RESEARCH FRAMEWORK

While much of the world is actively engaged in research on ICT's role in the betterment of higher education and the development of knowledge-based economies, Pakistan is concerned that there is a dearth of research material linking ICT and the Pakistani HES. Current literature shows ICT's important role—both in everyday aspects of life, including education, development, employment, economic growth, administration, poverty reduction, community engagement, and research, and in society-wide applications like life-long learning, the emergence of knowledge societies, and globalization (e.g., Aypay, 2010; Shaikh, 2009; Aldridge, 2008; Hameed, 2006). This study examines the link between ICT and higher education in order to understand critical issues such as needs for the Pakistani HES, the relationship between ICT and learning, growth of ICT use, problems with ICT, and the impacts of and future prospects for ICT integration.

In many studies, researchers (e.g., Teo, 2009; Derek, and Dahlman, 2006; Ng et al., 2006; Atkins, 2005; Van der Wende, 2002; Chung, 2001) claim that since ICT use has made world economies more competitive and interdependent, knowledge creation and its use have become focal points for long-term development strategies. They also suggest that since ICT improves the standard of living, modernizes societies, promotes equity in education, enhances the quality of teaching and learning, and, with other technologies, is a force for change, a more diversified and flexible type of HES in which research, teaching, and social engagement remain rich, relevant, and accessible is needed in countries transitioning from post-industrial to knowledge economies. This study strongly affirms that effective, results-oriented, and systematic ICT integration is needed to ensure a bright future for Pakistan's HES.

Bates (2001) addresses the issue of ICT usage in his study and claims that campus-based activities and private sector training markets have been the largest users of ICT tools and applications, and that the education sector has incorporated Internet use for many years. Additionally, he says that since a knowledge-based economy demands technology-ready workers, governments and business communities put enormous pressure on educational institutions to use ICT in their daily routine tasks. However, Isman, et al., (2010), Ojo et al. (2007), and Mumcu et al. (2004) claim that lack of ICT facilities and infrastructure in the workplace is significant barriers to ICT use. They conclude that a robust ICT infrastructure in higher education is a critical enabler and prerequisite for knowledge-driven development. This study's Delphi panel agrees on the inadequate provision of technological infrastructure as an important ICT policy and planning problem related to ICT integration.

In many studies (e.g., Vajargah, & Jahani, 2010; Erkunt, 2010; Shaikh, 2009; Balasubramanian et al., 2009; Gillard et al., 2008; UNESCO, 2008; Ng et al., 2006), researchers address the issue of ICT integration in higher education and suggest that policy makers and teachers can play an important part in this dimension. The former shapes a country's education policies, determines the ICT framework, and makes high-level decisions, while the latter ensures the appropriate, effective, and sustainable use of ICT to provide quality education for all. Hence, both groups need to understand how technology and the education system interact with each other. They strongly suggest that suitable levels of investment, adequate training, good policy, careful planning, restructuring the teaching process, and a systematic approach are required when integrating ICT into the HES in order to achieve maximum educational benefits. Further, they suggest that secondary and tertiary education levels should be given priority when integrating ICT in education. Shaikh (2009) makes a distressing observation concerning ICT skills development training programs in Pakistan. He found that due to fear of a difficult learning process, lack of responsibility and ownership, and poor attitude teachers deliberately miss their ICT training classes. Also, many teachers do not use ICT during their lectures even though they have been trained in ICT skills. Important global issues like ICT use, ICT integration, ICT infrastructure, and ICT-based HES are reviewed extensively in this study, as the questionnaire addresses the following issues: ICT use, ICT demand and supply, ICT integration problems and challenges, reasons for delay in integrating ICT, and suggestions for ICT-enhanced higher education. The study's Delphi panelists discussed, evaluated, and formulated their responses to these issues based on a Pakistani perspective.

The question of whether ICT is the panacea for all problems and grievances associated with the world's HESs is relevant here. Koc & Bakir (2010) and Pelgrum & Law (2003) argue that although ICT provides a solid foundation for quality education, but, educational goals, needs, and careful economics must drive ICT use in education.

The fact that ICTs are used with much greater regularity in universities in developed nations has resulted in different ICT problems in the developed and developing worlds. While HEIs in the developed world have to deal with the problems of interdisciplinary of technologies and departments, global responsibility, and sustainable development, the less developed world faces more serious problems such as massive growth in enrollment and institutional development, bad governance, high expenditures, poor and uneven distribution of ICT resources and infrastructure, incorrectly viewing ICT as a problem for organizational transformation, not making ICT responsive to the organizational vision and mission, and developing a non-systemic method of implementing ICT (World Bank 2009b; Nyandiere, 2006, Tomkinson et al., 2006; Tusubira and Mulira, 2004).

The World Bank (2009a), Rehman (2008), Hussain (2008), and the Boston Group (2004), have reviewed the status of higher education in Pakistan and stated that while HEIs in the developed world provide strategically planned vision and desire for the quest of merit, in Pakistan they witnessed declining academic excellence, lack of insight, mismanagement, bad governance, ignorance, and decay. Until recently, Pakistan either badly neglected or gave very little importance to higher education, science/technology, and research, despite the fact that the higher education enrolment rate has been constantly rising—from 3.5% in 1990 to 5.2% in 2007—and that enrollments are projected to double to 1.0 million by 2010 and triple to 1.9 million by 2015.

Atta-ur-Rehman (2007)—the former chairman of Pakistan’s higher education commission (HEC)—defines the core function of HEC as “to facilitate the transformation of Pakistan into a knowledge economy.” The steps being taken by HEC in recent years and the funds being provided by the World Bank to support higher education reforms designed to raise the standard of higher education in Pakistan have been recognized and appreciated by many researchers (e.g., Hoodbhoy, 2009; Shaikh, 2009; Amjad, 2008; Rehman, 2008; Hameed, 2006; Khan and Shah, 2004). These researchers have publicized that for the first time in Pakistan’s 63-year history, (i) operating budgets at universities have been increased significantly, (ii) faculty cadres have been lifted one grade above other public service employees, (iii) curriculum revision committees have been formed, and (iv) infrastructure such as electronic fixtures, Internet and broadband facilities, education portals, and digital research libraries have been upgraded or newly provided. They also recognize that a pool of highly qualified locally and foreign trained faculty has emerged in Pakistani universities because of the tenure track system, congenial environment, job security, and other fringe benefits. Fully funded scholarship programs in collaboration with local and foreign universities have been introduced to offer local and foreign scholarships to deserving and bright students on a merit basis. Researchers have concluded that the Government of Pakistan now considers ICT to be a lifeline for growth in the twenty-first century, and thus has designed cautious ICT policies in the recent past to promote the use of ICT in higher education. However, due to a lack of resources, and political issues such as inconsistent policies, there has not been an optimal strategy for improvement in the ICT sector.

Pakistan’s Medium-Term Development Framework 2005–2010 and Vision 2030 Approach Paper reflect policymakers’ vision of how to develop Pakistan into a knowledge-based economy. Rashid (2008) comments on the approach being adopted in these papers as:

“These papers set out strategic vision to develop Pakistan into a knowledge economy by committing increased resource allocation for: (i) higher education with enrolment at the tertiary level increasing from around 4 per cent (17-23 age group) to 8 per cent in 2010 and 20 per cent in 2022 with efforts focused at enhancing quality and encouraging private sector involvement and ensuring continued increase in funding until 1 per cent of GNP is devoted to this sector; (ii) skills development to make Pakistan’s labor force globally competitive including re-introducing technology streams in secondary education to gradually aim for enrolment figures of 50 per cent; (iii) science and technology and research and development (R&D) and to refocus efforts to those areas considered strategic for developing a knowledge-based economy and to encourage collaboration among public research institutions, universities and clusters of industries; and (iv) improvements in ICT infrastructure to ensure that such communications and multimedia infrastructure is state-of-the-art and able to keep pace with rapid advances”.

To change the current status of Pakistan as poor in terms of a knowledge-based economy, this study aims to provide solutions regarding ICT-based issues in Pakistan’s HES. This future-oriented scholarly research adds some rigor to the discussion of educational policy and planning, administration, and ICT integration at the higher education level from a Pakistani perspective. The recommendations and empirical evidence collected from this study are important contributions to the literature.

METHOD

Hypotheses postulated for this study were as follows:

H₁. There are no significant differences in perceptions among Delphi panelists regarding 13 collective issues related to ICT integration in Pakistan's HEIs, stated as:

- Present and future ICT use
- Use of common ICTs
- Use of educational/research ICTs
- How much faculty/students/staff should rely on ICT
- How much faculty/students/staff should use ICT
- How much help ICT provides to faculty/students/staff
- Reasons for delay in ICT integration
- Causes of low standards for HEIs
- ICT integration challenges in HEIs
- Suggestions for ICT-enhanced HES
- ICT demand in HEIs
- ICT supply in response to ICT demand in HEIs
- Attitude problems

H₂. There are no significant differences in perceptions among Delphi panelists regarding the question: Can ICT shape the future of higher education in Pakistan?

The Delphi research method—which is not only a qualitative approach, but also adds rigor and an audit trail to research by combining both the qualitative and quantitative approaches of modern research—has been used to carry out this study. This study's research decisions have been validated with appropriate statistical tests (sampling, graphs, mean, standard deviation, etc.), and a pilot study. The questionnaire was developed based on globally available literature on ICT-related issues at the higher education level. The Delphi panel was comprised of university personnel, students, and parents from both urban and rural areas of Pakistan.

This study uses normative Delphi, which seeks expert opinion from panelists on a prescribed list of questions/issues, and at the same time gives the panelists the freedom to agree/disagree with the issues discussed in the prescribed list and add any further issues.

Delphi Panelists

While there are no hard and fast rules regarding the selection of Delphi panelists, a number of factors, such as homogeneous/heterogeneous sample, decision quality/Delphi manageability, internal or external verification, etc., need to be considered (Skulmoski et al., 2007). Since the sample of study was almost homogeneous in terms of required expertise—only parents did not have direct experience with ICTs in HEIs, and their expertise is still justifiable since only technology-aware and knowledgeable parents were included in the study—a smaller sample of between 25 and 30 people could yield sufficient results. Also, since this study involves obtaining an individual's personal opinion based on his/her experience regarding ICT use and ICT integration issues in the higher education classrooms of Pakistan, there was no required level of technical expertise needed. Rather, any active and well-educated person could be seen as an expert to whom the questionnaire could be administered. The expert selection criteria laid down by this study for required level of expertise was:

Faculty member: A person currently employed in a university or institute of higher education.

Student: A student in the final stage of studies in any ICT-enhanced university or institute of higher education.

Administrative Staff: A person who works in a university or institute of higher education where ICT tools are used extensively in departments such as library, accounts, examination, or admission.

Parent: A person who considers ICT extremely important for his/her children to stay ahead in this era of globalization, and provides ICT facilities for his/her children at home.

ICT policy maker: A person at the secretary level who plays a vital role in designing government/university ICT policies.

Panelists included both males and females. There were 30 panelists, out of which 21 (70 percent) were male and 9 (30 percent) were female.

Instrument

In order to gather data that helps identify ICT integration problems and suggests solutions that lead to the design of user-friendly ICT policies, a 35-item questionnaire—initially composed of 32 questions in Round I, with three more questions added based on suggestions in Round I responses—based on 13 collective issues was proposed and finalized. It was divided into close-ended (questionnaire forms I and II) and open-ended [identification of new tasks/suggestions/comments (if any)] questions.

Questionnaire form I—based on three collective issues, i.e., ICT use in Pakistani universities, use of common ICTs, and use of educational/research ICTs—was developed to allow panelists to use their expert opinion to rate on a scale of 1 to 5 using likert-style questions, while questionnaire form II—based on the remaining 10 collective issues—was designed to ask panelists to identify (i) why there is a desperate need for ICT, (ii) ICT-related problems and integration challenges, (iii) reasons for delay in ICT integration, (iv) causes of the low standard of HEIs, (v) recommended actions for proper implementation of ICT infrastructure and policy, and, finally (vi) a forecast for the future of Pakistan's HES if the above-mentioned actions were taken.

Procedure

In order to improve comprehension of the Delphi questionnaire and to resolve any procedural problems, a pilot study was conducted using nine randomly selected individuals with equal representation of faculty members, parents, and students. The Delphi questionnaire was administered to each individual for testing and adjusting purposes before finally beginning the Delphi study.

The study was formally begun when a letter of participation was e-mailed to 500 randomly selected personnel requesting nominees for parents, teachers, students, administrative staff, and ICT policy makers. That letter highlighted (i) the importance of ICT in higher education, (ii) the purpose and objectives of the study, (iii) the expert selection criteria and required level of expertise, (iv) probable length of study, and (v) information about the submission of demographic information and queries (if any). The e-mail addresses of personnel were collected through official university web sites, formal requests to university authorities, and personal contacts.

Initially, it was decided that 60 personnel comprising five categories would be surveyed: faculty members, students, parents, administrative staff, and ICT policy makers, with two of each from Karachi, the biggest city and industrial hub of Pakistan; Islamabad, the capital city of Pakistan; and each of the four provinces: Punjab, Khyber Pakhtunkhwa, Balochistan, and Sindh. However, only 32 of those surveyed confirmed their participation through to the end of study. Therefore, based on the criteria laid down for the study (5 categories * 6 locations = 30, one person from each location → 1*30=30, two persons from each location → 30*2=60, i.e., the number of panelists could be 30, 60, 90 and so on), the responses of two redundant panelists were not included, resulting in a final survey of 30 panelists.

Delphi Round I began when a questionnaire was e-mailed to Delphi panelists with guidance on how to fill it out and submit it back to the Delphi organizers. The results of Delphi Round I were analyzed with the help of appropriate statistical tests such as statistical mean, standard deviation, percentages, etc., in order to measure the central point of the data set, variability in responses, and consensus level. In Delphi Round II, the group average (mean), standard deviation, and percentage of consensus on each particular issue/question were sent back to each panelist along with their previous ratings, and panelists were requested to review their responses with the group averages and once again rate each question/task, in order to achieve minimum level of variability in responses for further consensus. To grasp the overall understanding of issues, comments/suggestions on questions submitted by individual panelists in Round I responses were included in italic print against each question in Round II. Results of Delphi Round II were analyzed again against minimum variation in panelists' response rate on average (<0.5), which forced the Delphi organizers to stop the study at Round II and finalize/interpret results, as panelists had reached the required consensus level.

DATA ANALYSIS

In order to grasp the Delphi results, analysis of each question has been done in tabular form (Asymmetric Lambda) with appropriate statistical tests and bar graphs using the features of MS Excel (Table 1).

Table 1 Showing Round II analysis of Question 1

Question 1 (Present use)														
Panelist Categories							Percentages				Consensus			
	Score	A	B	C	D	E	Total	Score	Response	Participation	Mean	SD	Round off Mean	% USE
Rating	5	0	0	0	0	0	0	0	0.0%	0.0%				
	4	1	3	3	5	3	15	60	51.7%	50.0%				
	3	3	1	3	1	2	10	30	34.5%	33.3%				
	2	2	2	0	0	1	5	10	13.8%	16.7%				
	1	0	0	0	0	0	0	0	0.0%	0.0%				
Total		6	6	6	6	6	30	100	100%	100%	2.93	0.45	3	50%

Participation percentage reveals panelists' interest level while attempting any question during each round of Delphi. Mean is calculated for two purposes, i.e., (i) to know at what point of the data set panelists agree on any particular issue, and (ii) in questions 1 through 15, the panel mean is rounded and mapped—e.g., 2.93=3.0=50%, 3.83=4.0=75%—in order to show panelists' consensus on the nature of that particular question. Panelists' consensus in questions 16 through 35 is calculated by summing the response percentages of strongly agree (i.e., score 5) and agree (i.e., score 4) rows. The standard deviation (SD) column calculates spread or variability in panelists' responses. In order to assume that this study reached a strong level of consensus, the minimum level of SD was set to 0.5.

The panel mean and SD calculated against each question of Round I were added to the Round II questionnaire so that each Delphi panelist could compare his/her rating with that of the panel mean, and either change his/her response if satisfied with the panel's point of view or retain his/her old rating and justify that properly (Table 2). Any important issues brought forward against Round I open questions were added to the Round II questionnaire and panelists were asked to rate them.

Table 2 Showing Question 1 of Round II

Planning, Developing & Organizing instruction		Your Rating	Panel Mean	SD	% USE	5	4	3	2	1
Lesson planning, reading online books, searching text using ICT tools and applications such as MS Office, Google.	Present		3	.73	50%					
	Future		5	.35	100%					
Comments from Round: Presently all the standard books are not available in soft format or online especially for the Basic engineering and science. For new technologies almost most of the resources are available online but not for basic sciences. So how can they fully rely on ICT, as most of their supporting material in teaching is paper-based. Give stress and make them goal / result oriented.										
I did not change my response to the Panel MEAN (CONSENSUS) response because _____										

To decide whether to go for Round III, the SD of each question in the Round II responses was checked against the required minimum level of variability (≤ 0.5). Most questions fell within the minimum level of variability during Round II analysis, and hence this study came to an end at Round II.

RESULTS

Table 3 describes the results of study in detail.

Table 3 Showing Delphi Round II results

#	Description of Items	Round II results				
	<i>Tasks that Faculty/Students/Staff perform in their work</i>	Participation	Mean	SD	Consensus	
1.	Planning, Developing and Organizing instruction	Present	100%	2.93	0.45	50%
		Future	100%	5.00	0.00	100%
2.	Housekeeping and Record keeping Tasks	Present	100%	3.07	0.58	50%
		Future	100%	5.00	0.00	100%
3.	Managing Student Conduct	Present	100%	3.07	0.58	50%
		Future	100%	4.97	0.18	100%

4.	Presenting Subject Material / Teaching	Present	100%	3.13	0.43	50%
		Future	100%	4.97	0.18	100%
5.	Assessing Student Learning	Present	100%	2.97	0.49	50%
		Future	100%	4.87	0.35	100%
6.	Academic Research	Present	100%	2.90	0.40	50%
		Future	100%	5.00	0.00	100%
7.	Administrative Support	Present	100%	3.10	0.31	50%
		Future	100%	4.90	0.31	100%
8.	Meeting Professional obligations / self study: Using social networks/forums in quest of knowledge	Present	100%	3.03	0.49	50%
		Future	100%	5.00	0.00	100%
9.	Database/library research and information (IEEE, ACM)	Present	100%	3.20	0.41	50%
		Future	97%	5.00	0.00	100%
10.	Group discussion/supervision/training	Present	97%	2.21	0.56	25%
		Future	100%	4.93	0.25	100%
	<i>Average Results of Questions (8-10) showing Present use</i>	<i>Present</i>	<i>99%</i>	<i>2.81</i>	<i>0.49</i>	<i>42%</i>
	<i>Average Results of Questions (8-10) showing Future use</i>	<i>Future</i>	<i>99%</i>	<i>4.98</i>	<i>0.08</i>	<i>100%</i>
	<i>Average Results of Questions (1-10) showing Present use</i>		<i>100%</i>	<i>3.00</i>	<i>0.47</i>	<i>49%</i>
	<i>Average Results of Questions (1-10) showing Future use</i>		<i>100%</i>	<i>4.96</i>	<i>0.14</i>	<i>100%</i>
11.	Common ICT tools/applications	Present	100%	4.97	0.18	100%
		Future	100%	5.00	0.00	100%
12.	Educational/Research ICT tools	Present	100%	3.10	0.31	50%
		Future	100%	5.00	0.00	100%
13.	Rely on ICT		100%	4.07	0.25	75%
14.	Use of ICT		100%	4.07	0.25	75%
15.	Help by ICT		100%	4.00	0.37	75%
	<i>Causes of deprived standard of HES of Pakistan</i>					
16.	Poor distribution of ICT, lack of robust ICT policy		100%	4.53	0.68	87%
	<i>ICT integration challenges that HEIs of Pakistan face today</i>					
17.	<i>Education Policy and Planning: Inadequate technological infrastructure</i>		100%	4.40	0.67	90%
18.	Under funding, high cost of sustainability of the technology		93%	4.29	0.66	86%
	<i>Average Results of Questions (17-18)</i>		<i>97%</i>	<i>4.35</i>	<i>0.67</i>	<i>88%</i>
19.	<i>Expertise: Staff training, lack of ICT experts, lack of ICT skills</i>		100%	4.47	0.51	100%
20.	Language and educational content development		90%	3.93	0.77	89%
	<i>Average Results of Questions (17-18,19,20)</i>		<i>96%</i>	<i>4.25</i>	<i>0.65</i>	<i>92%</i>
	<i>Reasons for delays in ICT integration in HEIs of Pakistan</i>					
21.	Teachers' lack of ICT competencies		97%	4.47	0.57	93%
22.	Lack of money leading to limited access to computers and software		100%	4.60	0.50	100%
23.	Lack of creativity and unwillingness to change the running system		100%	4.53	0.51	100%
24.	Difficulty in linking ICT to the curriculum		100%	2.37	0.49	0%
25.	Needing ICT facilities in lecture halls rather than in computer labs		100%	4.30	0.60	93%
	<i>Average Results of Questions (21-25)</i>		<i>99%</i>	<i>4.05</i>	<i>0.53</i>	<i>77%</i>
	<i>Suggestions for ICT-enhanced HES of Pakistan</i>					
26.	Comprehensive guidelines, time-bound targets, political commitment		100%	4.65	0.55	97%
27.	Careful scrutiny of current state of HES		100%	4.61	0.50	100%
28.	Piloting of the chosen ICT-based model		100%	4.58	0.50	100%
29.	Specification of existing sources of financing		97%	4.65	0.49	100%
30.	Authorities should provide high tech ICT facilities and scholarships		97%	4.80	0.41	100%

31.	HES demands target-oriented, robust and effective ICT policy	100%	4.77	0.43	100%
32.	Effective ICT integration will brighten the future of HES of Pakistan	100%	4.80	0.41	100%
	Average Results of Questions (26-32)	99%	4.69	0.47	100%
33.	ICT Demand in HEIs	90%	3.12	0.61	75%
34.	ICT Supply in HEIs	93%	2.31	0.67	50%
35.	Problem of Attitude. Grabbing resources and misuse them.	93%	4.53	0.73	100%

When asked to rate the present and anticipated future use of ICT in Pakistan's HEIs (Questions 1–10), Delphi panelists rated present use as 49 percent and anticipated future use as 100 percent. The response rate achieved was around 99 percent in both rounds. In response to Questions 11 and 12, panelists rated common ICT use as 100 percent and educational/research ICT use as 50 percent presently, and predicted 100 percent use of both types of ICTs in the future. This study shows that 75 percent of panelists rely on ICT, 75 percent use ICT, and they believe that at most 75 percent help is being provided to them by ICT in their daily job routine tasks. Causes of the low standard of HEIs in Pakistan (Question 16) were rated 4.53 with 87 percent of panelists agreeing on these listed causes.

On ICT integration challenges (Questions 17–20), an 88 percent consensus with mean score of 4.35 for educational policy and planning challenges, 100 percent consensus with mean score of 4.47 for expertise challenges, and 89 percent consensus with 3.93 mean score for language and educational content development challenges was recorded. Seventy-seven percent of panelists showed their agreement with the listed reasons for delay in ICT integration (Questions 21–25). Suggestions for ICT-enhanced higher education and the future of Pakistan's HES (Questions 26–32) were rated 4.69 with 100 percent agreement. In response to open questions in Round I, only three new issues were brought forward: ICT demand and supply (Questions 33 and 34) were rated as 75 percent demand with only 50 percent supply. Attitude problems were suggested as one of the main causes of the low standards of higher education. This issue achieved 100 percent consensus (Question 35). Variability in responses (SD column) from higher values in Round I to lower values in Round II shows the consensus building process.

FINDINGS

Findings are based on the results of the study.

Currently, ICT is widely used in Pakistan's big-city HEIs, i.e., those in Karachi, Lahore, Peshawar, Quetta, Islamabad, etc., but when their use is measured throughout the whole country, this study reveals 50 percent use when compared with near-future (year 2019) or with developed countries. It is also assumed that educational/research ICTs are supposed to be used extensively in the near future, but unfortunately their current use is 50 percent. This study concludes that university personnel should use 75 percent ICT in their job-related tasks, should rely 75 percent on ICT (cutting out 25 percent due to local infrastructure, policy mechanisms and panelists' own confidence level with ICT) and that 75 percent help is being provided by ICT to university personnel in their job-related tasks.

Major causes of the low standard of higher education as suggested in this study are (i) poor or uneven distribution of ICT resources and infrastructure, (ii) high ICT expenditures and lack of money, (iii) poor or lack of robust ICT policy, (iv) incorrectly viewing ICT as a problem for organizational transformation, (v) not making ICT responsive to the organizational vision and mission, and (vi) developing a non-systemic method of implementation of ICT policy.

Panelists highlighted the inadequate technological infrastructure, under-funding and high cost of sustainability of the technology as educational policy and planning challenges. They suggested that lack of ongoing staff skills development training and lack of ICT competencies among support staff are challenges related to expertise, and they suggested that since a major portion of educational material is available online and is in English only, there is a need to develop material in local languages, which they identified as a language and educational content development challenge (Figure 1).

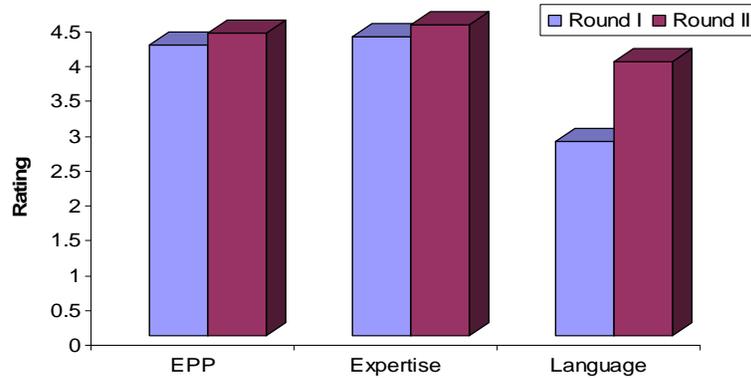


Figure 1. Showing panelists' consensus on ICT integration challenges faced by Pakistani HES

Reasons for delay in ICT integration in higher education include (i) teachers' lack of ICT competencies, as they take too little time to learn ICT skills; (ii) lack of money leading to limited access to computers and software; (iii) lack of creativity and willingness to change the system; and (iv) needing ICT facilities in lecture halls rather than in computer labs. However, it was not considered important that linking ICT to the curriculum is somehow very difficult (Figure 2).

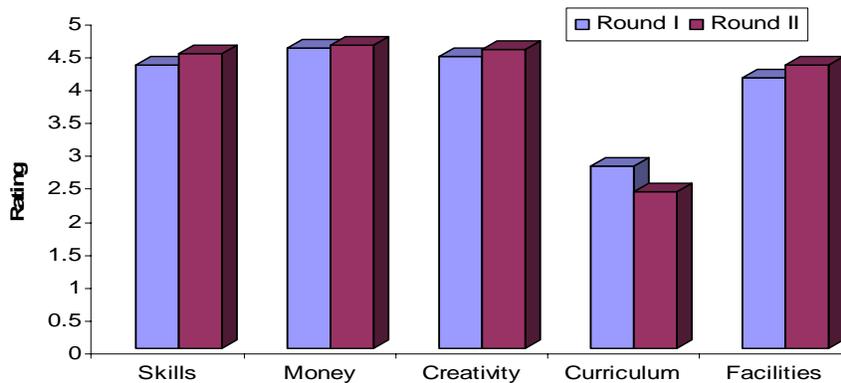


Figure 2. Showing panelists' consensus on reasons for delay in ICT integration

This study suggests (i) development of a systemic and politically committed method of implementation of robust, effective, and target-oriented ICT policies; (ii) adequate provision of technological resources such as fast and affordable internet connectivity, availability of the latest ICTs in higher education, sustainable availability of electricity and telephony, access to computers in schools and households, affordable teleconferencing facilities, free access to digital libraries, etc.; (iii) modifications in current higher education ICT curricula in order to emphasize both theoretical and practical uses of ICT; (iv) piloting the chosen ICT-based higher education model in order to pre-study potential problems in instructional/educational design, implementability, and usefulness; (v) careful scrutiny of the current state of HES, including curriculum, pedagogy, infrastructure, capacity-building, educational content, and ICT financing; (vi) developing sustainable strategies for arranging finances to support ICT over the long term, and (vii) identifying and harmonizing efforts among interest groups (Figure 3).

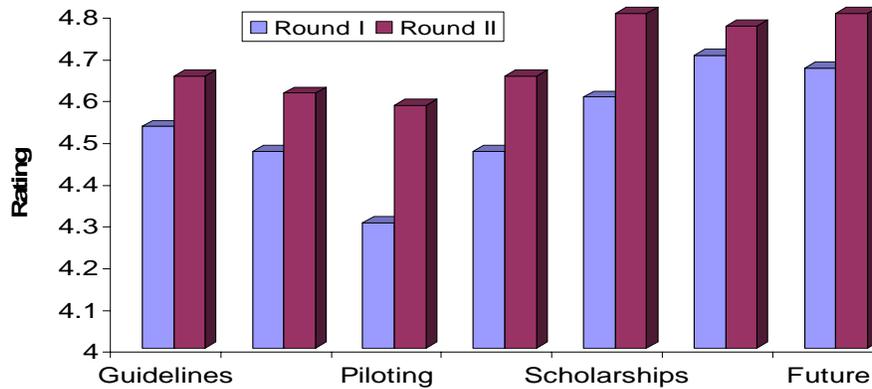


Figure 3. Showing panelists' consensus on suggestions for ICT-enhanced higher education

Panelists suggest that Pakistan's HES demands ICT policy with clear and explicit objectives, planned and time-specific targets, available resources, and political commitment. They identified a major gap in ICT demand and supply in HEIs, i.e., 25 percent. In their views, the current demand for ICT is 75 percent but only 50 percent is provided. This study shows strong agreement about attitude problems and comments that higher education authorities grab ICT resources but don't use them properly.

The overall variation in panelists' views is less than or equal to 0.5, which suggests that panelists reached a strong consensus level in Round II (Figure 4). In response to open questions, only three comments, i.e., ICT demand, ICT supply, and the problem of attitude were made, hence the majority agreed on the comprehensiveness of the Delphi questionnaire.

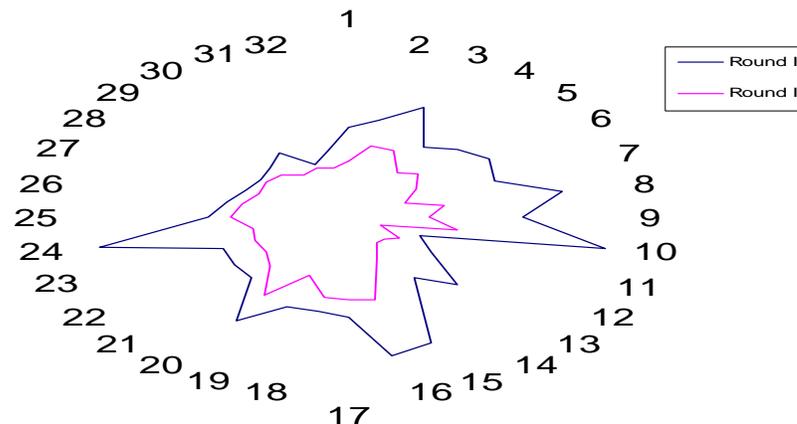


Figure 4. Showing consensus-building process among Delphi panelists

CONCLUSIONS

This study links ICT and the Pakistani HES with the aim of understanding needs, measuring growth, strengthening the relationship, coping with challenges, and, finally, suggesting solutions to problems. Important global issues such as low ICT use in education, the demand for technology-ready workers, a lack of ICT facilities and infrastructure in workplaces, high ICT expenditures, and other problems specifically related to the Pakistani HES, such as poor distribution of ICT, lack of robust ICT policy, under-funding, teachers' lack of ICT competencies, etc., are reviewed at length in this study. Delphi panelists evaluated, discussed, and formulated their recommendations on these issues from the Pakistani perspective.

Suggestions pertaining to ICT-enhanced higher education and increased ICT use as proposed by the Delphi panelists in this study include: (i) provision of ongoing staff training in developing ICT skills; (ii) generating consistent finances to support ICT use over the long-run; (iii) developing a systemic and politically committed method of implementation of robust, effective, and target-oriented ICT policy; (iv) adequate provision of technological resources; (v) modifications in current higher education ICT curricula while emphasizing both theoretical and practical uses of ICT; (vi) piloting the chosen ICT-based higher education model; and (vii)

careful examination of the current state of HES, including pedagogy, curriculum, infrastructure, capacity-building, educational content, and ICT financing.

This study adds rigor in ICT policy and planning, administration, and integration at the higher education level and affirms that an effective and robust ICT policy for HES can change the current status of Pakistan as poor in terms of a knowledge-based economy to rich. The recommendations and empirical evidence collected from this study are important contributions to the literature.

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RECOMMENDATIONS

Keeping in mind the current and anticipated future ICT status of the Pakistani HES as reported in this study, ICT policymakers can use the results of this study as a roadmap to ICT-driven development. Since this study was administered to the real stakeholders—the students, parents, faculty members, admin staff, and policymakers of the Pakistani HES—its results can undoubtedly shape the future of Pakistan's higher education system.

A separate committee may be formulated to promote educational/research ICTs such as digital libraries, scholarly search sites, encyclopedias, manufacturing/design tools, programming languages, course management systems, learning management systems, web development tools, satellite imagery tools, etc., in order to overcome deficiencies in the use of education/research ICT tools. To meet 75 percent ICT use and the goal that university personnel should rely 75 percent on ICT, the authorities should take the right measures at the grass root level in order to increase the confidence level of university staff in ICT use.

Since the scope of this study was limited to the Pakistani perspective, countries (either developing or developed) with the same nature of ICT integration problems can map the results per their needs.

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