"DIGITAL LEARNING AS EDUCATION INNOVATION AT UNIVERSITIES"

Tahira Afridi*
[1]University of the Punjab, Lahore, Pakistan (tahiraafridi2014@gmail.com)

ABSTRACT:
The well-rounded education is the interpretation of brilliant 21st century which has laid stress on use of digital technology in education. Policy makers are spotting at educational technologies to ensure the changed education. Rogers' Diffusion of Innovation Theory, which is considered more suitable for assessing the digital learning in education, was selected for this study. This study explores the perceptions of 3350 university students from Central Punjab, Pakistan, regarding the digital learning at public and private universities in Punjab. Survey research was used to achieve the objectives of the research study. A representative sample of administrators, teachers and students from faculties of Education and Business in eight Public and Private Universities of Central Punjab was taken. Descriptive and inferential statistics were applied to assess and compare responses taken on adapted five-point Likert rating scale. Respondents rated outside class digital learning activities as the highest and inside class digital learning activities as the lowest factor in order of their preference. The overall level of digital learning at public and private universities of Punjab with respect to all three sub-scales is found to be at an average level, thus conventional learning is continued. The major findings revealed stakeholders are having an easy access and sufficient skills to use these digital technologies but even then its integration in learning is beyond acceptance. This study recommends the continuation of current Prime Minister free Laptops Scheme, concerned authorities providing pay back student loans with easy installments, high speed internet facilities at department's computer labs, libraries, hostels and homes, improving searching skills of learners, counseling centers with trained staff for learners, learners' subsidized trainings and the rigorous application of digital learning activities inside the classroom.

Keywords:
Digital technologies, Digital Learning (DL), Technology Adoption and Integration, teaching, learning, Diffusion of Innovation (DOI)
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INTRODUCTION

Global efforts are made to embrace every learner and teacher with digital technologies (CBTs) like computers, internet, World Wide Web and laptops to ensure digital age learning and eliminate digital divide. Researchers believed that one major factor which ensures the student's effective learning is digital technologies (Gulek&Demirtas, 2005). The free laptop initiative was introduced by many states of America, New Zealand, Canada, Turkey and India. Studies have been conducted to explore the use and effectiveness of these technologies in learning environment (Ahmad & Rafiq, 2016; Iftakhar, 2016; Payal and Kanvaria, 2018; Silviyanti& Yusuf, 2015). The demands that society has placed on universities in general and faculty in particular is integration of digital resources in education (Greenhow, Robella& Hughes, 2009; Nicolle, 2005). New digital technologies like computers, Internet, WWW, laptops, facebook, blogs continue to spread in whole world (Muslem, Yusuf & Juliana, 2018).

The administration of universities, government and other concerned authorities have always invested in digital technologies with the hope that this access to the technologies will also ensure the effective use of it in education by the stakeholders (Pettersson, 2017; Ahmad & Rafiq, 2016). Yet the reality is different. Universities and specifically the university learners and teachers, the main executors of these technologies, are expected to play a big part in modeling the integration of these technologies in universities' teaching and learning, but the ground reality is different (Hariadi, Dewiyani, &Sudarmaningtyas, 2016). University teachers have been observed as the difficult users of these technologies (Olofsson, Lindberg &Fransson, 2018).

Pakistan as one of the developing nations has been going through a difficult phase of integrating the digital technologies in learning. While developed countries are decades away from their developing counterparts. According to Taimur-ul-Hassan & Sajid (2012) Pakistan is far behind in the technology accessibility and its integration in the learning developments. Among other initiatives of digital technologies, the government of Pakistan initiated to equip every university student with digital technology. The one-to-one laptop initiative was taken by Punjab Government back in 2011 with the purpose to equip 100 thousand brilliant students, currently studying in public sector universities/colleges. This initiative is expected to increase the adoption and integration of CBTs in education. Question arises whether such technology driven initiatives improves the situation or not? (Higher Education Commission, 2016).

According to Qureshi, Khola Robina and Michael (2012) there is a very limited research on assessing the adoption and integration of digital technologies in learning at public and private universities in Pakistan. In Pakistan even after the accessibility of technology, there is still issue of technology integration in learning. Evidence also exists that investing in these digital technologies do not always result in utilization and integration in digital learning as well.

MEASURING TECHNOLOGY ADOPTION AND INTEGRATION

Different models of technological innovation have been coined in past. Almost in every era change models have been of interest to educational and managerial scientists. These models are somehow interdependent on each other and one model supports other. Among these interrelated models are Rogers' Diffusion of Innovations (DOI) theory, the concerns-based adoption model (CBAM) of Hall and Hord (1987), Zaltman and Duncan's (1977) Strategies for Planned Change, Ely's (1990) conditions for change, and systemic change (Reigeluth& Garfinkle, 1994). The processes and models of change in business setups are similar to the models utilized in education (Bucherer&Uckelmann, 2011; Zott, Amit & Massa, 2011). They believe that the academic theories regarding change and industry practices have many commonalities and interrelated in nature.

Theoretical frameworks of Rogers (1995) theory provide the information on facilitating factors within digital technologies in education. He proposes that technological innovation and its diffusion is the outcome of stakeholders' efforts (change agents and leaders), but execution and acceptance of the technological innovation is dependent on teachers and learners (workers) who eventually are the users or executors of the innovation that is assisted through training and support. Roger's Diffusion of innovation framework explains a complete scenario of digital technology adoption and lays focus on the circumstances, environment, and attributes of innovation and conditions. It's been proposed that Rogers' DOI model as one of the most important model for technology adoption and integration because of its practicability (Zanaboni& Wootton, 2012; Ben &Hakkinen, 2014; Levin & Jacobson, 2017).

Diffusion of Innovations (DOI) theory provides a conceptual framework to this study as this theory assess technology or innovation in three ways: (1) accessibility of digital technology or innovation, (2) skills of adopters in that digital technology, and (3) integration of that digital technology in learning by the executors of technology. Therefore, current research study was conducted by using this model. DOI is based on stakeholder's expectations and perception which could be comprised of three dimensions as follows:

- Accessibility of digital or digital technologies (CBTs)
- Skills in digital or computers based technologies

- Integration of digital digital technologies in learning

DIGITAL LEARNING: PAST RESEARCHES

Globally speaking the digital technologies' adoption and integration in teaching at universities is appreciated, utilized and supported. In a past study conducted by Cator (2010) the digital technologies are praised and believed that the development of an infrastructure focusing on digital technologies for learning will free learning from a rigid information transfer mode (from book to teacher to students) . A study conducted by Phillip, Jameson-Charles and Cain (2015) in Trinidad and Tobago was about teachers' concerns and use of the Laptops in Secondary Schools. The study was about the opinions of teachers about the utilization of Digital technologies in learning and the factors which they encounter while using these digital technologies. The findings of the study concluded that there is unavailability of laptops for learners, deficient and improper infrastructure, weak support systems, no professional development for learners and intellectual challenges.

One of the previous researches conducted on DL was about one-to-one laptop initiative by Brian Maschmann in 2015. This study explored perceptions of learners, teachers and administrators about the implementation of DL in education, perceptions of student engagement, perceptions of student grades, benefits of one-to-one technology, and perceptions of continued success of the one-to-one initiatives. Another study by Catherine Gurley Raulston (2009) was about the initiatives taken by government for implementing digital technologies in teaching and learning. An implication of this study was if teachers are given resources and proper training on how to implement technology in the classroom, attitudes and classroom practices can be changed.

Another past research by Nertha Kate Nyirongo (2009) was about the barriers faced by stakeholders in implementation of DL in teaching and learning in universities of US. Results of the study revealed that while most faculty members actively engaged with digital technologies, such engagements often excluded instructional use. Benjamin Cabrera (2010) explored in his study the use of digital technologies for teaching and learning in Hong Kong. He revealed through his study that the major benefits of these technologies are the changing classroom configurations, using text messages for easier communication and investigating collaboration and social networking technologies for possible integration into the curriculum.

RESEARCH OBJECTIVES

The study was organized to attain the following objectives:

1. Determine the accessibility level and skills (adoption) of respondents to digital learning (DL) resources.
2. Determine the involvement of the respondents (students) in digital learning at Universities.
3. Determine the significant difference in the opinions of respondents (students, teachers and administrators) about their involvement in digital learning at universities.
4. Identify differences of opinions among respondents regarding their involvement in university digital learning with respect to demographic variables such as age, discipline, university type (sector) and gender.

RESEARCH METHODOLOGY

This study is based on PhD thesis of the author. This study assessed digital technology adoption and integration in learning at universities according to Diffusion of Innovation (DOI) model.

The research design used for this study was mixed method designs in educational research, which had two distinct phases (Creswell, 2002; Creswell, Plano, Guttman, & Hanson, 2003).

SAMPLE OF THE STUDY

Multi stage sampling technique was used, at first stage, Punjab was divided into four zones

i.e. Northern Punjab (04 districts), Central Punjab (18 districts), Western Punjab (07 districts) and Southern Punjab (07 districts). The Central Punjab was selected among the other zones of Punjab for its greater percentage of population and the larger numbers of universities as compared to other zones of Punjab Province. In second stage, the purposive sampling technique was used for selection of universities. Sample of the study was taken as eight general type universities located in Central Punjab selected on the following criteria:

- Existence of public and private universities in the same geographic area
- Existence of the both faculties: the Education faculty and Business faculty
- Working as main campuses of universities.

In third stage, the census and proportionate sampling techniques were used for selection of participants. The administrators and the teachers were selected on the basis of census and students on proportionate sampling technique. From the total students of these faculties, 30% of the students were selected for sample. Following table shows the distribution of the number of participants (estimated) in each sampled university.

Sr. No	Name of University	Sector	Estimated Number of Participants (30% of total)			Total
			Students	Teachers	Admin	
•	University of the Punjab, Lahore	PUBLIC	1140	83	15	1238
•	Govt. College University, Faisalabad		690	82	15	787
•	Lahore College for Women University		187	23	5	215
•	University of Education, Lahore		117	50	4	171
•	UMT, Lahore	PRIVATE	210	66	7	283
•	University of Faisalabad, Faisalabad		210	66	7	283
•	Beacon House National University, Lahore		180	11	2	193
•	University of Lahore, Lahore		210	12	2	224
	Grand Total		2944	393	57	3394

Table 1: *Distribution of the Number of Participants in the Sampled University*

INSTRUMENT

After the review of literature, the instrument of data collection comprising of self-report questions on five- point Likert type scale was adapted. The instrument was designed for the Education and Business students of public and private universities of Punjab. The questionnaire further parted in 3 sections: Demographic information (gender, age, qualifications, sector of university and department/ discipline), Digital technologies: accessibility and skills/ extent of use scale (6 close ended items), Digital Learning (DL) scale (25 items). The instrument's reported reliability after the pilot study was 0.814, which was later floated for data collection.

Collection and analysis of data

Quantitative data collectionwas done through taking data fromstudents, teachers and administrators from Public and Private Universities in central Punjab. The survey was self-administered and the author personally visited the sampled universities and collected the data.

Qualitative data were collected from learners, teachers and administrators through interview schedules. The questions were open-ended and worded in a flexible manner to allow for an in-depth discussion. Chi square, paired sample t-test, factor analysis, one sample t-tests, independent sample t-test, one-way ANOVA, Multi Analysis of Variance (MANOVA) and descriptive statistics were used to calculate overall picture of responses. Thematic analysis of the interviews was done.

FINDINGS OF THE STUDY

The Cronbach's *a* coefficient of the instrument was 0.848. In this study, students (87.4%) were in majority followed by university administrators and teachers. Majority of administrators, teachers, and students were from University of the Punjab, Lahore (36.8%). The male respondents were 40.7% and female respondents were 59.3%. Respondents from public sector (64.7%) were in majority whereas respondents from private sector were (35.3%). Discipline split of respondents was as management sciences (60.1%) and social sciences (39.9%). Their age as 20-29 years (84.9%), 30-39 years (8.6%), 40-49 years (3.7%), 50-59 years (2.2%) and above 60 years (0.6%).

Table 2: *Chi-Square against Respondents as the Level of Accessibility to the Digital technologies like Computers/Laptops*

Scales	Students	
	N	%
No-Access	72	2.5
Slight Access	76	3.5
Average Access	200	6.9
Full Access	2163	87.1
Total	2511	100.0

Table 4.12 shows that majority of respondents (88%) identified that they have full access to computers.

Table 4: *Paired–Sample t-test against Respondents as the Degree to Which Students Were Engaged with Digital technologies Before and After Government Laptop Initiative*

Statement	Before		After		*T*	*P*	Effect size (d)
	M	*SD*	*M*	*SD*			
Students engaged with digital technology due to laptop initiative.	2.7134	1.300	3.051	1.340	12.720	.00	0.25

In table 4, a paired-samples t-test was conducted to compare the degree to which students are engaged with digital technologies before and after the free laptop initiative. There was a significant difference in the scores before laptop initiative (*M* =2.71, *SD* =1.30) and after

laptop initiative (*M*=3.05, *SD*=1.34) conditions; *t* (287) =12.73, *p* = .00. Kohn's D formula was used to calculate the effect size 0.25. The real difference between the mean scores is medium. These results suggest that the free laptop initiative has increased the student's engagement to Digital technologies.

Table 5: *Chi-Square against Respondents as Hours per Week Students Use the Digital technologies for Educational Purposes*

Scales	Administrators		Teachers		Students		Total		χ^2	*P*
	n	%	*n*	%	*N*	%	*N*	%		
0-2 hrs. per week	14	31.8	146	45.6	1245	49.6	1405	48.9	17.66	.00
2-4 hrs. per week	23	52.3	83	25.9	523	20.8	629	21.9		
4-6 hrs. per week	7	15.9	43	13.4	355	14.1	405	14.1		
6+ hrs. per week	---	---	48	15.0	388	15.5	436	15.2		
Total	44	100.0	320	100.0	2511	100.0	2875	100.0		

Table 5 shows that majority of respondents (48.9%) has identified that they use 0-2 hours per week the digital technologies for educational purposes. A Chi-square test for independence indicated there is a significant difference among the respondents groups and the hours per week they use digital technologies for educational purposes, χ^2 (3, n=36) = 17.66 p=.00, phi=.22.

Table 6: *Chi-Square against Respondents as their Skills with Digital technologies*

Scales	Students	
	n	*%*
I have never used a computer much except for email but I intend to learn.	216	8.6
I have created a PowerPoint.	48	1.9
I have created an iMovie.	4	0.2
I have created a Podcast.	27	1.1
I use applications like word processing, spreadsheets, etc.	127	5.1
I use computers for learning in the classroom.	81	3.2
All Above (statements 2-6)	2008	80.0
Total	2511	100.0

Table 4.13 shows that majority of respondents (80.0%) have identified that they have much experience with computer as they have created an iMovie; a Podcast; used word processing, PowerPoint, spreadsheets, etc.; and also used computers for learningin classroom.

Table 7

(Factors)	Statements	Mean	SD	df	t-value
Inside-class digital learning activities	Use in lectures	3.33	1.25	2874	142.95*
	Use in Discussions	3.18	1.10	2874	154.92*
	Use in Memorization Exercises	3.087	1.159	2874	142.819*
	Use in Drills and Practice Assignments	3.326	1.136	2874	157.061*
	Use in Class Research / Finding Information	3.527	1.151	2874	164.381*
	Use in Class Readings	3.241	1.156	2874	150.310*
	Use in Class Writing / Note Taking	3.171	1.200	2874	141.737*
Outside-class digital learning activities	*Use in Homework Completion*	3.441	1.175	2874	156.996*
	Use in Projects Involving Problem Solving	3.590	1.143	2874	168.413*
	Use in Projects Involving Analysis of Data	3.557	1.151	2874	165.721*
	Use in Creating an Original Product (Making and Sharing Movies and Photos)	3.382	1.264	2874	143.427*

Mean Scores and One-Sample t-values Against Integration of Digital technologies in Learning Activities at Universities.

Table 7 shows that the respondents have shown agreement about the Inside-class digital learning activities as in most cases the mean score is above the cut point 3.0. In Outside-class digital learning activitiesthe respondents again showed agreement as the mean scores are above the cut point 3.0

Table 8: *Mean Scores and One-Sample t-values Against Respondents groups for Sub-Scales*

Factors (Digital Learning)	Alpha	Mean	*SD*	*Df*	*t*-values
In-Class Digital Learning Activities	0.81	3.27	0.79	2874	219.35*
Outside-Class Digital Learning Activities	0.76	3.49	0.90	2874	207.85*
Overall Learning Activities	0.85	3.35	0.74	2874	241.21*

The factor analysis as explained in previous section resulted in 2 factors of learning activities namely: In class digital learning activities and outside class digital learning activities. The ranking using the mean scores and standard deviation are given in table. In learning activities, the outside class digital learning activities, is the most prominent activity with highest scores (*M*=3.49, *SD*= 0.90) stating that the three groups of respondents as administrators, teachers and students agree most with outside class digital learning activities. The use of laptop during digital learning activities outside the class is highest and most prominent. It is followed by

inside class computer based learning activities (*M* = 3.27, *SD*= 0.79).

Table 9: *One-Way MANOVA and Post Hoc Tests Tukey HSD for Multiple Comparisons of Digital Learning for Sub-Scales with respect to Respondents groups*

CBTs in Teaching Activities	Administrators 01 (N=44)		Teachers 02 (N=320)		Students 03 (N=2511)		Mean Diff. 01 v/s 02	Mean Diff. 01 v/s 03	Mean Diff. 02 v/s 03	F-values	Effect size (d)
	Mean	*SD*	Mean	*SD*	Mean	*SD*					
In-Class Digital Learning	3.39	0.69	3.21	0.86	3.27	0.79	0.18	0.12	-0.06	1.34	.00
Outside-Class Digital Learning	3.56	0.82	3.44	0.94	3.49	0.89	0.13	0.06	-0.06	0.79	.00
Overall DL	3.46	0.70	3.29	0.81	3.35	0.74	0.16	0.10	-0.06	1.37	.00

**p<0.05*

Multivariate analysis of variance (MANOVA) was applied along with post-hoc tests in order to compare the Digital Learning (DL) across the respondent's groups. The three groups of respondents of the study as shown in Table 4.73 were administrators as 01, teachers as 02 and students as 03. There were no significant differences of opinion among the respondents groups regarding digital technologies' adoption and integration in overall digital learning activities at .05 levels in mean and standard deviation values, with F value of 1.373. Table 4.13 also shows the pair wise significant differences among different groups. There were no significant differences between; 01 Vs 02, 01 Vs 03 and 02 Vs 03.

CBTs in Learning Activities	Sector	*N*	Mean	*SD*	*MD*	*t*-values	*P*	Effect size (d)
In-Class Digital Learning	Public	1859	3.25	0.79	-0.04	-1.37	0.17	.05
	Private	1016	3.29	0.80				
Outside-Class Digital Learning	Public	1859	3.48	0.89	-0.04	-1.12	0.26	.04
	Private	1016	3.52	0.91				
Overall Digital Learning	Public	1859	3.33	0.74	-0.04	-1.43	0.15	.05
	Private	1016	3.38	0.75				

Table 10 *Independent Samples t-test against Digital Learning for Sub-Scales with respect to Sector*

**p<0.05*

T-test was done to find the difference of opinion among the respondents on basis of public and private sector (Table 10). There were no significant differences of opinion among the respondents regarding use of CBTs in learning activities.

Table 11: *Independent Samples t-test against Digital Learning in Sub-Scales by Gender*

CBTs in Teaching Activities	Gender	*N*	Mean	*SD*	*MD*	*t*-values	*P*	Effect size (d)
In-Class Digital Learning	Male	1171	3.29	0.80	0.04	1.40	.16	.05
	Female	1704	3.25	0.79				
Outside-Class Digital Learning	Male	1171	3.49	0.92	0.06	0.17	.86	.00
	Female	1704	3.49	0.89				
Overall digital Learning	Male	1171	3.37	0.75	0.03	1.03	.30	.03
	Female	1704	3.34	0.74				

**p<0.05*

T-test was done to find the difference of opinion among the respondents on basis of their gender (Table 11). There was no statistically significant difference in respondents' opinion on the basis of gender about the DL.

Table 12: *Independent Samples t-test for Digital Learning for Sub-Scales with respect to Discipline*

CBTs in Learning Activities	Discipline	*N*	Mean	*SD*	*MD*	*t*-values	*P*	Effect size (d)
In-Class Digital learning	Mge. Sci.	1727	3.27	0.79	0.01	0.33	.74	.01
	Education	1148	3.26	0.80				
Outside-Class Digital Learning	Mge. Sci.	1727	3.48	0.92	-0.03	-0.86	.39	.03
	Education	1148	3.51	0.87				
Overall Learning Activities	Mge. Sci.	1727	3.35	0.75	-0.04	-0.16	.88	.00
	Education	1148	3.35	0.74				

**p<0.05*

Another t-test was done to find the difference of opinion among the respondents on basis of disciplines (Table 12). There was no statistically significant difference in respondents' opinion on the basis of disciplines.

Table 13: *One-Way MANOVA for Digital Learning for Sub-Scales with respect to Respondents' Age*

CBTs in DL	20-29 Year 01 (N= 2442)		30-39 Year 02 (N= 246)		40-49 Year 03 (N= 105)		50-59 Year 04 (N=63)		60 Y/Above 05 (N=19)		F-value	Effect size (d)
	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*	Mean	*SD*		
In-Class DL	3.27	0.79	3.31	0.79	3.20	0.86	3.09	0.71	2.94	0.93	2.0	.00
Outside-Class DL	3.51	0.89	3.52	0.90	3.44	0.93	3.20	0.79	2.59	0.90	6.7*	.01
Overall DL	3.36	0.74	3.39	0.75	3.9	0.83	3.13	0.68	2.81	0.86	4.2*	.01

**p<0.05*

Table 14: *One-Way MANOVA Tukey HSD for Multiple Comparisons of Digital Learning in Sub-Scales by Respondents' Age*

Factor	Digital Learning Activities	(I) Age	Mean Difference (I-J) (J) Age			
			30-39 Year (02)	40-49 Year (03)	50-59 Year (04)	60 Y/Above (05)
Digital Learning	In-Class Digital Learning Activities	20-29 Year (01)	-0.04	0.074	0.188	0.335
		30-39 Year (02)		0.110	0.224	0.370
		40-49 Year (03)			0.114	0.260
		50-59 Year (04)				0.146
	Outside-Class Digital Learning Activities	20-29 Year (01)	-0.02	0.06	0.30*	0.91*
		30-39 Year (02)		0.08	0.32*	0.93*
		40-49 Year (03)			0.24	0.85
		50-59 Year (04)				0.61
	Overall Digital Learning	20-29 Year (01)	-0.03	0.07	0.23*	0.54*
		30-39 Year (02)		0.09	0.26*	0.57*
		40-49 Year (03)			0.16	0.47
		50-59 Year (04)				0.31

**p<0.05*

Multivariate analysis of variance (MANOVA) was applied along with post-hoc tests in order to compare the digital learning across the respondent's age groups. The five age groups of respondents shown in table are 20-29 years as 01, 30-39 years as 02, 40-49 years as 03, 50-59 years as 04 and 60-above years as 05.

Within the digital learning activities, the table shows that the respondents with age groups 20-29 years and 30-39 years significantly show higher degree of agreement than the age groups of 50-59 years and 60 years above regarding outside class digital learning activities. The real difference in the mean scores between the respondents according to their ages was small. Eta square was used to calculate the effect size which was 0.01.Similarly the respondents with age group of 20-29 years and 30-39 years significantly show higher degree of agreement than the age groups of 50-59 years and 60 years above regarding overall DL activities. The real difference in the mean scores between the respondents according to their ages was small. Eta square was used to calculate the effect size which was 0.01.

DISCUSSION

This study was designed to answer three basic objectives. The first research objective was to, "Determine the accessibility level and the skills (adoption) of respondents to digital learning (DL) resources" according to results, the majority of respondents have either a laptop or a computer but they have an average access to internet and WWW. The reasons for having full access to laptops or personal PCs by a greater number of university students might be the affordable prices of PCs in the country or the Prime Minister initiative of providing free Laptops scheme in the Public Sector Universities in Pakistan but, a large population did not have proper access to internet and World Wide Web, should be a matter of concern for the authorities (Ahmad & Rafiq 2016). The data provided by students, administrators and teachers in interviews also support these findings. During interviews they mentioned that almost every student has laptop

but the real problem is with internet and WWW. The reason for average access to internet and WWW may be the limited access of resources like internet, electricity crises and computer labs **(**Khurshid, Shah & Norman, 2016).

The majority of respondents have identified that they use the digital technologies 0-2 hours per week for educational purposes. Minority of respondents have identified that they use digital technologies 6 plus hours per week for educational purposes. Such low use of DL for educational purposes may be due to average access to these technologies. The data of respondents' interviews blamed the poor maintenance of these digital technologies and the limited access of internet. The students probed that we have the digital technology with limited access but the effects of these technologies are always positive on our learning (Binbin Zheng, Mark Warschauer, Chin-Hsi Lin, & Chi Chang, 2016). Certain initiatives have been taken by the government to improve the access of digital technologies (www.hec.gov.pk/laptops, 2018) in learning at universities which include the laptop initiative as well. According to findings of this study the majority of respondents have identified that they were slightly engaged with digital technologies before laptop initiative and the majority of respondents have identified that they are very much engaged with digital technologies after the laptop initiative. This means that the use of digital technologies has increased after the laptop initiative by the government (Ahmad & Rafiq 2016). The data provided by interviews also support our findings as the students believed that laptop initiative has increased the student's engagement to digital technologies (Ballew, 2017). In the opinions of students, government should take more initiatives to improve the access to digital technologies like internet for everyone, computer labs and maintenance of these technologies (Iftakhar, 2016).

As one of the objective of this study was to analyze the skills of respondents in digital learning so the results of this study showed that the majority of students are highly skillful and have much expertise in digital technologies. They have created an iMovie, a Podcast, used applications like word processing, PowerPoint, spreadsheets, etc. and also used computers for learning in the classroom. The findings explored that the students are competent enough in digital technological skills. The reason could be the educational background of these students. Moreover the students are motivated to struggle for learning these skills in order to improve their learning and meet the challenges of the 21st century. There are studies symmetrical with the findings of our study revealing that the university students are competent enough in the use of CBTs (Iftakhar, 2016; Muslem& Abbas, 2017). The interviews data provided by the respondents of our study also support the quantitative findings of this study. The respondents further said in interviews that now the need is that universities must guide and train them in market demanded skills needed in digital learning. Ghavifekr and Rosdy (2015) also addressed the teachers' needs to learn good digital learning skills for improving and ensuring effective learning as well as to meet the demand of the 21st century teaching skills. The respondents of our study revealed that the students possess the skills needed to operate these digital technologies, at their own. University administration is not providing any of the opportunities of trainings, professional development, technical support and capacity building to get market demanded skills in digital technologies for effective university learning. Another research study aligned to our research's findings has also emphasized that DL skills are changing every day which is resulting in job's transitions that's why the university administration must train the stakeholders in changing market demanded skills required by the employer (Jahnke, Bergström, Mårell-Olsson, Häll, & Swapna, 2017).

The second research objective of the study was to, "Determine the involvement of the respondents (students) in digital learning at

Universities" The results of this study show that the students of university are utilizing digital technologies like laptops, internet, www, websites, screens and others in learning in two ways i.e. inside class digital learning activities and outside class digital learning activities. In digital learning the use of digital technologies in outside the class digital learning is most prominent activity, followed by use of these technologies in inside the class digital learning activities. Similar findings are reported by different research studies (Jahnke et al., 2017; Håkansson& Lindqvist, 2015). The reason of using the CBTs in outside the class learning activities could be the teachers or the university administration does not allow the use of digital technologies in the classrooms considering them as the distractors (Salomon & Ben-David, 2016). Another reason for low use of digital technologies in classroom is revealed by Song, (2014) in his study. He revealed limited internet access restricts students from much use of CBTs in inside class learning activities. In the ongoing digitalization of schools, students can use their own digital devices (BYOD) in learning activities during their time at school which will enhance use of CBTs in inside class learning. The data provided by our respondents through interviews also support the quantitative results of our study as students said that we do not use digital technologies inside the class for learning. They said that they like face to face teaching more. The positive thing revealed in the findings of this study was the use of DL in both type of learning that can ensure the improved learning.

The inside class Digital Learning activities included in this study are; use of digital resources in lectures, discussion, memorization exercise, drills and practice assignments, in-class research or information finding, in-class reading and in-class writing. The findings revealed that among inside class DL, the most practiced inside class learning activity is, in-class research or finding information. This might be because the students don't have any other source through which they can collect information instantly inside the class. The teachers also feel convenient to ask students to look for information than to find information for them. The situation in rest of inside class learning activities is average and not frequently practiced by students. Pettersson, (2017) in his study also exposed that the use of digital technologies in inside class learning is very low and this might be because no pedagogies have been designed for these type of learning which will improve inside class digital learning.

The outside class digital learning activities included in this study are; homework completion, project involving problem solving, projects involving analysis of data and ability to create an original product. The findings of this study revealed that among outside class DL activities; the most practiced outside the class DL activity is using digital technolog in projects involving problem solving. The reason could be the projects assigned to students by teachers frequently, such search engines which provides the information on projects are easily available on internet. Through interviews from our study's respondents it was concluded that the students use digital technologies frequently outside the class to conduct projects involving problem solving.

The last research objective of this study was, "Identify differences of opinions among respondents regarding their involvement in university digital learning with respect to demographic variables such as respondents' groups, age, discipline, university type (sector) and gender". The findings of this study show that the administrators, teachers and students agree that digital technologies are integrated in learning but the situation is not as good as it should have been. The research findings of Håkansson, (2015) and Jahnke et al., (2017) are also aligned with the findings of our study that teachers and students do use digital technologies in learning but its use is not up to the required level. The reason may be that change is always resisted, so the integration of these technologies is resisted as well. Similarly Bhatti and Amjad, (2013) repoted that students basically use digital technologies for three main

purposes: education, research work and entertainment. During the interviews of our study, the administrators, teachers and students claimed that they are adopting digital technologies in learning but they use these technologies more for socialization purposes. Similar findings are reported in other research studies which are aligned with our study's findings and it is reported in those studies that maximum number of students did not use inter net for education purposes but, for using Social Networking, and entertainment (Chhacher, Khuskh, &Chacher, 2013; Kassangoye, Jager, &Rugimbana, 2013).The results of this study showed that there were no significant differences of opinions among the respondents on basis of public and private sector for overall digital learning activities. This means that public and private sector has no difference of opinion regarding the digital learning. The reason of this same opinion can be the leveled playing field for both sector universities. In private universities due to the ongoing digitalization of universities, students can use their own digital devices (BYOD) (Song, 2014) whereas in public universities the governments' technology boosted initiatives like laptop initiative, internet (wingle) by Punjab Government, technological resources by Higher Education Commission (HEC) have increased the DL during their time in universities (Ahmad & Rafiq, 2016). The results of this study indicated no statistically significant difference in respondents' opinion on the basis of gender about the digital technologies' integration in learning at universities. Some research studies are also aligned with the findings of our study that the respondents on basis of gender have no difference in use of digital technologies and the reason giving equal opportunities to students in universities avoiding any gender discrimination (Elsaadani, 2012; Muslem, Yusuf & Juliana, 2017). The findings of our study are in contrast with some of the studies as Hafkin and Huyer (2007) and Goyal (2011) argue that most women will not benefit from the digital technology to the extent that men do, but that this is hard to quantify due to lack of data. They suggested that new technologies should be integrated with no gender bias and inequality must be removed. The findings of our study indicated no statistically significant difference in respondents' opinion on the basis of disciplines about the digital technologies in learning. The reason could be the emphasized importance of digital technology in academics and curriculum across the board. Muslem, Yusuf and Juliana, (2017) also presented symmetrical findings to our study claiming that universities' every discipline has realized that technology is for all and it should be embedded in curriculum of every discipline, as no profession can survive in future without digital technology.

The results show that there was a statistically significant difference in respondents' opinion on the basis of age groups regarding technology adoption and integration in learning. This means that the respondents with different age groups have different opinion regarding digital technologies adoption and integration in learning at their universities. The reason of this disparity is that the people with different ages respond differently to certain phenomenon. The results of our study showed that within the learning activities the respondents. Within the digital learning activities, the respondents with age groups 20-29 years and 30-39 years significantly show higher degree of agreement than the age groups of 50-59 years and 60 years above regarding the use of digital technologies in outside the class DL activities. This means that young respondents or youth participates more in the digital learning. Khan, Bhatti and Khan, (2011) also explored same findings in their study that people with different ages utilize the digital technologies differently. They claimed that this disparity could be the youth's motivation to do challenging tasks and adopting change whereas the old or senior people don't adopt changes.

CONCLUSIONS

The findings of this study make a conclusion that the digital learning at public and private

universities in Punjab has not achieved a satisfactory status yet. The findings revealed that the general accessibility and adoption of digital technologies is much higher than the integration of these technologies in digital learning. Students of universities in Punjab are having an easy access to these digital technologies. Along with the easy access the respondents specifically the learners possess enough skills and expertise for operating these digital technologies. Despite of easy access and sufficient skills, the integration of these digital technologies in learning at universities has yet not achieved the status which it should have been achieved. Students are skillful, competent and have expertise in using these digital technologies. Even then the use of these digital technologies is low in university learning; hence the conventional learning is continued. Significant difference of opinions was found regarding digital learning among respondents according to ages and respondent's groups. No significant difference was found among the respondents regarding digital learning with respect to sector, gender and discipline.

RECOMMENDATIONS

Following recommendations are made on basis of this study's findings

- The continuation of the current Prime Minister free Laptops Scheme for students in the Public Sector Universities and along with government the universities and HEC should also facilitate students by providing pay back student loans with easy installments so that deprived students can also fill the gap.
- HEC, the universities' authorities and government may take measures to overcome the slow speed of the internet, the frequent power breakages and providing students with easy access to internet facilities at department's computer labs, libraries, hostels, and homes.
- Students have much expertise and skills in general digital technologies like iMovie; a Podcast; applications of word processing, PowerPoint, spreadsheets, etc.; thus it is recommended that the universities' authorities, HEC and ministry of education may arrange professional digital technologies'trainings for students. The students may also be offered subsidizedtraining programs and low cost or free digital resources. The authorities might release funds to these universities for organizing training sessions and collaboration with international projects like Microsoft, Google etc. to assist DL process.
- The concerned authorities of universities and government may design market demanded skills in such digital technologies required for university learning so that the learners may benefit and affect the digital learning positively.
- The integration of digital technologies in learning at universities might be a must and not an option. The digital learning may be made a part of curriculum and learning pedagogies. Instead of considering these activities as a barrier and resistance in learning the learners might conduct discussions to promote digital learning.
- The results of this study showed that the students use the digital technologies mostly in outside the class digital learning activities and less in inside the class digital learning activities. This is why it is recommended that in the ongoing digitalization of education, students might be allowed to bring their own digital devices (BYOD) in learning activities during their time at university which will enhance the use of digital technologies' use in inside the class DL activities.
- Inside the class digital learning may be promoted among the students like: free books, technical reports, electronic thesis and dissertations, indexes and abstracts, presentations available on slide share, online cloud storage (sky drive, Google drive and one drive). Usually students are ignorant of these resources to be used in digital learning activities so the teachers might introduce these CBTs resources to students through proper promotional strategies.
- The results showed that within the digital learning young teachers utilize digital

technologies more than the senior/old teachers. Thus it is recommended that senior faculty of universities may be motivated to utilize digital technologies in learning as their use in learning effects the use of these technologies in students. Training courses, IT staff support and team work between young and senior faculty will motivate the senior teachers to use CBTs in teaching and learning.

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