



Information Communication Technology (ICT) among University Students in Pakistan

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ARTICLE INFO

Article History:

Received: April 13, 2022

Revised: June 26, 2022

Accepted: February 19, 2023

Available Online: February 22, 2023

Keywords:

Higher Education

ICT Resources

Online Learning

COVID-19

Technology

Funding:

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

ABSTRACT

In the sphere of education, the influence of technology is growing tremendously. However, due to rapid technical progress, its implementation has been fraught with various difficulties, particularly in developing countries. This study investigates current trends and challenges in the use of information and communication technology (ICT) among university students in Karachi, Pakistan. The study is based on a quantitative approach. A random sample of 130 university students is collected through a paper-pencil survey questionnaire. For data analysis, descriptive statistics are applied. According to the results, the majority of students use smartphones for educational purposes and spend more time on the internet for entertainment and other purposes than for academic purposes. They acknowledge the significant role of technology in their learning and have an intermediate level of computer skills. Most of the students are dissatisfied with the available ICT-based technology in universities.

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1. Introduction

The influence of modern technology in the field of education has extensively transformed the whole process of teaching and learning. According to Gros and López (2016), technology has great educational potential in terms of improving educational quality, facilitating universal access to education, and bridging learning divides. Saal, Van Ryneveld, and Graham (2019) highlighted that technology is used as a tool to strengthen the overall learning experience. It is both a part of the curriculum and a tool for delivering and guiding education.

In this regard, Khan Tithi, Chakraborty, Akter, Islam, and Khan Sabah (2021) described information and communication technology (ICT) as a remarkable term that focuses on communication technologies. Huth, Vishik, and Masucci (2017) have elaborated ICT as an umbrella term that includes any communication device or application, encompassing radio, television, cellular phones, computers, network hardware and software, satellite systems, and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning. König, Jäger-Biela, and Glutsch (2020) also acknowledged that the integration of information and communication technology has revolutionized all areas of education in a wider way.

Although, the expansion of new varieties of computers and internet technologies have overwhelmed university- students' learning processes, as Ali (2019) has mentioned. However, Martinez-Daza, Guzmán Rincón, Castaño Rico, Segovia-García, and Montilla Buitrago (2021) justified that it has a high customized capacity and ability to help learners manage their learning based on their strengths, needs, skills, and interests, as well as being suitable for universities

to provide a world-class education to the country's growing young population. According to Lysenko et al. (2019), accessibility to quality educational content and the opportunity for individualized learning are the two major advantages of technology-based education. The United Nations Educational, Scientific, and Cultural Organization in 2019 has clearly stated that ICT can complement, enrich, and transform education for the better.

However, implementing a technology-based network in a formal educational setting is difficult in many respects since it requires both cognitive and technical abilities, as well as administration, replacement, and maintenance services. Dwivedi (2019) asserted that an institution-wide technology-based network is also associated with cost-related issues. It is heavily dependent on the socioeconomic and socio-cultural backgrounds of students and teachers. Thus, in a formal educational setting, establishing a technology-based infrastructure as well as organizing, maintaining, managing, and running it, in the context of a developing country can be quite challenging because it entails many technical, social, psychological, and cost-related issues. Despite that to conceive the future, as Melo, Llopis, Gascó, and González (2020) asserted, information and communication technology may play an essential role in the mediation of the teaching-learning process.

In this regard, the recent pandemic acts as a reminder of the importance of Information and communication technologies in the field of education. As a result of the Coronavirus outbreak, educational institutions all around the world were compelled to abruptly switch from traditional to online modes of education. Because of this rapid transformation, the educational sector of Pakistan at all levels has faced various challenges and disruptions. The Executive Director of Center for Global and Strategic Studies (CGSS), Islamabad, Pakistan has stated that many Pakistani university students have expressed their concerns regarding online learning classes and have rejected this system of education due to poor internet connectivity and a lack of effectiveness in the online education system. He further reported that the students said that because of persistent internet issues, it is nearly impossible for them to complete their tasks and attend lectures and quizzes, (Akram, 2020).

While computers technology has become a necessity in education, more attention must be paid to the development of infrastructure and professional skills in order to maintain students' and teachers' intensives, as motivation is a vital learning factor, particularly in online learning. However, in the context of Pakistan, adopting technology for educational purposes involves a number of external factors related to its accessibility, technical and financial assistance, as well as many internal factors, including individual and social issues, such as students' and teachers' technical skills, age group, inclination, belief, attitudes, and incentives to use technology for teaching and learning. In this regard, Kozlova and Pikhart (2021) identified physiological, psychological, environmental, and technical challenges to concentration when utilizing technology for learning. As well, they found technology itself to be distracting. Although, with the closure of educational institutes due to the current pandemic, it is quite obvious that the educational system is becoming more reliant on technology, and its integration into educational activities is gaining popularity and will continue to do so in the future.

Hence, in the field of education, the rising impact of technology is unavoidable. However, rapid technological progress has been creating new problems. This study is based on the unified theory of acceptance and use of technology (UTAUT). Thus, the study measures and describes university students' intentions and attitudes (behaviours) towards the use of Information and communication technology. Although, the analysis of the present study allows us to determine existing trends and problems in the adoption of information and communication technologies among university students for learning purposes in the context of Karachi, Pakistan.

1.1. Research Questions

1. To what extent are university students using computer devices and the internet for academic purposes?
2. To what extent do university students have proficiency in computer programs or applications?
3. To what extent is information and communication technology available to students at universities?
4. How do university students perceive the integration of technology into their studies?

1.2. Objectives of the Study

Many studies on the integration of technology in education in Pakistan have been conducted, though most of them are limited to the use of a single ICT device for learning or in the context of a specific university, whereas this study collects data from students of different universities in Karachi, Pakistan, and extends the results of previous studies by investigating various external and internal factors regarding the use and problems of technology in learning. The study was driven by the following objectives:

1. To investigate the use of information and communication resources (computer devices and the internet) among university students for academic purposes.
2. To explore students' experiences with the available computer- technology in universities.
3. To evaluate students' computer skills and their perception regarding the use of technology into their studies.

1.3. Limitation of the study

The data for this study was collected from a sufficient number of students studying at four different universities in Karachi, Pakistan. However, the generalization of the findings to the entire population may be limited for two major reasons. First, a number of federal, provincial, and private universities and their campuses are available in Karachi, and they have different rankings within the country, provided by the Higher Education Commission on the basis of different standards or criteria. Second, the data was collected by using a single research instrument that was a survey form, and the results of this study could not be verified by other means such as observations, interviews, or other measures.

1.4. Significance

The results of this study may be helpful for future research to examine the trends and difficulties in employing technology in teaching and learning. When implementing a technology-based educational environment, it is possible to ascertain the main causes of the disruption of education during the recent pandemics and identify the areas that require improvement.

2. Literature Review

This research investigated students' accessibility and usability of information and communication technologies in the context of Karachi, Pakistan. Most surveys in Pakistan are limited to the usage of a single ICT device or in the context of a specific university or discipline, whereas in the present study, data was collected from students studying in different disciplines at public and private sector universities. The study added more detail and investigated both external and internal factors that influence the use of technology for learning purposes.

Information and communication technologies have been used to improve and assist teaching and learning strategies for many decades. The recent pandemic has only reinforced this trend. In the literature, many scholars have studied the impact of communication technologies such as computers and mobile devices; internet connections; computer-based applications and software; social networking apps and sites on education from diverse perspectives. Various research models have been established in this area to characterize or describe the accessibility, application, adoption, usage, and integration of technology in the teaching-learning process. However, the results of those studies reveal a considerable inequality between the contexts of developed and developing countries.

According to Unwin and Unwin (2017), people were optimistic about the potential of ICTs, especially the development of mobile devices and the expansion of social media, as an opportunity for developing countries to improve and bring positive changes. However, its advantages, on the other hand, are frequently related to rising global inequality. Despite that, UNESCO recognizes the importance of computer-based technologies in guaranteeing universal access to high-quality education and educational equity. As Chandio, Seman, Samsuri, Kanwal, and Shah (2018) pointed out that UNESCO has been aiding countries in developing policies to utilize the potential of ICTs to enhance education. Malik, Rohendi, and Widiaty (2019) asserted that the implementation of modern technology in the field of education still requires more attention. In this respect, they pointed out that a teacher's ability to use the latest technology

must be developed along with pedagogical and subject knowledge. A combination of these three categories of knowledge has the potential to promote active learning and a shift from a teacher-centered to a learner-centered approach. Thus, in education, the appropriate use of information and communication technology may increase students' participation and motivation.

Abbas, Aman, Nurunnabi, and Bano (2019) reassessed the integration of digital media and social networking platforms into education as a revolutionary resource of information and communication technology due to the prevalence of social networking sites and apps among college and university students. They also discussed various the benefits and drawbacks of using social media platforms for educational purposes. Many post-COVID-19 studies have investigated the challenges and benefits associated with online teaching and learning because educational institutes across Pakistan were forced to quickly shift from traditional methods to an online-mode of education despite limited technical and computer expertise as well as financial resources. Computer-based teaching-learning, according to Adnan and Anwar (2020), may be advantageous in digitally advanced nations, but it is inadequate in Pakistan. Toquero (2020) emphasized the utmost importance of appropriate curriculum and instructional practices when it comes to online teaching and learning. (Basilaia & Kvavadze, 2020) asserted that the improvements in instructional methods, online teaching-learning tools, and platforms, along with the development of online evaluations and the formation of open-book assignments based on principles, will be crucial in the near future. They also recommended that future research projects should explore the expanding impact of technology on education and the quality of online teaching and learning.

Adaptions in teaching and learning practices were critical in order to save the academic year during the current pandemic's disruption of education systems. Universities could have used a well-developed computerized learning management system or incorporated students' preferred informal social networking platforms as a flexible pedagogical tool, (Makumane, 2021). In Pakistan's educational sector, technology for instructional purposes was not widely used before the outbreak of the recent pandemic. Therefore, many educational institutions have struggled to respond to this sudden change in the mode of education. As a result, many issues concerning the quality and strategy of online instruction, a lack of communication devices and poor internet connections, and the lack of appropriate procedures for online examinations were influencing the entire teaching and learning process. This experience of using technology for teaching and learning purposes may be beneficial in the future as a supplement or alternative mode of education, but the emphasis on the inclusion of technology in education is still undervalued, Iqbal, Ashiq, Rehman, Rashid, and Tayyab (2022). While the penetration of information and communication technology has increased in the developing world, literature analysis still shows a significant gap between the need for technology-based infrastructure and its accessibility. Regarding that, for further research work, Thomas, Khan, and Ahmad (2022) proposed technology acceptance model to investigate attitudes, usefulness, and accessibility toward the use of technology for teaching and learning purposes.

3. Methods

In the present study, a paper-pencil survey questionnaire was used for data collection. The questionnaire was produced and published by the Commonwealth of Learning (C.O.L) and adapted by the researcher. The survey questionnaire was composed of close-ended questions. The first section of the questionnaire was about the students' background information. The second section was comprised of questions related to students' usage of information and communication resources for academic and other purposes. The final section included three questions about students' computer skills, their experiences with available technology in universities, and their perspectives on integrating technology into their studies. A question about any disability that requires accessible or adaptive technologies was included in the questionnaire; all the participants marked the option of "No" to answer. Likert-type scales were used to measure participants' opinions and attitudes.

This study was based on a quantitative approach. It was a survey research of descriptive research design that allows for the collection of primary data and may provide the information required for executives to develop action plans.

The population of the study was university students. Data was collected randomly from four universities in Karachi, Pakistan, including NED University of Engineering & Technology, the

University of Karachi, Indus University, and Muhammad Ali Jinnah University. We received 130 responses in total. 83 percent of the total respondents were undergraduate students, while 17 percent were post-graduate. 31 percent of students were female, while 69 percent were male. 77 percent of the students were between the ages of 21 and 25, while 15 percent were younger than 20.

A four, five, and six-point likert-type scale was employed for scaling the participants' responses. In this regard, descriptive statistics were used to represent the data. Percentages, mean, median, and standard deviation are applied to measure the frequency, central tendency, and variability of the collected data. Following that, statistical results were used to draw the study's interpretation, conclusion, and recommendations.

All respondents were thoroughly informed about the objectives of this survey, and they contributed voluntarily. The researchers protected the identities of the respondents to ensure ethical standards.

4. Results

4.1. Use of ICT based Resources among University Students

To measure the most commonly used information and communication devices (computers) among university students for learning purposes, a 4-point Likert-type scale was used on a continuum from "use always" to "never use" in the descending order of magnitude.

Table 1: Students' Most Commonly Used Devices for Learning Purposes

Variable	Devices	Never	sometimes	often	Always	Mean	SD
Frequency and Percentage (%)							
N=130							
1	Smartphone	5(3.8)	13(10)	76(58.4)	36(27.6)	3.10	0.72
2	Laptop computer	102(78.4)	6(4.6)	10(7.7)	12(9.2)	1.48	0.98
3	Desktop computer	52(40)	48(36.9)	23(17.6)	7(5.3)	1.88	0.89
4	Tablet/iPad	99(76.1)	18(13.8)	8(6.1)	5(3.8)	1.38	0.77
Overall						1.96	0.12

Specifically, 1 denoted "never used," 2 denoted "sometime used," 3 denoted "often used," and 4 denoted "always used." Results shows, smartphone is most popular device among university students than laptops, desktop computers, and tablet/ iPad. As 76 (58.4%) and 36 (27.6%) participants out of 130 said that they use smartphones for learning purposes "often" and "always", respectively. Furthermore, the mean score (M = 3.10, SD = 0.72) indicates students' positive attitude about the use of smartphone in their learning, while the use of laptop computers (M = 1.48, SD = 0.98), desktop computers (M = 1.88, SD = 0.89), and tablet /iPad (M = 1.38, SD = 0.77) indicates participants' negative attitudes (table 1).

Table 2: Students' Use of the Internet for Academic and Other Purposes

Use of Internet (hrs./day)	Academic Purpose	Other Purposes
	Frequency and Percentage (%)	Frequency and Percentage (%)
	N=130	N=130
Do not use daily	10(7.6)	3(2.3)
< 1 hour	8(6.1)	7(5.3)
1-2 hour	53(40.7)	18(13.8)
3-5hour	38(29.2)	58(44.6)
> 5 hour	21(16.1)	44(33.8)
Mean	3.17	4.02
SD	1.25	0.95
Median	3	4

To investigate the use of the internet among university students for academic and other purposes, a 5-point Likert-type scale was used on a continuum from "more than 5 hours" a day to "do not use" daily in the descending order of magnitude. 1 denoted "do not use daily," 2 denoted "1 hour," 3 denoted "1-2 hours," 4 denoted "3-hours," and 5 denoted "> 5 hours." The result indicates that students spend more time on the internet for entertainment, social connectivity, or other purposes rather than academic purposes. The mean score for the use of the internet for academic purposes specified a moderately positive attitude of the students (M =

3.17, SD = 1.25), while for other purposes the mean score indicated a highly positive attitude of students (M = 4.02, SD = 0.95). Furthermore, for the use of the internet for academic purposes, the result indicates median number 3 and for other purposes, median number 4. That shows the majority of the students (53 out of 130) selected the option of spending 1-2 hrs./day on the internet for learning purposes, and for other purposes, most of them (58 out of 130) selected the option of spending 3-5 hrs./day on the internet (table 2).

4.2. Students' experiences with the available ICT facilities in the University

Participants were asked to rate their experiences with the available computer and internet based facilities or services in the university. To rank their different experiences, a 6-point Likert-type scale was used, from "not available" to "excellent". Specifically, 1 represented "not available," 2 represented "poor," 3 represented "fair", 4 represented "neutral," 5 represented "good," and 6 represented "excellent".

Table 3. Students' Experiences with Available ICT Technology in Universities

Variables	ICT facilities	Not available	Poor	Fair	Neutral	Good	Excellent	Mean	SD	Median
Frequency and percentage (%) N=130										
1	e-classroom facilities	78(60)	5 (3.8)	17 (13.0)	10(7.6)	20 (15.3)	0	2.15	1.56	1
2	computer labs	0	50 (38.4)	48 (36.9)	8 (6.1)	16 (12.3)	8 (6.1)	3.11	1.22	3
3	LMS	90 (69.2)	15 (11.5)	0	20 (15.3)	5 (3.8)	0	1.73	1.26	1
4	Internet speed	43 (33.0)	31 (23.8)	14 (10.7)	30 (23.0)	8 (6.1)	4 (3.0)	2.55	1.46	2
5	Wi-Fi access	80 (61.5)	10 (7.6)	8(6.1)	22 (16.9)	10 (7.6)	0	2.02	1.44	1
6	Download & use of open source	58 (44.6)	24 (18.4)	20 (15.3)	24 (18.4)	4 (3.0)	0	2.17	1.26	2
7	Technical maintenance	51 (39.2)	24 (18.4)	22 (16.9)	29 (22.3)	4 (3.0)	0	2.32	1.28	2
Overall								3.44	0.13	4

According to the results, the majority of the students chose the scale of "not available" for the variables 1, 3, 4, 5, 6, and 7. However, all students marked that computer labs (variable 2) are available in universities, but most of them rated them on the scale of "poor" or "fair". Furthermore, the overall mean score (M = 2.29, SD = 0.13) indicates students' negative attitudes and dissatisfaction with the available technology in the university, as well as the overall median number of 2, which denotes the scale of "poor". Thus, the results show that universities have information and communication technology for students, but students are not satisfied with these services because they are insufficient for academic requirements (table 3).

4.3. Students' self-assessment of computer skills

Students were given a list of computer programs and asked to rate their level of expertise on a point-5 Likert scale, from "I cannot use" to "use very well". Specifically, 1 represented "cannot use," 2 represented "use to a small extent," 3 represented "satisfactorily," 4 represented "use well," and 5 represented "use very well". The findings of the students' self-assessment are presented in Table 4.

Table 4. Students' self-assessed computer proficiency levels

Variable	Computer Skills	Cannot use	to a small extent	Fair	Use Well	Use very Well	Mean	SD	Median
Frequency and percentage (%) N=130									
1	Word processor	0	10(7.6)	26(20)	56(43.0)	38(29.2)	3.94	0.90	4
2	Presentation software	0	8(6.1)	38(29.2)	48(36.9)	36(27.6)	3.86	0.90	4
3	Spreadsheet	15(11.5)	47(36.1)	26(20)	26(20)	16(12.3)	2.85	1.23	3
4	E-mail	0	8(6.1)	34(26.1)	44(33.8)	44(33.8)	3.95	0.92	4
5	Search engine	0	6(4.6)	22(16.9)	57(43.8)	45(34.6)	4.08	0.84	4
6	LMS	110(84.6)	0	10(7.6)	10(7.6)	0	1.38	0.93	1
7	Social networkings sites (web 2.0)	3(2.3)	5(3.8)	26(20)	50(38.4)	46(35.3)	4.01	0.96	4
Overall							3.44	0.13	4

The result shows students' highly positive attitudes for variable 5 (M = 4.08, SD = 0.84) and variable 7 (M = 4.01, SD = 0.96). Their moderately positive attitude for variable 1 (M = 3.94, SD = 0.90), variable 2 (M = 3.86, SD = 0.90), and variable 4 (M = 3.95, SD = 0.92).

However, for the use of spreadsheet software (variable 3), the result shows the mean score (M = 2.85, SD 1.23) that indicated students' low level of expertise, as 47 out of 130 (36.1%) students chose the scale of "use to a small extent". For the use of an online learning management system (variable 6), the mean score (M = 1.38, SD = 0.93) indicates students' negative attitude, as 110 out of 130 (84.6%) students chose the scale of "cannot use".

Although the overall mean score (M = 3.52, SD = 0.13) shows that students believe that they have a sufficient level of computer skills, as the overall median number 4 denotes the scale of 'use well' (table 4).

4.4. Students' perceptions on the integration of technology into their studies

A 4-point likert-type scale on a continuum from "disagree" to "strongly agree" was used to assess students' perceptions of the integration of technology into their learning. Specifically, 1 indicated "disagree," 2 indicated "neither agree nor disagree," 3 indicated "agree," and 4 indicated "strongly agree."

Table 5. Students' Perceptions on the Integration of Technology

Variables	Statements ICTs-----	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Mean	SD	Median
Frequency and percentage (%)N=130								
1	Assist in getting better results in studies.	6(4.6)	10(7.6)	48(36.9)	66(50.7)	3.34	0.81	4
2	Help to understand subject matter more deeply.	6(4.6)	14(10.7)	44(33.8)	66(50.7)	3.31	0.84	4
3	Help in completing assignment/project more conveniently.	4(3.0)	10(7.6)	50(38.4)	66(50.7)	3.37	0.76	4
4	Enable learning collaboratively.	6(4.6)	14(10.7)	48(36.9)	62(47.6)	3.28	0.84	3
5	Encourages to explore new content.	4(3.0)	30(23.0)	60(46.1)	36(27.6)	2.98	0.80	3
6	Improve technical & management skills.	8(6.1)	14(10.7)	52(40)	56(43.0)	3.20	0.87	3
7	Improve academic & professional career prospects.	4(3.0)	14(10.7)	50(38.4)	62(47.6)	3.31	0.79	3
Over all						3.25	0.04	3

The result shows students' highly positive attitude about the integration of technology into their studies, as the overall mean score (M = 3.25, SD 0.04) indicates and the overall median number 3, also indicates, most of the students agreed and acknowledged the significant role of technology in their studies (table.5).

5. Discussion

Due to the growing impact of information and communication technology several studies have been conducting to investigate its integration in the field of education from various aspects. Its impact has changed learning and teaching strategies and the manner in which knowledge and skills are acquired. In this regard, a few researched studies are discussed below in relation to the findings of the current study.

Ricardo-Barreto et al. (2020) investigated the trends of ICTs at various Colombian universities. They found, the significance of desktop computers are still maintained in the university context. They claimed that numerous similar studies with students' population revealed that, for academic purposes, students preferred to use desktop computers rather than smartphones. However, they determined that the use of smartphone is significantly common but asserted that smartphones may or may not be focused on a formal educational setting or classroom environment and using the apps to facilitate classroom activities has an inferior level of acceptance. In this regard, findings of the present study revealed that smartphones are most popular among university students in the context of Karachi, Pakistan. Although, students have laptops and desktop computers, and can access to the desktop computer in universities but they often use smartphones for learning purpose. As Asghar, Barberà, and Younas (2021) also found

that in Pakistan, mobile phone technology is widely accepted for educational purposes because of its accessibility. In addition, mobile technology were using as a crucial educational requirement across the country during the coronavirus pandemic lockdown. It urged university students to continue their studies, keep in touch, and collaborate more effectively and efficiently.

The present study is also found that in the universities the available support systems for technology infrastructure and its maintenance are insufficient and majority of the Students cannot access Wi-Fi and a good-quality internet connections in their universities. They cannot download or use study materials, free educational resources and applications. According to the results students are unsatisfied with the available technology in the universities. In this respect, Ricardo-Barreto et al. (2020) further highlighted certain elements that could influence the development of ICT trends, such as technological infrastructure, instructional assistance, teacher training, resource accessibility and availability, and intensives for using open digital and virtual resources. Furthermore, Soomro, Kale, Curtis, Akcaoglu, and Bernstein (2020) has asserted, the obstacles in the use of technology for educational purposes lead to a loss of motivation and dedication that have been highlighted as a key learning factor, particularly, in online education. Rehman, Zhang, and Iqbal (2021) conducted a study in the context of Pakistan on the usage of technology for online classes during the global pandemic. They also found the same results that low internet speed and electricity breakdowns were the major obstacles when implanting technology-based education. In this respect, they also pointed out the absence of effective online forums and the non-serious attitude of the learners.

In this regard, students' computer proficiency also affect their attitudes towards adopting technology for learning. This research study found that students believe that they have basic computer skills, though most of them are not skilled at using Excel spreadsheets and LMS services. Irum, Khatoon, and Jumani (2020) also found the similar results, the students have an intermediate level of computer skills as well as Excel and LMS are the least used applications among the students of public sector universities of Sindh, Pakistan. In this respect, the results of the present study also indicated that an effective online learning management support is not accessible to the majority of university students. As Janson and Söllner (2017) asserted, an LMS is an online system that is used to manage students' academics, such as timetables, course outlines, learning materials or content, academic records or learning outcomes, conducting exams or assignments, and so on. It enables students to track their learning information on one page as well as establishes interconnections among teachers, students, and university administration or management. Memon, Miran, Memon, and Sodhar (2019) conducted a survey-based study in different universities of Interior Sindh, Pakistan. They evaluated awareness, use, efficiency and the popularity of available LMS tools among teachers and students. They found that the majority of participants (80%) were unfamiliar with this forum or system of learning, and only (20%) of computing faculty participants were familiar with its various learning tools. In this regard, current study found that most of the universities are not providing an effective computerized learning management platform and students were unable to receive considerable educational assistance.

Therefore, there is a need to introduce or modify an institutional technology-based teaching and learning management forum, with the required or modern features, to support the development, delivery, assessment, and administration of study courses. And presently, its integration is essential in all mode of education whether traditional, blended, or online. As Urbina, Villatoro, and Salinas (2021) asserted, it is important for an educational organization to revisit their provided LMS facility on a regular basis or periodically. Charania, Bakshani, Paltiwale, Kaur, and Nasrin (2021) suggested that universities should enrich the technology based education with customized teaching-learning tools or options in order to facilitate students with a customized and organized learning experience. Veluvali and Suriseti (2022) pointed out that the educational institutes can change their outdated way of education into a more engaging, inclusive and student-centric with the integration of an effective computerized learning management platform. However, its implementation, institution-wide is quite challenging.

Many previous studies in the context of Pakistan have shown that social networking sites have a potential to be used as a networking system for educational purposes as students are already using these platforms for entertainment, social connectivity or other purposes. As Alshaibani and Qusti (2021) found that WhatsApp is the most popular social networking platform among university students. It encourages students to participate in learning, improve their

learning skills, and supports collaborative learning. According to the students, WhatsApp assists them in completing assignments more efficiently than the traditional way. Raza et al. (2020) found, Facebook as a very popular social networking site among university students. They investigated the factors that lead to its heavy usage in the context of Pakistan. They found that students are more driven to use Facebook to increase their social circle, learn new concepts, and seek expertise in this area. As a result, social influence, social contacts, behavioral goals and attitudes, and information-seeking all play a role in students' Facebook usage. Therefore, these platforms may serve as a forum for collaboration among students, teachers, and university administrators. Consequently, it may function as a learning management platform to support the teaching and learning. According to Farrell and Brunton (2020), there are several psychological aspects that are linked together for successful teaching and learning, particularly when learning online, such as peer or group cooperation, teacher-student, and student-student involvement.

Thus, in a formal educational setting, an appropriate use of social networking platforms inside and outside of the classroom may be advantageous. It may facilitate group learning, discussion forums, and the exchange of lectures, videos, presentations, course materials, and academic information, according to (Olelewe, Orji, Osinem, & Rose-Keziah, 2020). However, it is still a subject of intense debate, whether the integration of social networking platforms into formal education should be used as a parallel learning mode or to assist teaching-learning activities. Because there is also a widespread belief that using social media and networking sites during formal educational activities leads to students' distraction. Despite that, according to Chugh, Grose, and Macht (2021), due to the COVID-19 lockdown, the use of social networking sites for educational purposes has increased significantly, as well as encouraged students to keep studying. During the pandemic, the educational institutions that had never used an LMS platform, converted social networking sites into an online teaching-learning platform and administered a wide range of educational activities.

Information and communication technology has a lot of potential for expanding educational access and creating a more personalized and meaningful learning experience as well as the quality of teaching and learning is improved, as many previous studies have shown. However, these advantages are determined by learners' attitudes and perceptions. Martinez-Daza et al. (2021) investigated students' perceptions, knowledge and use of ICTs for educational purposes in a Colombian higher education institute and they found variations in the students' attitude towards the inclusion of technology into their studies. Although the overall perception was very positive. In this regard, the current study also investigated students' perceptions in the context of Karachi, Pakistan and also found students' highly positive attitude towards the integration of technology in their studies.

Kozlova and Pikhart (2021) conducted university students' interviews to evaluate their perceptions and experiences regarding the use of ICTs in their learning during the recent pandemic lockdown, in the context of Czech Republic. They found most of the students were appreciative of their professors' usage technology for teaching. When compared to physical classes, most of the students reported no decrease in motivation. According to them students' responses indicated that the benefits of ICT-based learning are heavily dependent on the instructor's technical skills, ability to alter their online lecture delivery, and the production quality of pre-recorded lectures, to engage the learners. In this regard, Ali (2019) found that university faculty members need to learn technical skills for the effective implementation of information and communication technology in teaching-learning activities. In addition, Chakraborty, Dhara, and Santra (2018) have discovered that the aspect of cost is strongly reliant on the successful use of information and communication technology among the criteria of availability, utilization, knowledge, and cost.

Thus, financial assistance and technical competency of faculty, students, and other related staff members are essential for the implementation of an effective ICT-based infrastructure in universities.

6. Conclusion

Based on the findings, it is concluded that the majority of university students have access to computer devices and internet services. Although, when compared to academic purposes,

most of them spend more time on the internet for entertainment, social connectivity, or other purposes. In comparison to laptops, desktop Computers, or tablets/iPads, the majority of students prefer their smartphones for learning. As indicated in the discussion and literature review section, numerous previous studies in the context of Pakistan have also revealed that, due to the power breakdown problem in most areas of the country, students commonly use their smartphones for learning purposes.

The present study also found, university students have an intermediate level of computer skills and a highly positive attitude toward incorporating technology into their academics. They are, however, dissatisfied with the existing computer and internet-based facilities at universities as well as the lack of technical maintenance for these services, implying that technical assistance provided by the universities is insufficient to meet the demands of higher education.

As a result of a lack of technical resources or assistance at educational institutions, students are less likely to be open to technology in their academics, which diminishes the incentives to use technology for learning purposes. In this regard, past research in the context of developing countries has shown that, among the social, cultural, psychological, financial, and technological issues, one of the primary impediments to the adoption of technology in education is cost.

6.1. Recommendations

To stimulate the use of information and communication technology in education, universities need to provide the latest technical assistance to students as per their educational requirements. In this regard, university students must have access to a laptop computer with a strong internet connection. Smartphones may assist learning, but when utilized for specific purposes, a desktop or laptop computer is unquestionably a better option. Although students can access desktop computer facilities at universities, a university-provided laptop computer may be a better choice due to its mobility and the prevalence of power outages in most areas of the country. Furthermore, in order to encourage the potential use of technology for educational purposes, universities' technical and financial capacity must be increased, and the existing technical assistance needs to be upgraded and maintained. Universities must provide an effective computerized teaching-learning management system with modern tools to assist teaching and learning. In this regard, appropriate modifications to the existing curriculum and teaching methods are required. As well, some training sessions or programs about the use of the latest computer programs, applications, or educational software are also essential.

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