OPPORTUNITIES AND CHALLENGES IN THE USE OF ICT AT TERTIARY LEVEL: TEACHERS' PERCEPTIONS

KHADIJA RAFEEQ[1], MUHAMMAD QASIM ALI[2]

ABSTRACT

Modern technological tools revolutionized teaching and learning. The study's goals were to 1) find out the opportunities and challenges in the use of ICT 2) explore the relationship opportunities and challenges in the use of ICT. The study was descriptive, and the population of the study includes academic teachers from universities in Sahiwal division. The study sample consisted of 250 teachers. The questionnaire was pilot tested for reliability and validity. The study revealed that university-based professors use digital libraries to expand their expertise. The quantity of PCs in computer labs is likewise lacking. Teachers are reluctant to employ advanced ICT devices. The study found that while teachers have (81%) positive opportunities to use ICT resources and technologies in universities, there are (34%) obstacles. The usage of ICT tools by teachers can increase their motivation and productivity. The report advises universities to provide enough teacher training facilities, ICT-related courses, and specialists to improve their technical expertise based on modern information and communication technologies.

Keywords: Opportunities, Challenges, Use of ICT, Tertiary level
JEL Codes: N7, O1

I. INTRODUCTION

Teaching and learning processes have been transformed by introducing modern technological instruments. We can learn about the applications of modern information and communication technology (ICT) instruments in higher education institutions through their research. Information and communications technology (ICT) gadgets play an essential role in the workplace (Audi et al., 2021; Audi et al., 2021). When information and communications technology (ICT) first appeared, it impacted how people lived in society and how they performed their work in companies. In a variety of research studies, the usefulness of these modern information and communication technology (ICT) gadgets in the classroom is examined, as are teachers' evaluations of their effectiveness in the classroom during the teaching and learning process (Hevko, 2019; Celebi, 2019; Islahi & Nasrin, 2019). Computer-aided technologies (ICTs) are the electronic tools used for information gathering and processing. They also include data storage, distribution, and presentation. Several associated instruments, such as Android applications, computer machines, advanced software versions, current hardware gadgets, satellite technologies, and Wi-Fi zones, among others, are employed for the aim mentioned above (Roy, 2015). Attaching current information and communication technology (ICT) devices to classroom presentations results in significant advancements, raising concerns about the use of ICT devices in educational settings. In such conditions, university lecturers are constantly looking for methods to make their classrooms more creative and inviting.

Technology is well-liked by university instructors. Classroom activities were frequently enhanced by using information and communications technology (ICT). Data searching sources, multimedia platforms, data processing word devices, and data analyzing Microsoft spreadsheets were discovered to be among the most commonly used ICT tools in this study (Granados & Jaramillo, 2019). In order to use ICT as a motivational tool in university-level teaching, several factors must be considered, including teachers' thinking about ICT use (Mwendwa, 2017), teachers' technical knowledge and skills (Umar, et al., 2014), teachers' professional and self-

[1]Department of Education, University of Sialkot, Sialkot, Pakistan.
[2]Department of Education, University of Sialkot, Sialkot, Pakistan.

----

development (Hevko, 2019), teachers' training (Islahi & Nasrin, 2019), teachers' motivation (Lubis et al., 2018, (Fu, 2013) Availability of technology (Frost et al., 2017; Roussel et al., 2021; Sajid and Ali, 2018; Senturk and Ali, 2021; Haider and Ali, 2015; Kassem et al., 2019), updated software and hardware (Gilakjani et al., 2019), technical expertise and support (Gilakjani et al., 2019), etc. (Taimur-ul-Hassan & Sajid, 2013). More significant usage of advanced gadgets in classroom teaching and learning activities has been discovered due to the criteria mentioned above. As indicated in their research work, Bhattacharjee and Deb (2016) examined how instructors in higher educational institutions are perceived to be becoming more skillful persons due to the usage of information and communications technology (ICT) devices. Technology-enhanced learning (ICT) devices improve students' learning process and attain educational objectives. According to educational professionals, using information and communications technology (ICT) for professional development helps ensure that future teaching practices are retained and that student learning progress is achieved in a complex learning environment. According to Wahyudi et al., (2018) study, teachers' proactive participation in the teaching-learning process through the adoption of digital machines for higher education was discussed. Incorporating information technology into the classroom and instilling cutting-edge applications into the curriculum teaches employees to develop motivational skills. In this case, motivation is essential in both teaching and learning environments, as seen in the following diagram. Teachers and students utilize these digital devices for various purposes because they are an integral part of the digital environment for pupils today (Frydrochov-Klimova & Poulova 2014).

This study focuses on the opportunities and challenges of integrating advanced ICT gadgets into teachers' pedagogical practices. As a result, teachers' advanced skills and relevant knowledge serve as motivating agents for integrating these gadgets into pedagogical practices. For this reason, several research studies (Olofsson et al., 2018) examined the factors that were available and missing when using ICT devices in the teaching zone, as well as the factors that were required to make things possible or difficult for the proper attachment of these advanced ICT resources in the complex learning environment (Sipila, 2014). Educational institutions provide advanced computer appliances and high-speed internet access in Pakistan to help teachers become knowledgeable. Additionally, these help teachers improve their professional and personal development more quickly. However, integrating ICT-based activities into classroom activities is moving at a glacial pace. It appears that teachers are the primary source of the significant fall in technology adoption. Besides teacher reluctance to adopt technology, other factors such as a lack of advanced hardware appliances, a lack of the latest software, a lack of technological knowledge, a lack of confidence in one's abilities, inefficient time management, and a lack of teacher training opportunities all play a significant role in preventing the effective integration of technology in the classroom (Bingimlas, 2009). It is not only for academic purposes that teachers utilize information and communications technology (ICT). Technology, it is undeniable, is creating opportunities for improvement in the educational process while also altering teachers' perspectives on the use of technology. Teachers' motivation and professional, technological knowledge and abilities are being improved due to the use of ICT tools. In applying information and communications technology (ICT) in higher education, however, there are specific opportunities and challenges. The study will investigate the relationship between the opportunities and obstacles in using ICT resources and tools among university-level teachers. In this study, the following are the main objectives:
1. To find out the opportunities and challenges in the use of ICT
2. To explore the relationship of opportunities and challenges in the use of ICT.

II. REVIEW OF RELATED LITERATURE
Recently, experts have been working hard to integrate ICT into education. Recently developed ICT has a creative effect on people's abilities to seek knowledge. They suggested that new media are great presentation tools that focus on students. (Watson et al., 2011) According to Toro & Joshi (2012), advanced ICT media conduct fundamental changes in education. Modern teaching methods use computer apps. Facilitate classroom procedures using advanced technologies like the Internet and computer technology (Tunio et al., 2014). The Internet is a network of interconnected fast tracks that carry data between different communication channels (Freeman & Hasnaoui, 2010). Lindberg & Olofsson (2016) discussed how teachers could include ICT in the classroom. The results reveal that instructors utilize ICT to multitask. Without teacher beliefs and beliefs, the whole situation of ICT applications for education becomes agitated (Zhao, 2013; Heinonen et al., 2019). Teachers use ICT for classroom activities (Dabbagh et al., 2019), teachers use ICT for better cooperation (Ghavifekr & Rosdy, 2015), teachers use ICT for personal development (Ghavifekr & Rosdy, 2015). This study uses ICT as a motivational tool in universities (Avidov-Ungar & Amir, 2018). Teachers use ICT to deliver excellent instruction in university classrooms (Mwenda, 2017).

According to Ertmer et al., (2015), teachers' beliefs, daring, and competence for technical operations considerably open its absorption in active university regions. (Zhao, 2007) Work for social sciences strengthens instructors' views on introducing new ICT machines in the classroom. The majority of university lecturers are pleased about their use and acceptance. They also suggested that correct outcomes require training. Imon (2017) investigated the use of ICTs in university classes. Teachers' thoughts and ideas (Kaur, 2019), technical expertise and support (Taimur-ul-Hassan & Sajid, 2013), technology access (Frost et al., 2017), teachers' technical skills and pedagogical knowledge (Nisar et al., 2011), teachers professional and personal development (Mkpa et al., 2019), teachers training (Tabassum et al., 2015). These institutions are challenged with ubiquitous technologies and collaborative learning (Moyne, 2018). Mwendwa (2017) studied ICT in education. He thinks ICT is crucial in higher education. He also wants to know how universities will provide future curricula due to the fast-increasing ICT. ICT has several effects on human existence. ICT is essential in higher education, industry, education, and entertainment. Also, ICT precise information exchange and research (Mikre, 2011). According to Huang et al., (2014), advanced ICT devices are a great source of knowledge for all citizens and are a proven capacity generator and economy stabilizer. They play an essential role in higher education by providing equal learning opportunities for all students and effectively organizing higher education systems. These new technologies significantly impact education in developed and developing countries and are vital for individual and institutional capacity growth. Thus, more excellent planning of advanced educational technology is required to enhance developing nations.

According to Celebi (2019), incorporating ICTs, especially the Internet, into teaching allows teachers to use innovative teaching methods efficiently. As a result of these advanced ICT devices, the teacher's job as a motivator is vital in larger educational complexes (Islahi & Nasrin, 2019). Gilakjani et al. (2019) discovered that teachers' attitudes toward using computers in the classroom are positive and that computers are an excellent teaching tool. In order to effectively employ technology in classrooms, teachers should be taught. Chou et al., (2018) investigated how instructors' acceptance advances ICT appliance innovation, complex educational innovation, and instructional activity innovation. They observed a positive relationship between these developments. According to Iqbal et al., (2015), teachers in Pakistan's public sector use technology to make educational decisions. The study also urges government organizations to pay attention to advanced ICTs. The use of ICT in education led to the expected outcomes (Islahi & Nasrin, 2019; Lawrence & Tar, 2018; Chou et al., 2018; Gilakjani et al., 2019; Celebi, 2019; Olofsson et al., 2018; Fathima, 2013; Mostafa et al., 2017). University teacher services were used to improve teaching quality and student learning capacities. Teachers were expected to be experts in their subject areas and know and use ICT. Teachers are facilitators who support learning and are also accountable for integrating ICT into educational complexes. In a complicated learning environment, the instructor's role should be emphasized. Moreover, they must be mastered to use advanced ICT tools in complex teaching and learning processes (Fathima, 2013).

The use of modern ICT applications in education is highly advantageous for teaching. The use of ICT tools by university lecturers to improve their skills and knowledge has improved teaching quality and motivation. Teachers have access to ICT resources within university grounds and utilize this advanced ICT equipment to make their work easy and reliable. These quick ICTs are now used in universities for most instructional and administrative tasks (Yunus & Suliman, 2014; Olofsson et al., 2018). Teachers' views on current ICT for educational activities are directly linked. Teachers are pleased about using ICT gadgets in teaching and classroom activities. Significant investments in ICT are achievable as it is an essential tool in the teaching-learning process. Similarly, how should this tool be learned first and then taught in today's digital world? (Mostafa et al., 2017). An advanced teaching approach with a computer application positively influences instructors. Authors worldwide taste research (Aziz-Mohammadi & Samadi, 2014). Siddiquah & Salim (2017) investigate ICT in universities. The study indicated that most lecturers use multimedia to make their lectures interesting. They used Microsoft Word for various activities, Excel for arithmetic work, and PowerPoint to convey their courses. It was noticed that instructors used the Internet and computers in numerous classroom activities and that higher-level teachers used these ICT devices to get instructional materials and regularly used e-mail for communication (Padmavathi, 2013). Advanced ICTs have revolutionized the way teachers teach, creating a more effective educational environment. Technologies made teachers more productive and created a challenging working environment in highly equipped classrooms. They have entirely transformed traditional classrooms into technology-based classrooms—a cooperative era for all students (Khan et al., 2015).

In private universities, modern ICT tools and user competence affect the learning process. These innovative tools are utilized for training the teaching staff of these private educational institutions. Students believe that ICT tools are more necessary weapons in teachers who instill necessary abilities in the same universities. Students' learning becomes more valuable, innovative, and evaluative. The university administration faculty is keen on obtaining such ICT equipment and equipping university classrooms and computer labs (Khokar, 2016). They use modern ICT media in Pakistani universities to turn around the education economy. Teachers embracing contemporary ICT devices are critical to improving Pakistan's educational level and bringing it with worldwide educational standards. So, using sophisticated media or ICT, educators can keep up with global education improvements (Shaikh & Khoja, 2011). It combines modern technology like computers and the Internet with traditional methods like using books for information gathering and presenting it on blackboards. Modern technology, software, and high-speed interconnected networks are used in sophisticated computer versions. Many underdeveloped nations now have computers in universities (World Bank, 2016). Computers in higher education are linked to modern digital libraries and multimedia learning rooms (Wallet, 2014). Granados & Jaramillo (2019) compared gender ICT use at universities. The results revealed a gender discrepancy, with men scoring higher for advanced ICT applications. Pakistani instructors present their efforts to integrate ICT into pedagogy, notably in public universities. All provinces seek to incorporate ICTs to improve higher education quality (Iqbal et al., 2015).

Social webs are the newest generation of advanced media sharing platforms that allow sharing and development of content. Teachers use YouTube to prepare lectures and connect with students to share ideas (Dabbagh et al., 2017). Other tools used (Twitter, wikis, Google, Facebook, etc.) (Dabbagh & Kitsantas, 2012). In the digital age, teachers have access to ICT resources (Chen, 2010), proven to be effective for many activities. In universities, teachers have access to computer labs and internet facilities. Lectures are made more interesting through multimedia, Microsoft Word is used for report writing, PowerPoint for lesson presentation, ICT gadgets are used for multiple purposes, and digital libraries enhance knowledge (Bhattacharya and Sharma, 2007). (Siddiquah & Salim, 2017). The ICT use in Pakistan is still in its infancy, according to Tabassum & Shehzadi (2018). Despite university labs being well-equipped and most teachers employing computers as a teaching tool, teachers lack confidence in using ICT gadgets in the classroom. Thus, teachers lacking ICT abilities may lack confidence in applying technologies in their profession. Teachers must be trained in using modern ICT devices. Moreover, it improves their ability to implement modern teaching methods in their active work fields, thereby raising the quality of higher educational complexes for future generations. Azmi (2017) According to research, university professors and teachers have problems integrating ICT into their classroom activities. According to various research, teachers lack interest in using ICT devices due to insufficient computer applications available in laboratories and time management issues (Frost et al., 2017). (Miima, Ondigi, & Mavisi, 2013). The lack of ICT-related courses (Tartarashvili, 2017) and teacher technical expertise about using these technologies (Lubis & Sarji, 2018) also made instructors less confident in the field of ICT (Nikolopoulou & Gialamas, 2016).

Even though contemporary ICT gadgets are available for university lecturers, some still do not use them appropriately. Based on another work, several aspects failed to get superior results. Teacher hesitation, teacher confidence, inadequate training, and poor organization. Aimless to accomplish technological advancements in schooling (Shaikh, 2009). New technology concepts were brought into the educational process in the digital age. Researchers and educators started developing IT tools, hypertext, multimedia, and networking to create cognitive and constructivist learning environments. These tools did not produce better results than traditional education (Ali et al., 2018). Nikolopoulou & Gialamas (2016) emphasized two aspects for instructors' usage of advanced ICT devices. These were: teacher confidence and pedagogical skills of using the latest ICTs in various classroom activities. Many studies show that lack of confidence is the main barrier to instructors using ICTs in their daily operations. Thus, a lack of confidence, time management, and understanding to integrate ICT makes teachers unwilling to use old ways in their teaching activities (Miima & Mavisi, 2013). Lack of confidence and ICT skills were also preventing teachers from using ICT in the classroom. Thus, teachers lacking ICT abilities may lack confidence in adopting these technologies in their profession (Cubukcuoglu, 2013).

III. RESEARCH METHODOLOGY

The purpose of the study was to examine the opportunities and challenges of using ICT at the tertiary level, and the study was descriptive research. University teachers were considered the potential respondents for the study, so participants were all the university teachers in the Sahiwal division. The study's population included all university teachers in two districts (Sahiwal and Pakpattan) in the Sahiwal division (N=502). According to the table of Krejcie and Morgan, for a population of 500 teachers, the sample size would be 217 (Cohen, Manion,

----

and Morrison 2010). Only a tiny percentage of the study's population was chosen as a study sample, and the researchers gathered data from 250 university teachers.

In order to collect the necessary data, a questionnaire for teachers has been used in the research process because of the researchers' ease of administration of the questionnaire; these prove to be a valuable source of information (Kombo & Tromp, 2006). Gay (2012) stated that a set of questions is posed to a population to elicit responses based on the respondents' perceptions of the information they must provide. We used a structured form for the questionnaire in this study. Teachers' perceptions about ICT use at a tertiary level were included in 18 items. The validity and reliability of a study's instruments and the methodology used to carry out the research are both critical components. The data is worthless at best and misleading at worst if the methods used to collect it are invalid and unreliable. Because of this, reliable and accurate data can be gathered from the participants. Every effort was made to place each item in its proper location. Furthermore, the instruments were piloted on 20 university teachers to ensure their validity. Its overall Cronbach's Alpha value was 0.83, which falls somewhere between (.65–.95). The researcher's goal was to place each questionnaire item in the most appropriate location possible. In order to collect data, the researchers meet with university teachers (respondents) in their workplaces (selected universities) to obtain permission from the relevant authorities. The questionnaires were distributed to 300 university professors, who were also given instructions on how to complete them. Because the questionnaires were filled out and returned by the researchers, they received an overall response rate of 86%. The researchers went to great lengths to ensure that the data they gathered from the participants was accurate and trustworthy. Finally, the data from the survey participants (a total of 250) were incorporated into the analysis.

IV. DATA ANALYSIS AND INTERPRETATION
For data analysis, MS Excel was used, which yielded a graphical representation of the data in the form of percentages and also found the relationship between opportunities and challenges in the use of ICT at the tertiary level.

Figure 1 Opportunities in the use of ICT at tertiary level
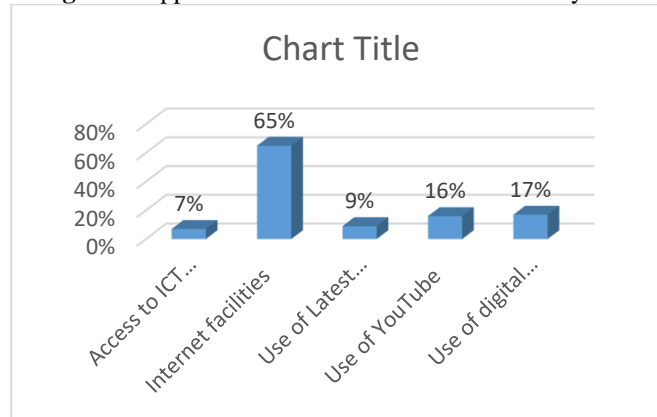
The above graphical presentation informed that teachers (65%) at the tertiary level got the opportunity to use the internet facility in the premises of their concerned universities, so they (16%) prepare their lectures by taking guidance from YouTube videos. It is a good sign for academic circles that teachers (17%) use digital libraries; on the other hand, they (7%) claim that they have access to ICT resources while the respondents (9%) responded that they make the use of latest ICT gadgets. In conclusion, we can say that majority of the teachers accept that internet facility is a basic need for university teachers, and it also plays a vital and significant role in enhancing their professional development and efficacy.

Figure 2 interprets the data that shows the challenges in the use of ICT at the tertiary level. The data shows that university teachers (16%) lack interest in the use of ICT while the university teachers (60.8%) also responded that they are confronted with the lack of accessibility of ICT resources in the institutional premises. Teachers (20.8%) have the perception that there is a lack of training for the adoption of ICT and its resources at the tertiary level. Another important perception of teachers (1.6%) is that they lack technical knowledge; in this way, they are reluctant to use ICT. Teachers (39.2%) admit that there are insufficient computers in the computer labs. Time management (21.6%) is a more significant hurdle in using ICT at university or home. In conclusion, we can say

----

that university teachers' professional development and competence are seriously influenced due to the lack of accessibility of ICT resources at the tertiary level.
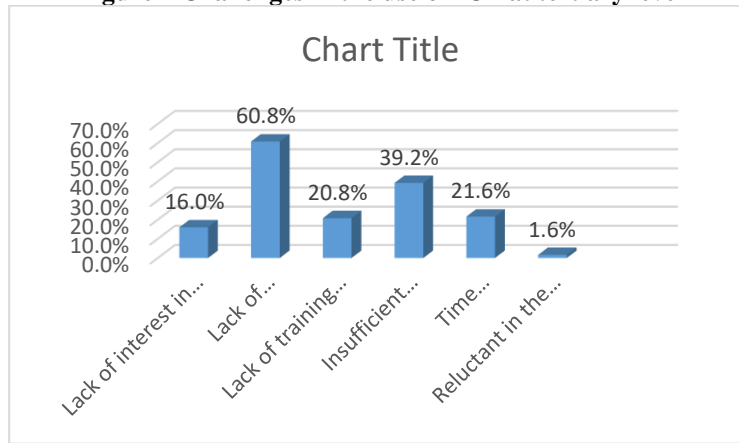
Figure 2 Challenges in the use of ICT at tertiary level

Table 1: Overall opportunities and challenges in the use of ICT

	Use	Opportunities	Challenges
Use	1	0.80	0.38
Opportunities	0.80	1	0.41
Challenges	0.38	0.41	1

Table 1 depicts the overall relationship between opportunities and challenges in using information and communications technology (ICT) at the university level. According to the survey, teachers have the most positive perceptions of using ICT resources and tools, and they have the most opportunities (80%) to use ICT resources and tools at the university level. They find difficulties (38 percent) in using information and communications technology (ICT) at university. Therefore, university teachers have the most significant number of opportunities to use ICT resources and tools, but they also face several challenges when putting these resources and tools to use.

V. FINDINGS, CONCLUSION AND DISCUSSION
Researchers discovered that teachers are given opportunities to utilize internet resources and prepare for lectures by consulting YouTube videos and other sources of information. Teachers also acknowledge that they use digital libraries and make use of the most up-to-date ICT devices available on university campuses. As a result, the study's findings suggest that university teachers recognize that access to the internet is an essential requirement for their jobs and that it also plays a critical and significant role in enhancing their professional development and effectiveness. On the other hand, according to the study's findings, university teachers are confronted with challenges such as a lack of interest in the use of information and communication technology (ICT) devices/gadgets or a lack of accessibility to ICT resources within the institutional premises. They also acknowledge that there is a scarcity of training to adopt information and communications technology (ICT) and its resources at the postsecondary level. Teachers are unfamiliar with the technical knowledge of information and communication technologies (ICT), and as a result, they are hesitant to use ICT. Teachers are also confronted with the issue of a lack of computers in computer labs, and time management (21.6 percent) is cited as a more significant challenge in utilizing ICT at university or home for students. As a result, the study concluded that the lack of access to ICT resources at the tertiary level has a significant impact on university teachers' professional development and competence.

As a result, university teachers who used ICT tools in their classrooms to improve their teaching skills and knowledge found that the quality of their instruction increased due to the increased teachers' motivation and increased productivity of the classroom. They used information and communication technology (ICT) to manage various tasks, including routine classroom activities, personal use, teacher professional development, and, finally, improved collaboration. Universities today are aligning their academic faculty with cutting-edge

----

technological gadgets to streamline their students' teaching and learning process. As a result, they are incorporating projectors and multimedia into their classrooms. The effective use of information and communications technology (ICT) in Pakistani universities to develop professional thinking and the personal improvement of teachers eliminated the lack of factors that deactivate university teachers in their active working environments. The study discussed how teachers' professional and self-development could only be achieved through information and communication technology (ICT), which enables teachers to effectively use technology in classrooms to improve the quality of teachers as well as the quality of higher education institutions (Mkpa and Ekoh-Nweke, 2019). According to the findings of this study, teachers' technical knowledge, an insufficient number of ICT-related courses, and a lack of teacher training are the most significant roadblocks to their professional and self-development. Although a limited number of workshops, seminars, and conferences are held at the university level, this is insufficient to meet the primary goals and ensure the proper integration of technology into the teaching-learning process. According to the findings of the Granados and Jaramillo (2019) study, the most frequently used ICT tools in education are Microsoft Word, Microsoft Excel, and Microsoft PowerPoint. According to this study, these three technologies (Microsoft Word, Microsoft Excel, and Microsoft Power) are also frequently used by teachers in their teaching practices. It was discovered in the Gilakjani et al. (2019) study that teachers should be trained in technology because they use it effectively in their classroom teaching practices. This study also discovered that nearly ninety percent (89 percent) of university teachers effectively use ICTs in their teaching practices.

VI. PEDAGOGICAL IMPLICATIONS

Based on the findings of the study, the researchers proposed the following recommendations: The study may recommend that universities take steps to provide an adequate number of ICT media (computers, internet, and other similar facilities) that will assist teachers and students in achieving the goals that they have set for themselves in order to have a successful future. In addition, it is recommended that universities ensure adequate teacher training facilities and provide an adequate number of ICT-related courses at the university level, in addition to making experts available for improving their technical knowledge based on modern information and communication technologies.

REFERENCES

Ali, M. Q., Nargis, N., Yasmeen, R., & Iqbal, Z. (2015). ICT use for effective teaching- learning process in secondary schools in Punjab province. *Asian Journal of Social Sciences and Humanities, 4* (3), 138-143.

Ali, M. Q., Riaz, H., & Wattoo, R. M. (2018). Role of Information Communication Technology in Developing Academic Intimacy among Secondary School Students. *International Journal of Distance Education and E-Learning, 3* (2), 1-12.

Audi, M., Ali, A., & Al-Masri, R. (2021). Determinants of Advancement in Information Communication Technologies and its Prospect under the role of Aggregate and Disaggregate Globalization.

Audi, M., Ali, A., & Roussel, Y. (2021). *The Advancement in Information and Communication Technologies (ICT) and Economic Development: A Panel Analysis*. International Journal of Innovation, Creativity and Change, 15(4), 1013-1039.

Avidov-Ungar, O., & Amir, A. (2018). Development of a teacher questionnaire on the use of ICT tools to teach first language writing. *Computer Assisted Language Learning, 31*(7), 675-693.

Aziz-Mohammadi, F., & Samadi, F. (2014). The impact of call on improving Iran students' accent. *Indian Journal of Scientific Research, 7*(1), 794- 798.

Azmi, N. (2017). The benefits of using ICT in the ELF classroom: From perceived utility to potential challenges, *Journal of Educational and Social Research, 7*(1), 111-118.

Bhattacharjee, B. & Deb, K. (2016). Role of ICT in 21st century's teacher education: *International Journal of Education and Information Studies, 6*(1), 1-6.

Bhattacharya, I. & Sharma, K. (2007). India in the knowledge economy: An electronic paradigm. *International Journal of Educational Management, 21*(6), 543-568.

Bingimlas, K. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. *Eurasia Journal of Mathematics, Science & Technology Education, 5*(3), 235–245.

Celebi, N. (2019). Teachers and ICT"s in secondary education: The Turkish case. *International Journal of Technology in Education and Science (IJTES), 3*(1), 19-28.

Chen, R. J. (2010). Investigating models for preservice teachers' use of technology to support student-centered learning. *Computers & Education* in Press.

Chou, C., Shen, C., Hsiao, H., & Shen, T. (2018). Factors influencing teachers' innovative teaching behaviour with information and communication technology (ICT): the mediator role of organizational innovation climate, *Educational Psychology*. DOI: 10.1080/01443410.2018.1520201.

Cox, J. (2017). A teacher's professional development goals: Retrieved from http://www.teachhub.com/teachers-professional-development-goals.

Cubukcuoglu, B. (2013). Factors enabling the use of technology in subject teaching. *International Journal of Education and Development using Information and Communication Technology (IJEDICT), 9*(3), 50-60.

Dabbagh, N., & Kitsantas, A. (2012). Personal Learning Environments, social media, and self-regulated learning: A natural formula for connecting formal and informal learning. *The Internet and Higher Education, 15*(1), 3-8.

Dabbagh, N., Fake, H., & Zhang, Z. (2019). Student Perspectives of Technology Use for Learning in Higher Education. *RIED. Revista Iberoamericana de Educación a Distancia, 22*(1), 127-152.

Ertmer, P.A., Ottenbreit-Leftwich, A., & Tonduer, J. (2015). Teacher beliefs and uses of technology to support 21st century teaching and learning. In H. Fives & M. Gills (Ed.), *International handbook of research on teachers' beliefs*. New York, NY: Routledge.

Fathima, S. (2013). Challenges of ICT in teaching learning process. *International Journal of Engineering and Science*, 51-54.

Freeman, I., & Hasnaoui, A. (2010). Information and communication technologies (ICT): *A Tool to Implement and Drive Corporate Social Responsibility (CSR)*. Paper presented at 15th International Conference of the Association Information and Management 2010, AIM 2010.

Frost, L., MacLeod, K., & Laronde, G. (2017). Challenges in providing information and communication technology (ICT) education in aboriginal Canadian schools: *International Journal of Digital Society (IJDS), 8*(1), 1251-1259.

Frydrochov-Klimova, B., & Poulova, P. (2014). *ICT as a Motivational Tool in the Learning of Foreign Languages.* Retrieved from: http://www.europment.org/library/2014/interlaken/bypaper/EDU/EDU-06.pdf

Fu, J. S. (2013). ICT in education: A critical literature review and its implications. *International Journal of Education and Development using Information and Communication Technology (IJEDICT), 9*(1), 112-125.

Ghavifekr, S. & Rosdy, W.A.W. (2015). Teaching and learning with technology: Effectiveness of ICT integration in schools. *International Journal of Research in Education and Science (IJRES), 1*(2), 175-191.

Gilakjani, A. P., Sheikhy, R., Montashery, I., & Alizadeh, M. (2019). A Mixed Method Study of Teachers' Attitudes towards Computer Pronunciation Software in Teaching English Pronunciation. *International Journal of Instruction, 12*(1), 821-840.

Granados, S. H. B., & Jaramillo, M. L. A. (2019). Learning styles and the use of ICT in university students within a competency-based training model. *Journal of New Approaches in Educational Research, 8*(1), 1–6.

Haider, A., & Ali, A. (2015). Socio-economic determinants of crimes: a cross-sectional study of Punjab districts. *International Journal of Economics and Empirical Research*, 3(11), 550-560.

Hazita-Azman, A. S., Hussin, S., Hasim, M. S., & Hassan, M. A. (2014). Determining digital maturity among ICT users in Malaysia. *Malaysian Journal of Communication, 30*(1), 23-35.

Heamealeainen, R., De Wever, B., Nissinen, K., & Cincinnato, S. (2019). What makes the difference–PIAAC as a resource for understanding the problem-solving skills of Europe's higher-education adults? *Computers & Education, 129*, 27–36.

Heinonen, K., Jaaskela, P., Hakkinen, P., Isomaki, H., & Hamalainen, R. (2019). University teachers as developers of technology-enhanced teaching—do beliefs matter? *Journal of Research on Technology in Education*, 1-17.

Hevko, I. (2019). Information technologies in education: opportunities and negative consequences. *Journal of education, health and sport, 9*(1), 69-77.

Huang, R., Kinshuk, & K. Price, J. (2014). ICTs as transformative enabling tools in education for sustainable development. *ICT in Education in Global Context: Emerging Trends Report 2013–2014*, Springer Heidelberg New York Dordrecht London.

Imon, M. M. I. I. (2017). ICT integration in secondary education in Bangladesh: A study   of   policy and practice, *M.Phil. Thesis,* department of education, faculty of   educational   Sciences, University of   Oslo.

Iqbal, M. N., Ali, M. Q., Hassan, U. M., & Alamgeer, M. (2015). Information   Communication Technology in secondary/higher secondary schools in Pakistan: Application and Practices. *Journal of Institute of Social Sciences.* BZU Multan: Pakistan.

Islahi, F., & Nasrin. (2019). Exploring teacher attitude toward information technology   with   a   gender perspective. *Contemporary educational technology, 10*(1), 37-54.

Kassem, M. Ali, A. & Audi, M. (2019). Unemployment Rate, Population Density and Crime Rate in Punjab   (Pakistan): An Empirical Analysis. *Bulletin of Business and Economics (BBE),* 8(2), 92-104.

Kaur, H. (2019). Teachers' opinions on ICT as a teaching tool in teaching and learning   process.   *Hawaii University International Conferences Arts, Humanities, Social   Sciences   &   Education*, January 3 - 5, 2019, Prince Waikiki hotel, Honolulu, Hawaii.

Khan, M. S. H., Hasan, M. & Clement, C. K. (2015). Barriers to the introduction of ICT   into   education   in developing countries: the example of Bangladesh. *International   Journal   of   Instruction,   5*(2), pp. 61-80.

Khokar, A. J. (2016). Students and teachers perceptions of ICT use in classroom: Pakistani classrooms. *The Asian Conference on Technology in the Classroom   2016 Official Conference Proceedings, retrieved from:* https://www.researchgate.net/publication/307476407

Lawrence, J. E., & Tar, U. A. (2018). Factors that influence teachers' adoption and   integration of ICT in teaching-learning process. *Educational Media International, 55*(1), 79-105.

Lindberg, J. O., & Olofsson, A. D. (2016). Contrasting views: student and teacher perceptions on ICT in education, *ICICTE 2016 Proceedings*, 1-10.

Lubis, A. H., Idrus, S. Z., & Sarji, A. (2018). ICT usage amongst lecturers and its impact towards   learning process quality. *Jurnal Komunikasi, Malaysian journal of communication, 34*(1), pp. 284-299.

Miima, F., Ondigi, DS. & Mavisi, R. (2013). Teachers' perception about integration of   ICT in teaching and learning of Kiswahili language in secondary schools in   KENYA. *International journal of arts and commerce, 2*(3), 27-32.

Mikre, F. (2011). The role of information communication: Review article with emphasis to the computer and internet. *Ethiopian Journal of Education and Science, 6*(2), 1-16.

Mkpa, M. A., & Ekoh-Nweke, AC. (2019). Professional self-development strategies of   basic   education teachers in Abia state, Nigeria. *European journal of education studies, 5*(10), 19-32.

Mostafa, J., Hashemi, S. A., Sosahabi, P., & Berahman, M. (2017). The role of ICT in   learning – teaching process: *World scientist news, 72*, 680-691.

Moyne, M. (2018). The development and evaluation of DEFT, a web-based tool for   engineering design education. *IEEE Transactions on Learning Technologies, 11*(4), 545–550.

Mwendwa, N. K. (2017). Perception of teachers and principals on ICT integration in the   primary   school curriculum in Kitui County, Kenya: *European Journal of Education Studies, 3*(7), 408-430.

Nikolopoulou, K., & Gialamas, V. (2016). Barriers to ICT use in high schools: Greek teachers' perceptions. *Journal of computer education, 3*(1), 59–75.

Nisar, M. W., Munir, E. U., & shad, S. A. (2011). Usage and impact of ICT in education sector; A study of Pakistan. *Australian journal of basic and applied sciences, 5*(12), 578-583.

Olofsson, A. D., Lindberg, O. J., Fransson, G. (2018). Students' voices about information   and communication technology in upper secondary schools: *The international   journal   of information and learning technology, 35*(2), 82-92.

Padmavathi, M. (2013). A survey of secondary school teachers' perceptions, competency and use of computers. *International journal of education and psychological research (IJEPR), 2*(4), 7-16.

Roussel, Y., Ali, A., & Audi, M. (2021). Measuring the money demand in Pakistan: a time series analysis. *Bulletin of Business and Economics (BBE)*, *10*(1), 27-41.

Roy, S. D. (2015). Application of ICTs in teaching-learning process. *International Research Journal of Interdisciplinary & Multidisciplinary Studies (IRJIMS), 7(1)*, 72-84.

Sajid, A. & Ali, A. (2018). Inclusive Growth and Macroeconomic Situations in South Asia: An Empirical Analysis. *Bulletin of Business and Economics (BBE),* 7(3), 97-109.

Schulz, R., Isabwe, G. M., & Reichert, F. (2015). Investigating teacher's motivation to   use   ICT   tools   in higher education. *Conference Paper, Research gate.*

Şentürk, İ., & Ali, A. (2021). Socioeconomic Determinants of Gender Specific Life Expectancy in Turkey: A Time Series Analysis. *Sosyoekonomi*, 29(49), 85-111.

Shaikh, Z. A. (2009). Usage, acceptance, adoption, and diffusion of information and communication technologies in higher education: A measurement of critical factors. *Journal of Information Technology Impact (JITI), 9*(2), 63-80.

Shaikh, Z. A., & Khoja, S. A. (2011). Role of ICT in shaping the future of Pakistani higher education system. *The Turkish Online Journal of Educational Technology, 10*(1), 149-161.

Siddiquah, A., & Salim, Z. (2017). The ICT facilities, skills, usage, and the problems faced by the students of higher education: *EURASIA Journal of Mathematics Science and Technology Education, 13*(8), 4987-4994.

Sipila, K. (2014). Educational use of information and communications technology: Teachers' perspective. *Technology, Pedagogy and Education, 23*(2), 225–241.

Tabassum, S. & Shehzadi, K. (2018). ICT Awareness among Faculty Members of the Public Sector Women Universities of Pakistan: *Proceedings of the RAIS Conference,* 128-144.

Taimur-ul-Hassan & Sajid, A. R. (2013). ICTs in learning: Problems faced by Pakistan. *Journal of Research and Reflections in Education, 7*(1), 52 -64.

Tartarashvili, M. (2017). ICT in education: The context-specific characteristics and challenges for developing countries based on the example of Georgia, *Master's Thesis,* Tallinn university of technology, faculty of business and governance.

Toro, U., & Joshi, M. (2012). ICT in higher education: Review of literature from the period 2004-2011. *International Journal of Innovation, Management and Technology,3*(1), 20-23.

Tunio, M. N., Rashdi, P. I. S., & Abro, Q. M. M. (2014). Evaluation of ICT education in private secondary schools: a case study of Hyderabad, Sindh Mehran University. *Research Journal of Engineering & Technology, 33*(1), 43-48.

Umar, I. N., Tarmizi, M., & Yusoff, M. (2014). A study on Malaysian teachers' level of ICT skills and practices, and its impact on teaching and learning. *Procedia - Social and Behavioral Sciences, 116*, 979 – 984.

Wahyudi, R., Poernomo, D & Puspitaningtyas, Z. (2018). Effect of Information Technology, Satisfaction and Motivation to Teacher Performance: *The International Journal of Social Sciences and Humanities Invention 5*(1), 4370-4378.

Wallet, P. (2014). *ICT in Education in Asia: A Comparative Analysis of ICT Integration and E-Readiness in Schools across Asia*. Montreal, Canada: UNESCO.

Watson, S. L., & Watson, W. R. (2011). The role of technology and computer-based instruction in a disadvantaged alternative school's culture of learning. *Computers in the Schools, 28*(1), 39-55.

Wentzel, K. R., & Miele, D. B. (Eds.). (2016). *Handbook of Motivation at School. Second Edition Educational Psychology Handbook Series*. New York, USA: Routledge.

World Bank (2016). Technology and innovation in Education. Retrieved 30.07.16 http://www.worldbank.org/en/topic/edutech

Yunus, M. MD., & Suliman, A. (2014). Information & Communication Technology (ICT) tools in teaching and learning literature component in Malaysian secondary schools. *Asian social science, 10*(7), 136-152.

Zhao, Y. (2007). Social studies teachers' perspectives of technology integration. *Journal of Technology and Teacher Education, 15* (3), 311-333.

Zhao, Y. (2013). Recent developments in technology and language learning: Literature review and meta-analysis. *CALICO Journal, 21*(1), 7-27.