Impact of COVID-19 on Digital Learning – Challenges and Future Prospects

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Abstract- COVID-19 has a serious impact on various stakeholders of the teaching and learning community including instructors, managers and students. This imposed educational institutions switching their all educational activities on digital learning paradigm enforcing social distancing. Therefore, this study intends to gauge the impact of digital learning in higher education settings. Quantitative mode of research has been conducted to collect the data from respondents. An online survey questionnaire have been administered amongst the students of various Universities of Pakistan. It has been observed that the digital learning is emerged as an alternate mode of teaching and learning and it is becoming main stream of education. However, it has also been perceived that most of the learners are found reluctant in utilizing different gadgets for digital learning due to lack of adequate knowledge of this paradigm especially in developing countries like Pakistan. The outcomes of the study can serve as a road map for the higher education commission while designing course outlines as well as recommending provision of ICT infrastructure keeping such pandemics in view in future.

Keyword- Digital Learning, Online Learning, E-learning, Mobile Learning, Internet, Information and Communication Technology (ICT), Higher Education.

I. INTRODUCTION

The prevailing situation of COrona, VIirus, and Disease (COVID) has been affected almost all countries round the globe. This outbreak of COVID-19 has imposed a profound effect on almost every walk of the daily life including economic, tourism, construction, manufacturing, education and etc. [1]. This situation forced more than 145 countries to close the educational institutes as a preventive measure to protect learners, instructors, managers from this virus [2-3]. This pandemic has affected almost 1.6 billion learners round the globe. Moreover, approximately 94% of the world's student population has been affected due to shutting down of the educational institutions [4]. Hence there is need of paradigm shift in terms of teaching and learning throughout the world. This has been sparked on account of lockdown in various countries due to wide spread of COVID-19 pandemic. Consequently, most of the educational institutions worldwide have no choice to adopt Information and Communication Technologies (ICT) for switching towards digital mode of learning and teaching instead of traditional face-to-face class room learning [5]. As a result, students registered to the institutions have started to shift them on digital mode of learning [6].

Currently fourth wave of COVID-19 is in progress and it is very difficult to predict at this stage that how long this pandemic will take to be controlled. Therefore, educational institutions round the globe have decided to develop learning objects for the learners of all disciplines utilizing available limited technical resources [7]. This is not smooth and simple to switch to this digital paradigm as various challenges and obstacles have been encountered by the learners, instructors and educational institutions as well [8]. The most common challenges for the adoption of this digital learning includes lack of infrastructure, lack of the Internet connectivity in remote areas, readiness of the educational institutions, lack of ICT enabled students and instructors and etc. [9].

Digital mode of education or E-learning remains a top followed research topic in last few decades in the world as well as in Pakistan. Being a developing country Pakistan has limited resources and progress in this field was not much impressive. Pakistan has two specific universities which are working on distance education. COVID-19 has worked as catalyst to prioritized e-learning system of education. Similar to other nations, COVID-19 has attacked the educational activities of Pakistan and now it is the top priority of majority of the universities to adopt the digital learning. Still studies in the context of COVID-19 are rare, and thus there is a need to conduct further

research to address issues of online learning [10]. Therefore this study aims to gauge the impact of digital learning on learners during the COVID-19 at higher education institutions (HEIs). Moreover, this study also focuses on addressing the crucial challenges encounters by the HEIs in switching to this paradigm shift.

II. LITERATURE REVIEW

The outbreak of COVID-19 pandemic reveals the significance of digital learning using web-based systems over the Internet or Intranet. Digital learning emerges from distance learning, which facilitates learners to improve their qualification(s), knowledge and skills without affecting their jobs and/or other activities [11] with the flexibility of time. Digital learning applications and processes may be one of web-based learning, computer-based learning, virtual learning opportunities, digital collaboration, e-learning or mobile learning. The term digital learning in this study covers wide range of learning technologies that is executed using electronic mode of communication based on the Internet or Intranet technology [12]. These including e-learning, online learning, mobile learning, web-based learning and so on. Therefore, all types of learning contents or learning objects that can be delivered and/or accessed using digital media including computers, tablets, iPods and/or mobiles are part of digital learning. Therefore, e-learning shall be used as a synonym to represent digital learning in this study. As a conclusion one can state e-learning is the learning with the help of latest Information and Communication Tools anywhere, anytime, at the ease of the learner with cost effectiveness and desired quality.

Due to the advancement of ICT, this universe is becoming global village, and universities adopting the latest information and communication tools in forming it as a global village especially due to outbreak of Novel Corona Virus as pandemic. HEIs round the globe switched to ICT for provision of better, efficient, effective and flexible learning [13] considering social distancing and lockdown of the institutions. It is a fact that the impact of ICTs in education is a global phenomenon due to prevailing situation of COVID-19. This transformation of ICT in education and training is creditworthy creating the competitive environment between educational institutions regardless of the borders [12, 14-16].

Higher educational institutes are shifting to digital mode of education during pandemic and computer scientists are implementing learning management systems. It has been observed that the students' engagement, intention and attitude towards digital learning is not as par expectations. Recent studies affirm that the success of e-learning / digital learning is not possible without attaining the student engagement [17-18]. This is found a serious problem, especially in the current scenario of COVID-19 in developing and underdeveloped countries where students have minimum interaction with technology. Therefore, there is a need to grasp this issues to be resolved and improve the e-learning experience of students [19-20]. Thus, active involvement of the students has major role in success of online learning programs.

Due to outbreak of the deadliest Novel Corona Virus has enforced to shut down the educational institutions across the world. Therefore, in order to handle with this situation, UNESCO has encouraged to switch to online learning mode by developing or outsourcing the online learning management tools. Similar situation has been perceived in Pakistan, the Higher Education Commission (HEC) has proposed to the Public and Private sector HEIs to adopt online mode of learning [21-22]. However, almost all HEIs of Pakistan are utilizing conventional mode of learning and teaching so far. Even though it is crystal clear that the adoption of ICT is ineluctable in HEIs across the world specifically and in Pakistan especially. As no budget had been allocated to the HEIs of the country in this regard [23-24]. Therefore, only few of the institutions responded to HEC call for paradigm shift, whereas, few of the HEIs have given the deadline for this paradigm shift by June 01, 2020.

A lot of studies about e-learning has already been conducted considering challenges and opportunities of e-learning considering various aspects and stakeholders of the systems. However, majority of such studies has been conducted in an ordinary circumstances. A very confined attention has been given in the state of the art literature to identify the challenges and opportunities of this paradigm during COVID-19. Therefore, this study contributes in gauging effectiveness of the e-learning during COVID-19 in HEIs of Pakistan. Furthermore, challenges encounters by the HEIs of the country in adopting this mode of learning have also been highlighted in this study.

III. RESEARCH METHOD

Qualitative model of research have been adopted using survey questionnaire as a data collection tool for this study.

3.1 Sample

The population selected for this study are students, instructors, administrators, managers and software developers from various HEIs and software development industry of Pakistan. In total 435 survey

instruments have been distributed, with collecting 345 responses at the rate of 79.3%. Some of the responses have found incomplete and hence excluded. Therefore, the sample size for this study consists of 320 indicating the response rate of 73.5%. In order to select the population, a stratified random sampling technique has been adopted amongst the population as it constitutes of diverse groups. It is pertinent to highlight that all the participants are being indulge in online mode of teaching and learning at the moment. A demographic profile of the population is illustrated in Table 1.

Table 1: Demographic Profile of Respondents

Factors	**Category**	**Frequency (No. of Respondents)**	**Percentage**
Gender	Male	45	46.3
	Female	52	53.6
Age	15-25	22	22.7
	26-35	29	29.89
	36-45	35	36.08
	45+	11	11.34
Occupation	Learners	27	27.83
	Instructors	32	32.98
	Developers	25	25.77
	Administrators	13	13.40
Proficiency on Internet	Novice	21	21.64
	Intermediate	48	49.48
	Expert	28	28.86
Web usage	<1 year	9	9.2
	1-2 years	14	14.43
	2-3 years	22	22.7
	>3 years	51	52.57

3.2 Survey Instrument

Online survey technique has been adopted in order to collect the data from respondents. A modified version of [9] have been utilized to identify the challenges encountered by the various stakeholders of online learning specifically associated with the prevailing situation of COVID-19. Before administrating the survey, the instrument has been discussed with 4 experts of the domain, to gauge the validity and appropriateness of the items. Each of the experts having significant experience in e-learning in terms of research and practice. Later-on a pilot test have been conducted with 15 research scholars of M.S and Ph. D level to ensure the clarity of each item of the instrument.

3.3 Analysis

Data was analyzed using spread sheet software in terms of percentage distribution and mean value. Scale value assigned to each of the five responses is demonstrated in Table 2.

Table 2: Scale Values

Response	**Value**
Strongly Agree	5
Agree	4
Normal	3
Disagree	2
Strongly Disagree	1

$$\text{Mean Score}=\Sigma(FSA\times5+FA\times4+FNAND\times3+FDA\times2+FSDA\times1)/N$$

IV. RESULTS

4.1 Reliability of the Instrument

Cronbach's alpha is one of the commonly employed techniques to gauge the reliability and internal consistency of the instrument [25-26]. The value of this coefficient ranged between 0.0 to 1.0 reflecting higher the numeric value higher the internal consistency and bonding between the items. According to [27] values of Cronbach's coefficient ranges between 0.7 to 0.9 I acceptable. However, the value higher that 0.7 is considered as better reliability and stronger bonding between the items of an instrument. Cronbach's alpha of the instrument have been reaches 0.88, that argues higher consistency and reliability between the items of the devised instrument.

4.2 E-Learning Adoption Challenges during COVID-19

The results of survey have been summarized in terms of mean values as illustrated in Table 3. The mean values has been calculated of each challenge and has been assembled in descending order with respect to their cruciality and importance of each of the challenge.

Table 3: Challenges and Related Mean Values

Challenges	Mean
Electricity Crises	3.82
Accessibility of Internet Broadband	3.80
Cost of Mobile Internet	3.77
Bandwidth	3.76
Literacy Rate	3.71
Lack of Interest of Faculty	3.64
Practical Arrangements	3.60
Lack of ICT Enabled Students	3.60
Access to Latest Digital Devices	3.52
Lack of Resources	3.50
Lack ICT Enabled Teachers	3.45
Formal Implementation Process	3.39
Lack of Instructional Design Process	3.17
Socio-Cultural Norms	2.97
Support for Students	2.72
Change in Universities Structure	2.60
Support for Teachers	2.49

V. DISCUSSION

Identified issues have been categorized into different themes which are adapted from the existing literature. This adaption is based on the experiences, observations, opinions of researchers from existing literature [3, 5, 28-29] and in accordance to the formulated objectives of the study.

5.1 Technological Challenges

It has been observed that technical challenges are one of the crucial challenges to be addressed in order to dispense knowledge to the learners at their finger clicks. The most critical challenges that every Pakistani is experiencing is the steady supply of electric power which is mandatory for the adoption of this digital paradigm. This power issue is acting as an obstacle for the successful deployment of this digital paradigm almost across the country. Additionally, availability of e-learning resources including software, hardware, network [30], Learning Management System (LMS), Learning Objects (LO) and etc. is another amongst the crucial challenges. As it is required that all resources must be accessible by the stakeholders round the clock. Beside this energy crises, technical challenges may include adequate bandwidth access [31], high-speed Internet broadband [32] especially in remote areas where signals strength is always crucial, and the low cost to access these technologies. Therefore, technical resources are mandatory to manage and infrastructure to be enhanced immediately. As these shall provide backbone support for the effective execution of digital learning systems.

5.2 E-Learning Systems Challenges

It has been evident that HEIs were not equipped to strive with the abrupt outbreak of corona virus that has forced to down every activity. Moreover, almost all private and public sector HEIs utilizing conventional education system, which required to switch to digital system of learning and training. Moreover, acceptance of this paradigm shift by the instructors and learners is difficult since both are comfortable with the traditional method of teaching and learning [5]. One of the core reasons for the resistance from instructors is as they realized that they are required to convert course contents electronic mode i.e. to design and develop LOs. Quite large number teacher in the HEIs are not familiar even with the usage of the necessary software for the producing the course material and moreover they also do not want to change their teaching style. It has also been perceived that a huge number of instructors and students are still reluctant to adopt the digital mode of learning. Additionally, most of the students are not satisfied and comfortable with the various services of LMS. These services include assignment submission, examination and etc. Moreover, making the instructors and students as ICT enabled in order to acquire maximum utilization of LMS, hence the basic ICT literacy skills are believed vital for the effective, efficient and constructive learning.

5.3 Cultural Challenges

Cultural and social issues have a critical impact on the integrating ICT in education [33]. It has also been urged by [5] that culture is a vital element to enhance the proportion of successful adoption of e-learning

system. People from remote areas particularly the Northern and tribal areas of the country have their own traditional and cultural values. They are reluctant to permit their females to move to the urban areas with the intention of education due to their traditional, social and cultural constraints. In addition to this, these areas are also have lower literacy rate as compare to rest of the country. This low literacy especially in the domain of ICT is also one of the major hurdles in promoting e-learning in these areas. Further, it is also a matter to highlight that these areas are experiencing with the poor Internet connectivity and low bandwidth as well. Beside these challenges, unavailability of LMS and LO in localized languages is also imparting as a barrier in the successful adoption of digital learning.

5.4 Institutional Challenges

Due to outbreak of corona virus, all institutions have encountered various challenges to tackle the situation of lockdown. All institutions had been recommended by HEC to equip their staff and organizations with the cutting edge technology to cope up with the prevailing situation of COVID-19. HEIs are encouraged to adopt digital model of learning within their existing resources. Therefore, it depends on the policies of HEIs to successfully adopt and execute the LMS utilizing their existing resources. However, HEC has encouraged and facilitated HEIs to accept the challenges of this paradigm shift. In this regard, public sector universities have also been provided financial support to develop their own LMS, train the instructors and students as well. HEIs encountered various challenges including lack of LO development skills, motivation of the instructors as the instructors were comfortable with the traditional classroom methods. Only Allama Iqbal Open University (AIOU) and Virtual University (VU) have sufficient instructional designer work force as both institutions are already being operated in distance and virtual learning modes. Unfortunately, these are not being trained to design the course contents in electronic format [9, 34]. HEIs other than AIOU and VU are being lacked in the process of instructional designing consequently leading to poor designing of the LOs which hamper the effective LMS for learners. Hence, it is required for HEIs to formulate localized standards in order to promote e-learning to their respective learners. The challenges with lack of resources, practical arrangements for practical oriented courses, and lack of formal implementation processes are related to the institutions providing e-learning facilities and hence are prompted challenges that organizations are being encountered.

VI. CONCLUSION

COVID-19 has significantly impacted all aspects including the education system round the globe. Digital mode of learning and training has emerged as a savior need for the educational institutions to carry out their educational activities online instead of face to face classes. Even online education can reduce the cost but the transformation of educational activities from traditional to digital mode has its own challenges. Beside these challenges, various stakeholders have also encountered many problems in adopting this mode of teaching and learning platform. The identified challenges have been categorized as Technological, E-Learning System, Institutional and Cultural challenges. These challenges include availability, accessibility, Internet connectivity, sufficient bandwidth, lack of ICT enabled teachers and students. These are crucial challenges and need to be addressed on priority for the successful acceptance of the digital paradigm. In this way institutions can continue educational activities in future without interruption even during this dangerous pandemic of 21st century.

This study suggests recommendation to authorities for catering the future aspects due to impact of COVID-19 on education sector. Therefore, beside financial support by the government / related ministries and HEC, it is recommended that HEC should provide following technical and administrative facilities to tackle the above mentioned challenges highlighted during span of COVID-19:

- Provision of ICT infrastructure to enhance the availability and accessibility
- Enhance the Internet network throughout the country with larger bandwidth and maximum connectivity even in remote areas
- Arrange compulsory technical training of human resources (instructors and students) for successful acceptance of digital mode of learning and availability of ICT enabled instructors.
- Design and development of learning objects (web-based contents) needed for online courses, submission of assignment etc.

REFERENCES

[1] Almanthari, A., S. Maulina, and S. Bruce, *Secondary school mathematics teachers' views on E-learning implementation barriers during the COVID-19 pandemic: the case of Indonesia.* Eurasia Journal of Mathematics, Science and Technology Education, 2020. 16(7): p. em1860.

[2] Adnan, M. and K. Anwar, *Online Learning amid the COVID-19 Pandemic: Students' Perspectives.* Online Submission, 2020. 2(1): p. 45-51.

[3] Almaiah, M.A., et al., *Exploring the Main Determinants of Mobile Learning Application Usage During Covid-19 Pandemic in Jordanian Universities.* Emerging Technologies During the Era of COVID-19 Pandemic, 2021. 348: p. 275.

[4] Pokhrel, S. and R. Chhetri, *A literature review on impact of COVID-19 pandemic on teaching and learning.* Higher Education for the Future, 2021. 8(1): p. 133-141.

[5] Almaiah, M.A., A. Al-Khasawneh, and A. Althunibat, *Exploring the critical challenges and factors influencing the E-learning system usage during COVID-19 pandemic.* Education and Information Technologies, 2020. 25: p. 5261-5280.

[6] Mulenga, E.M. and J.M. Marbán, *Is COVID-19 the gateway for digital learning in mathematics education?* Contemporary Educational Technology, 2020. 12(2): p. ep269.

[7] Kaur, G., *Digital Life: Boon or bane in teaching sector on COVID-19.* CLIO an Annual Interdisciplinary Journal of History, 2020. 6(6): p. 416-427.

[8] Crawford, J., et al., *COVID-19: 20 countries' higher education intra-period digital pedagogy responses.* Journal of Applied Learning & Teaching, 2020. 3(1): p. 1-20.

[9] Farid, S., et al., *Identification and prioritization of critical issues for the promotion of e-learning in Pakistan.* Computers in Human Behavior 2015. 51: p. 161-171.

[10] Syauqi, K., S. Munadi, and M.B. Triyono, *Students' Perceptions toward Vocational Education on Online Learning during the COVID-19 Pandemic.* International Journal of Evaluation and Research in Education, 2020. 9(4): p. 881-886.

[11] Wong, D., *A critical literature review on e-learning limitations.* Journal for the Advancement of Science & Arts. School of Management & Information Technology, UCSI. Carseland, 2007.

[12] Meredith, S. and B. Newton, *Models of eLearning: Technology promise vs learner needs literature review.* The International Journal of Management Education, 2003. 3(3): p. 43-56.

[13] Selim, H.M., *Critical success factors for e-learning acceptance: Confirmatory factor models.* Computers & Education, 2007. 49(2): p. 396-413.

[14] Burkle, M. and Y. Sayed, *Integrating ICT in Higher Education: The Case of ITESM.* Mexico, International Journal of Education, 2001.

[15] Phipps, R.A. and J.P. Merisotis, *What's the difference?: A review of contemporary research on the effectiveness of distance learning in higher education*. 1999: Institute for Higher Education Policy Washington, DC.

[16] Laurillard, D., *Rethinking university teaching: A framework for the effective use of learning technologies*. 2001: RoutledgeFalmer.

[17] Rahman, A., *Using Students' Experience to Derive Effectiveness of COVID-19-Lockdown-Induced Emergency Online Learning at Undergraduate Level: Evidence from Assam, India*. Higher Education for the Future, 2021. 8(1): p. 71-89.

[18] Vate-U-Lan, P., *Psychological impact of e-learning on social network sites: Online students' attitudes and their satisfaction with life.* Journal of Computing in Higher Education, 2020. 32(1): p. 27-40.

[19] Grebennikova, V.M., et al., *Students' perception of E-learning based on media resources and readiness during COVID-19.* MEDIA WATCH, 2021. 12(2): p. 265-275.

[20] Xu, B., N.-S. Chen, and G. Chen, *Effects of teacher role on student engagement in WeChat-Based online discussion learning.* Computers & Education, 2020. 157: p. 103956.

[21] Shehzadi, S., et al., *The role of digital learning toward students' satisfaction and university brand image at educational institutes of Pakistan: a post-effect of COVID-19.* Asian Education and Development Studies, 2020.

[22] Ali, N., *Students disappointed with online teaching system amid COVID-19.* Retrieved from Daily Times: https://dailytimes. com. pk/587446/students-disappointed-with-online-teaching-system-amid-covid-19, 2020.

[23] Abbas, W., et al., *Analyzing the factors that can limit the acceptability to introduce new specializations in higher education institutions.* International Journal of Educational Management, 2017.

[24] Kayani, U.R. *FOSS Localization: A Solution for the ICT dilemma of developing countries*. in *2005 Pakistan Section Multitopic Conference*. 2005. IEEE.

[25] Qadir, M., et al., *A Novel Model for Quality Evaluation of E-Commerce Websites.* Technical Journal, 2021. 26(01): p. 71-79.

[26] Pallant, J., *SPSS survival manual: A step by step guide to data analysis using SPSS.*

Maidenhead. 2010, Open University Press/McGraw-Hill.

[27] Nunnally Jum, C. and H. Bernstein Ira, *Psychometric theory*. 1978, New York: McGraw-Hill.

[28] Farid, S., et al., *A Sustainable Quality Assessment Model for the Information Delivery in E-learning Systems.* Information Discovery & Delivery, 2018. 46(1).

[29] Qadir, M., et al., *A RIGOROUS APPROACH TO PRIORITIZING CHALLENGES OF WEB-BASED APPLICATION SYSTEMS.* Malaysian Journal of Computer Science, 2021. 34(2): p. 130-150.

[30] Almaiah, M.A., M.M. Alamri, and W.M. Al-Rahmi, *Analysis the effect of different factors on the development of Mobile learning applications at different stages of usage.* IEEE Access, 2019. 8: p. 16139-16154.

[31] Homan, G. and A. Macpherson, *E-learning in the corporate university.* Journal of European Industrial Training, 2005. 29(1): p. 75-90.

[32] Mason, R. and F. Rennie, *Broadband: A solution for rural e-Learning?* The International Review of Research in Open and Distance Learning, 2004. 5(1).

[33] Qureshi, I.A., et al., *Challenges of implementing e-learning in a Pakistani university.* Knowledge Management & E-Learning: An International Journal (KM&EL), 2012. 4(3): p. 310-324.

[34] Iqbal, M.J. and M. Ahmed, *Enhancing quality of education through e-learning: the case study of Allama Iqbal Open University.* The Turkish Online Journal of Distance Education, 2010. 11(1).