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Students of Higher Education Institutions (HEIs) and Information and Communication Technologies (ICTs): Viability of Digital Media Literacy in Pakistan

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ARTICLE DETAILS	ABSTRACT
<p>History:</p> <p>Received: February 17, 2022 Accepted: May 18, 2022</p> <p>Keywords:</p> <p>Information Communication Technologies (ICTs), Higher Education Institutions (HEIs), Actor Network Theory (ANT), Students, Pakistan</p>	<p>Information and Communication Technologies (ICTs) have changed the dynamics of higher education institutions (HEIs) worldwide. The dependency of students on ICTs increased significantly and it considered requisite for modern higher education. Adverse impacts of ICTs studied by scholars on students of higher education that reflect ICTs are influencing social interaction pattern, cognition, academics and bring addiction. However, little work is done in HEIs to create curricula of digital media literacy which may reflect the demography of students and direct training and utility of ICTs that may mitigate adverse effect. This article argues that how students of HEIs use ICTs and what are the plausible actors that can contribute in the digital media literacy in Pakistan. For this purpose, a structured questionnaire is designed to collect the data from 640 respondents of two major public sector universities of Pakistan i.e. University of Sargodha and Bahauddin Zakariya University Multan through online survey on google form by distributing it to various online WhatsApp groups by convenience sampling technique. Actor Network Theory (ANT) is the conceptual framework of this study. The findings of the study reveal that significant respondents spent their large amount of time on ICTs for pleasure instead of necessity drive. However, findings reflect that ICTs are using by youth for various purposes that are education, political and religious information, and entertainment. Moreover, the significant respondents use ICTs for connect themselves with Internet, gaming consoles, movies, audio/video players and sharing of documents. The gender is also significant factor that contributes in the utility of ICTs. This article argues on digital media</p>
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1. Introduction

Digital mobile devices (ICTs) are a significant phenomenon that is part of debate of modern scholars because of their varied impacts on individuals, society and Institutions. Information and communication technologies (ICTs) are assumed the substantial factor that can contribute in science and technology and also can gear the economy with fast pace. In the economic competition environment, significant industrial countries are paying their much attention on technology development and particular focus is on the technologies related to communication and connectivity. While other countries are giving emphasis on the utility of ICTs for varied sector i.e. communication, education and e-governance. Similarly in Pakistan, the penetration of ICTs mainly observed from the past decade. The past government in Punjab, brought ICTs to higher education institutions (HEIs) where they distributed significant amount of laptops to students and teachers of all across Punjab. The prime objective of the agenda of the government was to create a market through penetration of ICTs in higher education that can take the share of e-market at global sphere.

Digital mobile devices (ICTs) are also based on set of gadgets (mobile devices, laptops, desktops, kindles and tabs) that connect to internet through wireless (wi-fi), cellphones and various other mediums. However, connectivity with all said gadgets required vital software, storage capacity of the device and audio-visual players to allow its consumers to communicate, entertain, transfer file and mange various type of data. ICTs spurs contemporary world to get acquaintance to it so that it can contribute as an important factor in the education and learning (UNESCO, 2002).

The significant role of ICTs are to present complicated phenomenon in simple manner through simulations and other pedagogies and it enhance the higher order thinking of pupils in class room and later (Ishaq et al., 2020). ICTs are adopted by the students and teachers to change the context of formal learning. There is none of practice that before implementing ICTs to the institutions of higher education in Pakistan, there shall be a curricula that can direct the students' productive utility of ICTs and in terms of behavioral and cognitive adverse effects. However, significant work is need to be done to revise the National Education Policy 1998-2010 which give emphasis of productive utility of ICTs rather focusing on digital media literacy in Pakistan. Shaheen&Khatoon, (2017) argue that NEP 1998-2010 indulge a better policy where learners and instructors could indulge multiple sills on varied social-economic background. However, emphasis may carried on learning and education activities. Studies (Wilding, 2006; Selwyn, 2007; Del Carmen, 2021) indicate that there are several questions on utility of the ICTs on varied contexts.

To study how youth are consuming ICTs, their high level of penetration and the significant focus realizing that information and communication technologies with their services and manifestation have been turned into basic youth culture. Moreover, the usage patterns reflect multiple variables i.e. education, entertainment, political, religious information and other factors internet, game console, movies and audio video players and document sharing.

This study is structured to inquire about the use of ICTs by the students of two public sector universities in Pakistan i.e. University of Sargodha and BahauddinZakariya University Multan. The findings recommend digital media literacy for youth in Pakistan.

2. Literature Review

2.1. ICTs among Passive Consumers to Active Producers

Youth has become an active producer of mass media content through the means of smartphones. Now, technology convergence has drastically changed the landscape of conventional media. This is only possible because high speed ICTs are cheaper and easily accessible to every individual. Moreover, the invention of 4G and 5G technologies contribute significantly in that they can offer real time video streaming, fast downloading and unchecked access to global virtual space. Earlier, conventional media required specialized skills for operations, video making and dissemination of mass media content. However, the scenario is changing; smartphones, tabs, laptops and desktop and information communication devices provide a range of options that provide extensive opportunities for use that can produce all types of content through these devices (Roberts & Foehr, 2008). The information in terms of audio, video and data sharing and dissemination to multiple platforms through emails and social media tools is quite common. The youth that was earlier hard enough to get a chance on conventional media got another type of media (social media) which is the source of dissemination of specialized skills like singing, dancing, acting, filming and another academic and professional talent. Shah et al. (2005) argue that the power of ICTs empowered people through the weapon of new media technologies; demand information access, receive a prompt feed of news, learn about any issues of Interest, and personalized content with a great deal of flexibility of time and space are significant aspects that considered with ICTs. ICTs are the significant source of discourse that laud civic participation, issues concerning to public information, political participation and for more important manifest their own view and gather public support for the issues of public significance (Certomà and Corsini, 2021). Information Communication technologies (ICTs) have changes the dynamics of society, with the advent of new media, earlier the average people who seldom engage themselves in the content production, now disseminating their opinion and give prompt feedback via posing messages, sharing photo stories and launch discussion forums (Misuraca and Pasi, 2021; p.55).

2.2. ICTs from Social Change to Cultural Change

Volti (2004) argues that Ogburn in his extensively acknowledged book 'Social change in respect to culture and original nature' published in 1922 asserts that culture is segmented into two significant constructs; material and non-material culture. Material culture consists on the civilization that is comprising on apparatus of everyday life, gears, lodgings, communication infrastructure and transport, concisely complete set of everyday accessories. Whereas, non-material is culture that resides in the minds of people and reflects through actions (values, norms, traditions, institutions, education, religion, family and morality etc.). However, a 'cultural lag' refers the disproportion of speed between the material and non-material components of culture. Ogburn asserts that rapid changes took place in material culture. However, the non-material culture slowly evolves and material culture trigger the force of change in non-material culture. ICTs is driving force that is bringing succeeding contribution, which is, the efficient means of technology explored, the earlier is replaced. However, adhering of new technology with the beliefs and value system of people is requisite. Servaes, & Malikhao (2020) assert that when social change is referring into action; the Interests of all stakeholders of particular culture, need of the society and the capacity of the society to drive certain change in the particular direction are the key factors for sustainable change. However, this is the social process that driven by ICTs but the intervening factors such as Interpersonal communication (that could mediate through telecommunication, social media, or online apparatus) and traditional forms of communication. Rittaa H.(2021) conducted a study of the effects of ICTs on family solidarity in Finland and he explored that the latest information and

communication technologies have played a very crucial role in bringing together the distant family members. And it was revealed that ICTs especially mobile social media majorly play a positive role in family solidarity. Distant family members' interaction is increased and they may remain in contact and may socialize with each other up to much extent.

2.3. Ordinary Learning to Logical Reasoning

Chai et al, (2021) asserts that Neuroscientists conducted experimental study on the experience of youth with Internet; findings reveal that the individuals who performed with Google searches have extended dorsolateral prefrontal cortex of brain in comparison with reading text book. This part of the brain is responsible for fine talents, textual analogies and certain deliberations. However, working with technology stimulates neural tissues that increase the capabilities for smart decisions. Similarly, Rosen (2012) has been examining the ICTs functioning with brain, finds that youth possessing creative and positive changes when experiencing with ICTs. Significantly surge in IQ, sharp memory and influencing the understanding of information in digital, text or any other form are the key contributing factors that result the use of ICTs among youth. Schmidt & Vandewater (2008) argue that technology imparts cognitive skills among youth, when the children and youth use their spatial abilities in gaming using gaming consoles that significantly influence their visual tracking, mental abilities that contribute in the problem solving skills. Hisam et al. (2018) find in a comparative study on two schools of Rawalpindi, Pakistan on 171 children for analyzing how video games influence cognitive abilities of children, finding of the study reveal that issue resolving speed observed higher than of those non gamers, however, deductive reasoning and mathematical intelligence also significantly increased in the children who play two or more hours games. There was no correlation found with knowledge and gaming.

3. Methodology

This study ICTs and students of HEIs, viability of digital media literacy in Pakistan is studied from the ICTs' consumption patterns on students of two higher education institutions of Pakistan. This study explored on two compound variables level of reliance on ICTs and the purpose of utility by the students of University of Sargodha and Bahauddin Zakariya University Multan. Data is collected through online survey on google forms by distributing it to various online WhatsApps groups by the convenience sampling technique. Total respondents are 640 and reliability of the instrument is alpha 0.79. Actor network theory is the conceptual model of this study.

4. Findings and Discussion

The results of the study reflect that respondents age up to 18 years (Mean = 7.7%) use ICTs (smartphones, laptops, computers and other devices), age 19-23 years use ICTs (M = 38.5%), age 24 to 29 years use ICTs (M = 29.6%) and age above 30 years the use of information and communication technologies is (M = 15.2%). However, the tendency of use of ICTs among the age group 19- 29 years is significant than the other groups (See Fig. 1). The use of smart phone in the age between 19 to 23 years is (55.7%), use of laptop is (46%), use of computers (29.1 %), and other devices are (22.2%). Whereas, among the age group of 24 to 29 this can be observed as; the use of smart phones (20.4%), use of laptops (27%), use of computers (40.5%) and the use of other devices is (30.5%). Mylläri et al. (2011) asserts that age group plays an important role in their pedagogical thinking of the ICTs. The rational use of ICTs rest upon the individual's ability of proper use of ICTs. Halewood & Kenny (2008) noted that young people age between 19-24 years are (17.2%) of the global population and their connectivity provide them global outreach.

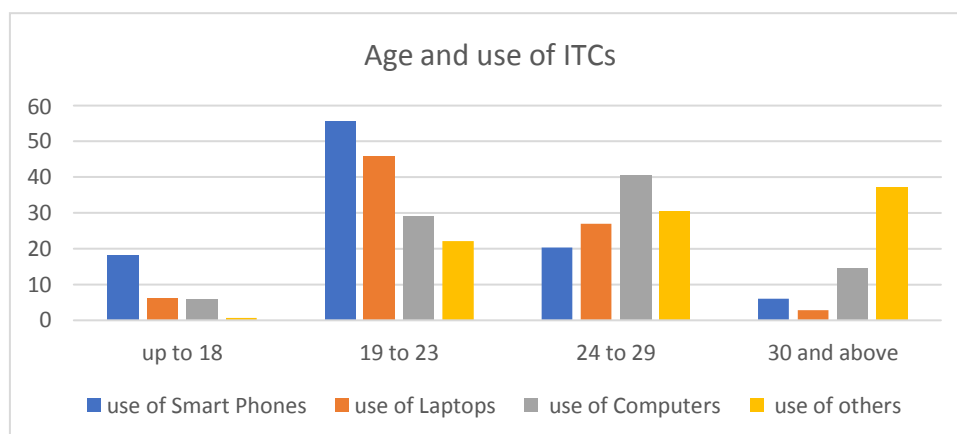


Figure 1: Use of ICTs and Age Group

Figure 2 reflects the gender wise use of ICTs among university students. It is observed the frequent use of smart phones among male (75%) is greater than the females (72.60%), similarly, the frequent use of laptop among females (28.60%) is higher than the male (21.30%). However, the frequent use of computers among (25.50%) among females is slightly higher than the male (24.60%), whereas, the frequent use of other devices among female (20.80%) is also greater than the male (18.90%). However, there is likeness in usage of male and female students on somewhat they use smart phone (male, 18.90% and female, 21.80), laptops (male, 45% and female, 45.80%), computer (male, 69.30 and female, 69.30%), and other devices (male, 35% and female, 33.70%). However, laptops and other devices significantly rarely use by the male and female students (see Fig. 2).

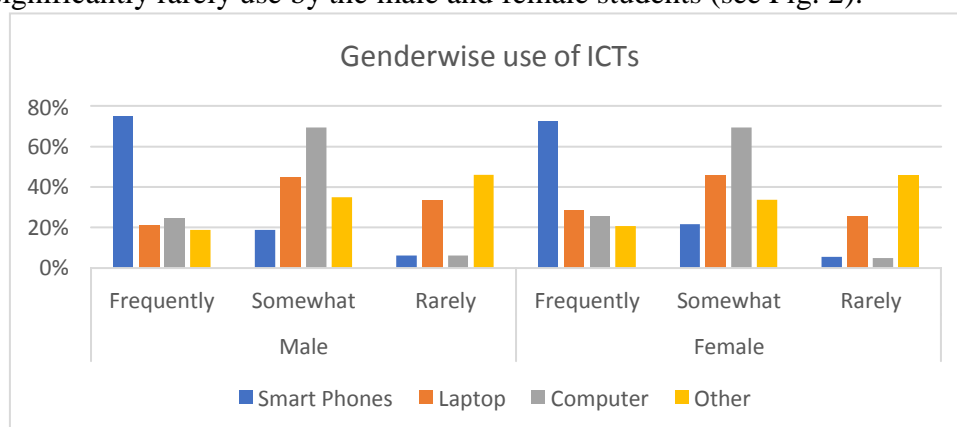


Figure 2: Gender wise use of ICTs

Verma&Dahiya (2016) noted on the gender wise analysis on the use of ICTs on nine Indian universities' students and find no significant difference on the use of ICTs pattern. However, Mahmood & Bokhari (2012) finds difference in the use of ICTs when making gender wise analysis and find that inequality in the use of ICTs can be bridged through computer assisted instructions at class rooms of the universities. Fig. 3 shows that the use of smart phone among students of Bachelors is (43.4%), among Masters (40.5%) and M. Phil and Ph.D students is (16.1%). Similarly, the use of laptops among students Bachelors is (47.3%), Masters (36%), M.Phil and Ph.D (16.6%). However, the result wavering on use of computers among where students of Bachelors use computers (13%), Masters (22%) and M.Phil and Ph.D (65%). Similarly, the use of other devices (Tablets, Kindles etc.) by the students of Bachelors are (12.8%), Masters (31.2%) and M.Phil/Ph.D students (56%).

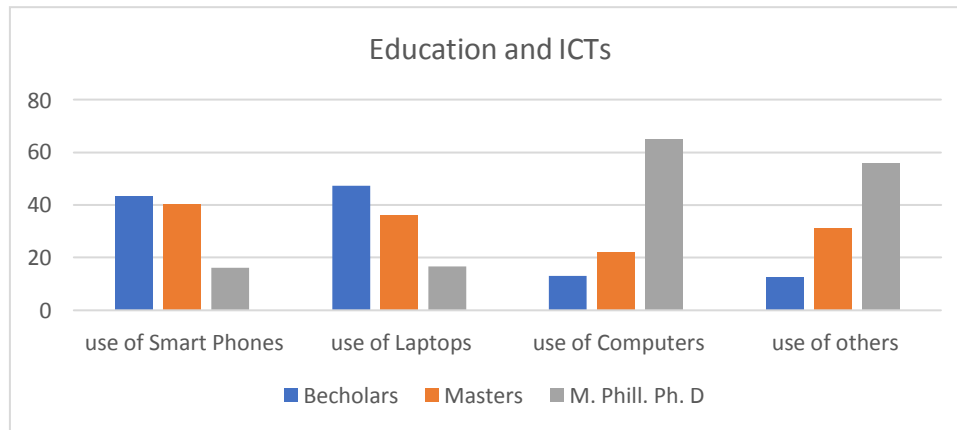


Figure 3 Education and using ICTs

Balasubramanian et al. (2009) reported in UNESCO that ICTs have strong correlation with the level of education. Although, it has varied implication but level of education create acquaintance with technology. Tummons et al. (2016) examined the use of medical students' ICTs on two campuses, remote and main campus of the Canadian university and find that there is gap between the level of education and location. They assert that this also observed that in industrialized countries, there is difference in the policy and practice of the use of ICTs on different level of education.

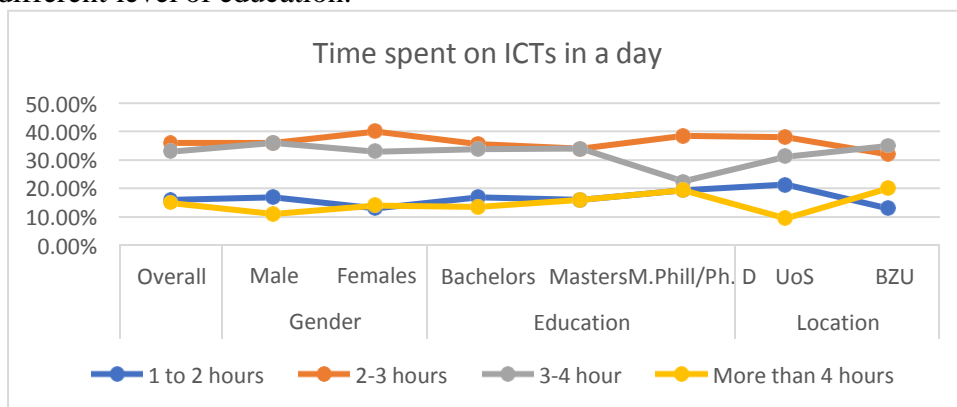


Figure 4: Time spending on ICTs

Results in Figure 4 reflect that how much time they spent on ICTs on the basis of different level of education, their gender and Institution. Overall, the 1- 2 hour use of ICTs among gender, level of education and location of the Institution is (16%), 2-3 hours (36%), 3-4 hours (33%) and more than 4 hours is (15%). But this percentage of use is varying, 1-2 hours use of Male students is (17%) and in females (13%). However, it is among Bachelors students (17%), Masters (16%), M.Phil and Ph.Ds' (19.5%). On the location of the Institution, the students of Sargodha University spent 1-2 hours a day is (21.40%) and among BZU (13%). However, 2-3 hour use of ICTs among male students is (36%) which is higher among females (40%) and in Bachelors (35.70%), Masters (34%), M.Phil and Ph.D (38.50%), among students of University of Sargodha is (38%) and among students of Bahauddin Zakariya University Multan is (32%). Similarly, 3-4 hours use of ICTs among male students is (36%), females (33%), Bachelors (33.90%), Masters (34%) and M.Phil and Ph.Ds (22.50%). However, it reflects (31.10%) among students of Sargodha University and among the students of BZU (35%). However, the consumption of ICTs more than 4 hours a day observed among male students (11%), female (14%), Bachelors (13.50%), Masters (16%) and among M.Phil and Ph.D students (19.50%). This use is dissimilar among students of UoS (9.50%) and BZU (20%). Nachmias et al., (2001) asserts that gender and learning process is taking place inside and outside of school that contributes in the digital media literacy. Luu and Freeman (2011) observed in Canadian and Australian universities that there is correlation

between ICTs and scientific learning, the students with prior knowledge of the use of ICTs earned higher grades. However, demographics where gender, the use of computers or ICTs give the reflection in the pattern of the use of ICTs.

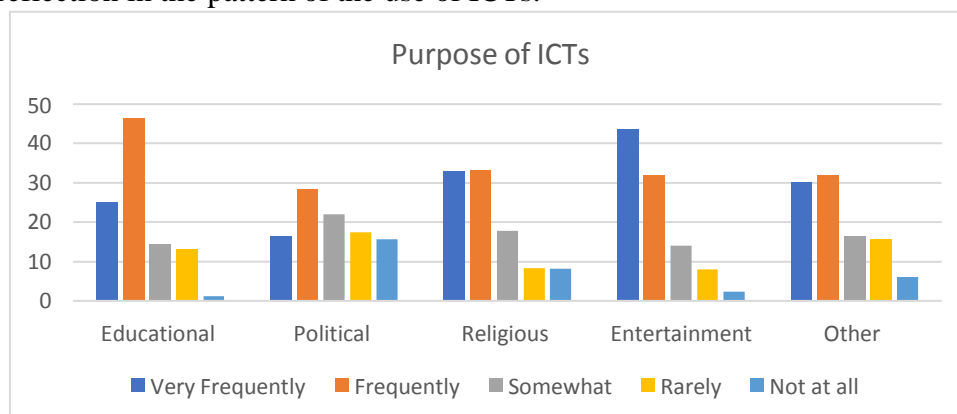


Figure 5: Purpose of use of ICTs

Figure 5 reveals the purpose of the use of ICTs where for education (Mean = 24.7%), political (M = 21%), religious (M = 22.9%), entertainment (24.4%) and other devices (M = 23.5%). The results are surprising there is marginal difference on the educational purpose of the use of ICTs and entertainment. Sattar (2007) argues that in the rural Pakistan, priorities by the government are not set to use ICTs for productive purpose. However, he give emphasis that in education and agro based economy, ICTs can change the dynamics of the rural society of Pakistan.

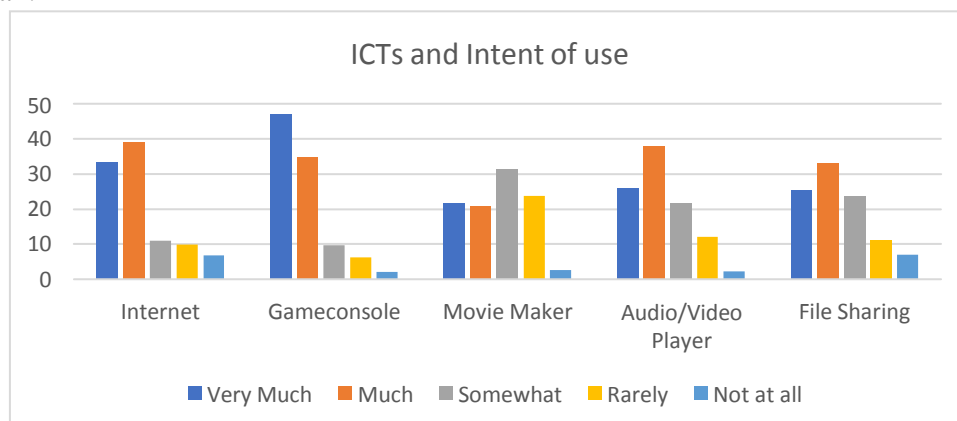


Figure 6: Intent of use of ICTs

The information and communication technologies use by universities varied purposes significant students (Mean = 23.85%) use for internet and information, games consoles (M = 24.47%), movie/video making (M = 24.3%), audio video players (M = 24.4%) and for file sharing (23.25%). However, youth significantly use ICTs for game consoles and audio video players (see Fig. 6). Granholm (2016) studies in qualitative research on the use of ICTs and Finnish youth. He finds from in-depth interviews that the use of ICTs is for varied purposes including social interaction, employing online and offline resources. However, the use of ICTs for entrainment is significant. Kolko and Putnam (2009) asserts that their study on gaming spans eight years of investigation in Central Asia in personal and private spaces. They find that video games provides youth first interaction of technology (ICTs) and it also a pathway of innovative space in the arena of ICTs. However, they observe gaming tendency prevail beyond gender preference and it create 'ICTs ecology'. Figure 7 reveal the role of ICTs in the academic achievements. Significant respondents (M = 27.75%) agreeing on the role of ICTs in academic performance whereas significant respondents (M = 14.8%) do not

see any role of ICTs in academic performance or see adverse role. Karamti, C. (2016) argues that the access and characteristic of teacher and student imparts in the academic achievement. Her study on the Tunisian HEIs reveal adverse impacts of ICTs on academic achievements. However, she recommends ICTs learning support for productive use of ICTs for youth.

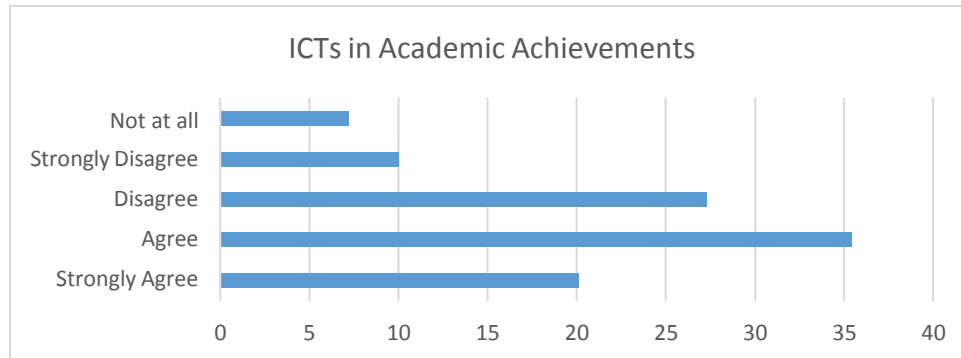


Figure 7: Academic achievement and ICTs

Dezuanni (2015) noted that in the digital media literacy, the engagement with ICTs, clarity in the intent of the use of ICTs and production of knowledge with the means of ICTs are contributing factors. He argues that formal education, production of the content for media via ICTs do not adequately impart in digital media literacy. However, there are several demographic variables that significantly influence the academic performance. Table 1, reflect the correlation of variables contributing in digital media literacy and demographics. There is significant relationship among age and education (0.158) in terms of variables contributing in digital media literacy. However, age and higher education Institutions (HEIs) and also have significant relationship (0.22). Similarly, on two tailed highly significant correlation exists on gender and age (0.78). Education and gender significantly reflect strong relationship (0.23) and it shows relationship among Education and Institution of higher education (HEIs) (0.09). However, there is significant two tailed relationship between HEIs and education (0.58). The findings reflect that age, education, gender and HEIs significantly influence the digital media literacy in Pakistan.

Table1: Correlation of Demographics and Digital Media Literacy Variables

Control Variables		Age	Education	Gender	HEIs
Variables contributing in digital media literacy		Correlation	.158*	.018	.227*
	Age	Sig. (2-tailed)	.052*	.780*	.030
		Correlation		.235*	.096*
	Education	Sig.(2-tailed)	.	.032	.587*
		Correlation			-.097
	Gender	Sig. (2-tailed)		.	.458*
		Correlation			
	Institution	Sig. (2-tailed)			.

* $p > 0.05$

Park (2012) refers that digital media literacy as a concept comprising on multi-facets and it can explore through scrutinize content from the device. He asserts that multilevel skills are requisite for the use of ICTs and it brings long-term impacts in terms adverse or positive. However, there are three factors that Park (2012) suggest that it can contribute in digital media literacy i.e. understanding of the utility of the ICTs, how technology can beneficial in social interaction and can create and productive use, how technology assist virtual space through participation. Plesner (2009) asserts that in network actor theory, diverse factor contribute to create a holistic picture. These actor are people, their social standards, their symbolic reflection and demographic elements. He argues that ICTs are integrated in the cloud of network whereas said actor contribute as an integral force for an impact on user. However, several studies (Adam & Tatnall 2010; Burnett, 2010; Mlitwa, 2007) recommend actor-network theory perspective for digital media literacy curriculum. It is asserted that the HEIs review on existing curricula on the ICTs.

5. Conclusion

ICTs as comprehensive pedagogy in terms of smart phones, laptops, computers and other devices commonly popular among male and female students studying at different levels in the HEIs. However, it is observed that utility of ICTs is varied on the basis of gender, age and level of education. The students' average use of ICTs for varied purposes is 2- 4 hours in day. Contrarily, the students are in bachelors programs use ICTs 2-3 hours a day and the significant purpose of ICTs is education and entertainment. However, internet surfing, gaming, audio/video content are the significant purposes of the entrainment while file sharing, group study is other significant academic purpose. Significant student of HEIs see the role of ICTs in academic performance. However, age and education, gender and age, age and HEIs, education and HEIs and Gender and HEIs, contribute as actors in the digital media literacy of HEIs of Pakistan. It is strongly recommended in the view of actor network theory (ANT) that there is need to develop the curricula in Pakistan of digital media literacy in HEIs for creating independent segments of demographic groups considering their age, gender, level of education for making them productive consumers/producers and avoiding long-term adverse effects of ICTs of HEIs of Pakistan.

References

- Adam, T., & Tatnall, A. (2010, September). Use of ICT to assist students with learning difficulties: An actor-network analysis. In *IFIP International Conference on Key Competencies in the Knowledge Society* (pp. 1-11). Springer, Berlin, Heidelberg.
- Balasubramanian, K., Clarke-Okah, W., Daniel, J., Ferreira, F., Kanwar, A., Kwan, A., & West, P. (2009). *ICTs for higher education. Commonwealth of Learning*, Vancouver. UNESCO (Report).
- Burnett, C. (2010). Technology and literacy in early childhood educational settings: A review of research. *Journal of early childhood literacy*, 10(3), 247-270.
- Certomà, C., & Corsini, F. (2021). Digitally-enabled social innovation. Mapping discourses on an emergent social technology. *Innovation: The European Journal of Social Science Research*, DOI: 10.1080/13511610.2021.1937069
- Chai, M. T., Malik, A. S., Saad, M. N. M., & Rahman, M. A. (2021). Application of digital technologies, multimedia, and brain-based strategies: Nurturing adult education and lifelong learning. In *Research Anthology on Adult Education and the Development of Lifelong Learners* (pp. 837-860). IGI Global.

- Dezuanni, M. (2015). The building blocks of digital media literacy: socio-material participation and the production of media knowledge. *Journal of Curriculum Studies*, 47(3), 416-439.
- Granhölm, C. (2016). Blended lives: ICT talk among vulnerable young people in Finland. *Young*, 24(2), 85-101.
- Halewood, N., & Kenny, C. (2008). Young people and ICTs in developing countries. *Information Technology for Development*, 14 (2), 171–177.
- Hisam, A., Mashhadi, S. F., Faheem, M., Sohail, M., Ikhtlaq, B., & Iqbal, I. (2018). Does playing video games effect cognitive abilities in Pakistani children?. *Pakistan journal of medical sciences*, 34(6), 1507-1515.
- Ishaq, K., Azan, N., Zin, M., Rosdi, F., Abid, A., & Ijaz, M. (2020). The impact of ICT on students' academic performance in public private sector universities of Pakistan. *International Journal of Innovative Technology and Exploring Engineering (IJITEE)*, 9(3), 1117-1121.
- Karamti, C. (2016). Measuring the impact of ICTs on academic performance: Evidence from higher education in Tunisia. *Journal of Research on Technology in Education*, 48(4), 322-337.
- Kolko, B. E., & Putnam, C. (2009, April). Computer games in the developing world: The value of non-instrumental engagement with ICTs, or taking play seriously. In *2009 International Conference on Information and Communication Technologies and Development (ICTD)* (pp. 46-55). IEEE.
- Luu, K., & Freeman, J. G. (2011). An analysis of the relationship between information and communication technology (ICT) and scientific literacy in Canada and Australia. *Computers & Education*, 56(4), 1072-1082.
- Mahmood, A., & Bokhari, N. H. (2012). Use of Information and Communication Technology: Gender Differences Among Students At Tertiary Level. *Journal of Educational & Instructional Studies in the World*, 2(4), 100-108.
- Misuraca, G., & Pasi, G. (2021). Shaping the welfare society: unleashing transformation through ICT-enabled social innovation. In *Perspectives for Digital Social Innovation to Reshape the European Welfare Systems*. IOS Press.
- Militwa, N. (2007). Technology for teaching and learning in higher education contexts: Activity theory and actor network theory analytical perspectives. *International Journal of Education and Development using ICT*, 3(4), 54-70.
- Mylläri, J., Kynäslähti, H., Vesterinen, O., Vahtivuori-Hänninen, S., Lipponen, L., & Tella, S. (2011). Students' pedagogical thinking and the use of ICTs in teaching. *Scandinavian Journal of Educational Research*, 55(5), 537-550.
- Nachmias, R., Mioduser, D., & Shemla, A. (2001). Information and communication technologies usage by students in an Israeli high school: Equity, gender, and inside/outside school learning issues. *Education and Information Technologies*, 6(1), 43-53.
- Park, S. (2012). Dimensions of digital media literacy and the relationship with social exclusion. *Media International Australia*, 142(1), 87-100.
- Plesner, U. (2009). An actor-network perspective on changing work practices: Communication technologies as actants in newswork. *Journalism*, 10(5), 604-626.
- Roberts, D. F., & Foehr, U. G. (2008). Trends in media use. The future of children, 18 (1), 11-37.
- Sattar, K. (2007). A sustainable model for use of ICTs in rural Pakistan. *International Journal of Education and Development using ICT*, 3(2), 90-102.
- Schmidt, M. E., & Vandewater, E. A. (2008). Media and attention, cognition, and school achievement. *The Future of children*, 18(1), 63-85.

- Selwyn, N. (2007). Web 2.0 applications as alternative environments for informal learning-a critical review. In *Paper for CERI-KERIS international expert meeting on ICT and educational performance* ,16 (1), 17-28.
- Servaes, J., & Malikhao, P. (2020). Communication for Development and Social Change: Three Development Paradigms, Two Communication Models, and Many Applications and Approaches. *Handbook of Communication for Development and Social Change*, 3 (1), 63-92.
- Shah, D. V., Cho, J., Eveland Jr, W. P., & Kwak, N. (2005). Information and expression in a digital age: Modeling Internet effects on civic participation. *Communication research*, 32(5), 531-565.
- Shaheen, S., & Khatoon, S. (2017). Impact of ICT Enriched Modular Approach on Academic Achievement of Biology Students. *Journal of Research & Reflections in Education (JRRE)*, 11(1), 49-54.
- Tummons, J., Fournier, C., Kits, O., & MacLeod, A. (2016). Teaching without a blackboard and chalk: Conflicting attitudes towards using ICTs in higher education teaching and learning. *Higher Education Research & Development*, 35(4), 829-840.
- UNESCO (2002). Information and communication technology in education: a curriculum guide for schools and programs of teacher development. *Division of Higher Education*. Retrieved from <http://unesdoc.unesco.org/images/0012/001295/129538e.pdf>.
- Verma, C., & Dahiya, S. (2016). Gender difference towards information and communication technology awareness in Indian universities. *Springer Plus*, 5(1), 1-7.
- Volti, R. (2004). William F. Ogburn" Social Change with Respect to Culture and Original Nature", *Technology and Culture*, 45 (2), 396-405.
- Wilding, R. (2006). 'Virtual'intimacies? Families communicating across transnational contexts. *Global networks*, 6(2), 125-142