Identifications of Barriers in Implementation of Digital Technology in Secondary Schools of Punjab

Sajida Ghani[1], Farah Malik[2], Shamim Ullah[3]

[1] Lecturer, Department of Education, University of Education, Lahore, Multan Campus, Pakistan.
  Email: sajida.ghani@ue.edu.pk
[2] Teacher, Pakistan Bait-ul-Mal, School for Rehabilitation and Child Labour (SRCL) Multan, Pakistan.
  Email: farah786rao@gmail.com
[3] Assistant Professor, Institute of Education and Research, University of the Punjab, Lahore, Pakistan.
  Email: shamimullah.ier@pu.edu.pk

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ABSTRACT

The objective of this study was to discuss the benefits of digitization in Pakistani schools. After identifying barriers related with infrastructure, teacher and students, the aim of this study was to encourage students for the tackling of these barriers. As these barriers are main hindrances to get quality education. Quantitative approach was used in the study. Survey method was applied. The accessible population of the study was school teachers from various Public sector schools of Punjab, Pakistan. Convenience sampling technique was used to obtain sample of the study. The sample of the study was 300 school teachers. A questionnaire was developed for the collection of data. The validity of the questionnaire was obtained through expert opinion while reliability was obtained through cronbach alpha. The alpha value was .75. Descriptive statistical techniques were used for data analysis. The findings of the study were that key barriers in implementation of digital technology include inadequate infrastructure, limited access to technology, insufficient teacher training, resistance to change, concerns about privacy and security, and disparities in digital literacy among students. Furthermore, the research delves into the socio-economic, cultural, and policy-related factors that contribute to the complexity of these barriers. It also investigates potential strategies and solutions to overcome these obstacles, emphasizing the importance of collaborative efforts between stakeholders, policy-makers, educators, and technology developers. The findings of this study contribute to the ongoing discourse on technology in education and provide valuable insights for creating more inclusive, effective, and sustainable digital learning environments.

Corresponding Author's Email: sajida.ghani@ue.edu.pk

1. Introduction

As per the World Bank study report, in Pakistan, almost 23 million children are not enrolled in schools. The age of these children are between 5 and 16 years. Due to this reason Pakistan has been facing a challenging issue, because Pakistan has been placed among those countries where the percentage of children who are not enrolled in schools is high. There are many factors. Main factors are security issues, school distance and lack of teachers. These factors can be countered by applying digitization in schools. Countries can improve their educational standards. They can prepare students to face future challenges due to use of digital education (Salam et al., 2017). The developing countries like Pakistan, where the socioeconomic conditions are limited for high quality education, the importance of digital education plays an important role. Because it can solve students' many problems, because due to limited resources one of the main issues for drop out of students from school are poverty and cultural standards. Especially in most of the areas in Pakistan female students cannot get education or enroll in schools due to cultural norms.

This problem can be solved as students can get education through digitization. They can get education at a distance. It will reduce the number of students for dropping out (Anwar et al., 2020). The education system of Pakistan could not get benefit from its IT sector. The same condition is with other sectors like industry, health, agriculture etc. There could be many reasons i.e. poorly run operations, inefficiency in use of resources, lack of transparency, out dated curriculum and poor departmental collaborations. Subsequently the schools always ask for funding and resources. Actually there is little coordination between IT investment and limited returns (Abbasi et al., 2021). It is unfortunate that IT sector has not been yet able to utilize IT completely in educational system especially when we compare it with other sectors. Because educational system has not yet improve its organizational performance and operational efficacy due to use of IT (Mudaliar, 2022). The educational institutions can address challenges and solve problems by applying IT tools. They can improve their organizational management. Due to this educational institutions especially schools can address issued like coordination, control or more (Farooq et al., 2020).

While prior research has highlighted common obstacles to the implementation of digital technology in education, there exists a gap in studies that specifically delve into the distinctive contextual challenges confronted by schools in Pakistan. Our investigation aimed to comprehensively grasp the particular hurdles inherent in the Pakistani educational system, encompassing cultural, socio-economic, and infrastructural factors. Most existing literature has primarily concentrated on administrative or institutional barriers. In contrast, our research delved into the viewpoints of teachers, examining how their attitudes, beliefs, and opportunities for professional development impact the effective integration of digital technology in the classroom.

1.1. Research Objectives
Following were the objectives of the study;

1. To conduct a comprehensive literature review to identify and classify the existing barriers to the implementation of digital technology in education.
2. To categorize barriers into institutional, infrastructural, cultural, and pedagogical dimensions.
3. Investigate the attitudes, beliefs, and perceptions of teachers regarding the use of digital technology in the classroom.

1.2. Significance of the Study
Our research offers policymakers evidence-based insights into the distinct obstacles impeding the efficient adoption of digital technology in schools across Pakistan.
Utilizing this information, policymakers can formulate targeted strategies to surmount these hurdles and foster the seamless integration of digital technology.
A comprehensive understanding of the challenges encountered by educators and students facilitates the pinpointing of areas where educational practices can be enhanced.
By addressing these obstacles, our study has the potential to enrich teaching and learning experiences by promoting the effective utilization of digital technology.
The view points by the school teachers regarding use of IT are very vital. The policy makers can shape their planning on the basis of these viewpoints. They can execute the professional development. The can provide tools and resources to the school teachers so that school teachers may be able to implement the IT technology in classrooms.

2. The Literature Review
In the contemporary world, digital education has gained growing significance, providing a multitude of advantages to students, teachers, and educational institutions. By incorporating technology into the educational process, digital education has the potential to enhance the attribute and value of teaching and learning foster equal chances for educational opportunities, and equip them for the challenges of an ever-evolving global landscape (Abbas et al., 2016). By transitioning to digital grading, evaluation and distance oversight, traditional schools can decrease the financial costs and encourage teachers for time allocation to delivering top-tier education. Online courses offer significant benefits to students in remote areas, overcoming barriers like geographical or financial constraints that limit access to traditional education. It is evidenced through the literature that digital education has many advantages. By applying digitization the need of physical classrooms can be reduced. The policy makers can utilize funds in infrastructure of digital education. The maintenance costs can also be reduced. In this way

digitization could be proved cost-effect. It could be a solution to improve quality education. Students can get quality education and barriers related with location and socio economic could be solved (Khan & Ahmed, 2013). Students would be able to get global information. They can improve their critical thinking, creativity, problem solving abilities through online courses. They would be able to get high quality education without hindrances of location and socio economic barriers. The high quality peer reviewed journals, internet resources and latest full text material is not available to traditional educational set up. These can be achieved through digitization.

Furthermore, they can customize the learning experience, progressing at their own Space and convenience. They have the flexibility to revisit concepts, replay lectures as needed, and access learning materials around the clock, regardless of their geographical location. In essence, the availability of unlimited information emerges as a significant advantage of digital education, offering students an extensive reservoir of information and diverse chances for individual and specialized advancement (Zubairi et al., 2022). One of the primary benefits of online education is the flexibility to attend lessons from the comfort of one's home. Armed with digital tools and internet connectivity they can participate in their classes, learning actively, without concerns about tardiness or missing out on coursework (Ahmad et al., 2023). Exposure to new learning tools and technologies in the digital education system cultivates strong self-directed learning strategies in students, enhancing their cognitive abilities. Through the digital education framework, students can assess the information required to access and utilize online resources effectively. Consequently, there is a substantial improvement in their productivity, efficiency, and overall learning capacity (Ahmed, 2016).

Given the constant evolution of technology, customs, and knowledge, staying abreast of current information and relevant subject matter has transitioned from being optional to imperative for students. Proficiency with technology is now essential, especially considering the frequent use of phones and laptops by students. The essence of the digital education landscape revolves around preparing students to navigate and excel in this dynamic technological world (Shaikh & Khoja, 2011). Educational institutions have their fixed schedule for the enrollment of the students. They have to follow their academic calendar. Digitization will offer the advantage of allowing students to determine their own timetables. Learning platforms are accessible around the clock, providing students with the flexibility to balance their various commitments without compromising the quality of their study and exam preparation (Zubairi et al., 2022). Advocating for ground-breaking instructional process that influence digitization to develop the teaching learning process, digital education encourages educators to incorporate multimedia elements such as videos, images, and simulations. These tools prove very helpful in conveying complex concepts. Students are actively participating in learning process because interactive activities like quizzes and games further buildup understanding and contributing to a more enjoyable learning for students (Warraich & Rorissa, 2022).

In recent years, Pakistan has dedicated significance efforts to bolster programs in digital education. The aim of this program is to improve learning quality to enhance educational access. Today due to wide spread of digitization has increased the need for flexible learning environment. Digital education leads as integral component for Pakistan' educational system (Mirza & Arif, 2016). Following paragraph shows some of the note able digital education in country. E-learn Punjab stands as ambitious initiatives and the aim is revolutionizing the educational landscape launched under the Punjab Government (Moin Ud Din et al., 2022). This plat form praising online education. An educational material are surrounded from grades 1 to 12. Through digital technologies e-learn Punjab delivers interactive designs. Because compelling content design help to enhance learning. The feature of the platform is video learning, quizzes and assessments. The Sindh education board has formulated measures to encourage computer education. Notably, the stability of Sindh virtual learning program (SLVP) is important and noteworthy. This platform proposals online education for one to twelve graders. Authentic and quality content has been presented in national curriculum and it could be found both in English and Urdu. The SLVP enhances the learning through innovative activities, assessments and with teacher support. (Adnan & Anwar, 2020).

Higher Education Commission (HEC) played an active role in digital education for the promotion of higher education. In recent years HEC took many initiatives for the promotion of higher education through digitization (Agyemang et al., 2019). HEC offered through National

Library of Pakistan (NDLP) has been providing e-books, online articles and access to online journals. It is also offering e-learning and online degree programs to promote distance learning. There is another example of an educational institution which is offering online educational programs is Virtual university (VU) of Pakistan. VU has been delivering high quality education through digital technology (Agyemang et al., 2019). VU has been enriching learning process through online methodologies in modern education acceptance of technology make digital education essential. Innovation revalorized and prepare students for future. Pakistan is facing may hurdles for digital education. Following sections will highlight challenges that should be conquered for the success of digital learning (Atkin et al., 2017).

Digital education provides strength to pupil to access the world by making innovations in different field (Atkin et al., 2017). They provide high quality courses and educational resources to pupil that were not in the past. However, they are very significant in pursuing higher education at current time. Moreover, pupil can enhance their learning as a result of this by working on their will (Laudari & Maher, 2019). Technology and Infrastructure is the main obstacle in initiating digital education in Pakistan. Various institutes in remote areas face the lack of technology. This limitation is a challenge for both students and teachers in pursuing digital education. A lot of people in Pakistan are not known to digital technology. This leads to challenge in acquiring effective learning. Moreover, pupil should focus on to learn digital skills to participate in virtual learning (Atkin et al., 2017). Opposition from various groups leads to obstacle in pursuing digital education. A lot of instructors feel hesitation in teaching in teaching creative methods. Furthermore, many factions seem as a threat in initiating digital education. Digital education faces hurdles due to financial constraints. Various initiatives are taken in pursuing this but they are in vein (Sheikh, 2015).

3.   Research Methodology

The study was quantitative in nature. Survey method was used. The data were collected from the teachers at school level. The teachers were selected randomly. Three hundred teachers were selected for the collection of data. Teachers were asked to share their views in implementing digital technology in Pakistan. An online questionnaire was developed under the kind supervision of supervisor. Google Forms were shared with teachers via email, social media, and whatts app. This study collected responses from 220 male and 80 female teachers. The reseachers used likert type scale, to rate items from strongly disagree to strongly agree. Before distribution, the questionnaire was evaluated by two experts, and adjusted the survey on the basis of their feedback. Inform consent forms were submitted to the participants. The participants voluntarily filled the questionnaires. Confidentiality was ensured. Data were analyzed through Excel and then SPSS 22. Validity of the instruments were ensured through expert opinion. The instrument was updated as per the suggestions given by the experts. Irrelevant items were removed. Cronbach's alpha was 0.87 which is good (Ali et al., 2019). We applied descriptive statistical techniques for quantitative data analysis.

4.   Results/Findings

Table 1: Role in Education

	Frequency	Percent
Administrator	69	23.2
Teacher	229	72.1
Student	2	.7
Total	300	100.0

Table 1 showed that the role of respondents in education. Majority of the respondents were working as teachers (72.1%), while administrator (23.2%) and students (0.7%).

Table 2: Age of Respondents

	Frequency	Percent
25-35	84	28.2
36-45	106	34.6
46-55	82	27.5
56-65	26	8.7
Total	300	100.0

Table 2 showed the age of respondents. Majority of the respondents (34.6%) were between 36-45 years, while (28.2%) 25-35, (27.5%) were between 46-55 and (8.7%) were between 56-65.

Table 3: Marital Status of respondents

	Frequency	Percent	Cumulative Percent
Married	269	89.6	89.6
Single	22	7.4	97.0
Divorce	5	1.7	98.7
Widow	4	1.3	100.0
Total	300	100.0	

Table 3 showed marital status of respondents. Majority of the respondents (89.6%) were married, (7.4%) single, (1.7%) divorce, and (1.3%) were widows.

Table 4: Experience of respondents

	Frequency	Percent
1-10	91	30
11-20	116	38
21-30	68	22
31-40	25	8
Total	300	100.0

Table 4 showed experience of respondents. Majority of the respondents (38%) had 11-20 years' experience, (30%) 1-10 years, (22%) 21-30 years while (8%) had 31-40 years.

Table 5: Subject of respondents

	Frequency	Percent
Science	135	45.3
Arts	163	50.3
Total	298	100.0

Table 5 showed subject of respondents. Majority of the respondents' subject was Arts (50.3%) and (45.3%) were belonged to Science.

Table 6: District of respondents

	Frequency	Percent
Narowal	233	77.5
Rawalpindi	61	20.5
Bahawalpur	5	1.7
Faisalabad	1	.3
Total	300	100.0

Table 6 showed that (77.5%) participants belonged to Narowal district while (20.5%) Rawalpindi, (1.7%) Bahawalpur, (0.3%) Faisalabad.

Table 7: Perception of Teachers regarding barriers in digital technology

S.NO	Items	Mean	SD
01	School has reliable internet access	3.34	1.22
02	There are sufficient devices	2.99	1.15
03	Technical issues rarely disrupt lessons	3.18	1.07
04	Teachers have received sufficient training in integrating technology into teaching.	2.80	1.26
05	Teacher feel confident in using educational technology tools	3.25	1.23
06	The budget for technology integration is sufficient	2.48	1.18
07	Ongoing costs for software licenses and maintenance are manageable	2.65	1.09
08	There is lack of suitable digital content for curriculum	3.27	1.11
09	Teachers often Struggle to find appropriate online resources	3.48	1.04
10	All students have equal access to technology at home	2.16	1.12
11	Concerns about creating a digital divide among students are prevalent	3.09	0.96
12	There are challenges in getting teachers, students, or parents to embrace technology.	3.56	1.11
13	Cultural or institutional barriers to the adoption of mobile technology	3.34	1.01

14	Student data is well-protected in the digital learning environment	3.42	0.95
15	Concerns about privacy issues related to technology use are widespread	3.31	1.02
16	There is a dedicated support system for troubleshooting technical issues. *	3.44	0.93
17	The support system is responsive to issues or concerns	2.88	1.06
18	There are clear policies and regulations regarding the use of technology in education.	2.97	1.04
19	Compliance issues with existing policies are a concern	3.04	1.07
20	Technology tools align well with educational goals and teaching methods.	3.32	0.94

Table 7 showed the mean and standards deviation of the items. The mean score above 3 showed that majority of the respondents were moderately agree with the statements, while mean score more than 2 showed that majority of the respondents had variability in their opinions or they has neutral view points on the factors related with implementation of digitization.

5. Discussion

The findings of the study are in consistent with the previous studies which identifies that one of the important barrier for implementation of digital technology in education is the infrastructural barrier. Along with infrastructural barriers other barriers like inadequate internet connections and outdated devices are also mentioned in the previous studies (Lewin et al., 2019). The consistency in the results showed the persistent nature of these challenges. To tackle these challenges a comprehensive approach is required. Besides these challenges other teacher-related factors are also very critical. Due to these critical teacher-related factors the implementation of digital education has become difficult. Some of the main teacher related factors i.e. resistance from teachers to implement digital education in schools, insufficient trainings to teachers for the implementation of digital education. Along these other barriers like lack of confidence for the implementation of digital tools in education have also been widely mentioned in the literature (Tondeur et al., 2017); (Wang et al., 2021). These persistent nature of challenges in the implementation of digital education require urgent action to tackle these challenges as without digitization we will be unable to solve problems i.e. drop outs. Urgent need of professional development programs and other training programs for the successful tackling of these challenges.

Some of the findings of our study are not consistent with the previous studies i.e. student-related barriers. The previous literature showed that students were very comfortable with the implementation of technology (Prensky, 2009). In our findings a presentable part of students has expressed serious concerns of the part of students related with implementation of digital education. These contrary findings suggests that an impressive interventions are required. The aim of these interventions must be enhancement of digital literacy among students This unexpected revelation suggests a growing need for interventions aimed at enhancing digital literacy among students (Anwar & Naveed, 2019); (Abbass et al., 2022).

6. Conclusion

There are many infrastructural, teacher and students related barriers for the successful implementation of digital education in public schools of Punjab. There is dire need of expert vision and an organized planning from the decision makers for the successful implementations and integration of digital technology in to the public schools of Pakistan. To tackle these barriers funds are required to the education sector. Curriculum must be revised as per the need of the contemporary needs. The current curriculum is not aligned with the latest trends. The present curriculum does not fulfil the demands related with digitization. In Pakistani government schools medium of instruction is Urdu while the tools related with digitization and their content is in English. This language barrier creates hurdle for the successful implementation of digitization. It is concluded that these challenges must be addressed by the Government on urgent basis.

6.1. Recommendations
➢ Resources are funds are required on urgent basis for the successful implementation of digitization.
➢ Professional development programs are required for teachers. So that they will be able to implement digitization.

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