Journal of Social Sciences Review (JSSR) DOI: https://doi.org/10.54183/jssr.v3i1.155

How to Cite This Article: Bibi, H. J., Ayub, A., & Ismail, I. (2023). Impact of ICT on the Progress and Productivity of Students at the University Level. *Journal of Social Sciences Review*, 3(1), 270-282. https://doi.org/10.54183/jssr.v3i1.155

Impact of ICT on the Progress and Productivity of Students at the University Level

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Vol. 3, **No.** 1 (Winter 2023)

Pages: 270 – 282

ISSN (Print): 2789-441X

ISSN (Online): 2789-4428

Key Words

ICT, Productivity, Academic Achievement, Students, University Level

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Abstract: *This study investigates the impact of ICT on academic achievement and innovation in Pakistani higher education institutions. Teaching, learning, and research have all been affected by ICT (in data analysis, storage, processing, publication, and dissemination). Thanks to information and communication technology improvements, it is now easier for students doing academic research to find a wider range of educational and scholarly resources (taken as representative of universities). Nevertheless, how much ICT use affects how well research students do and how productive institutions depend on how much and what kind of ICT use there is. The group was made up of 600 research students. The survey results show that research students could use ICT better for their studies and projects. The more research students and universities use ICT, the more productive and efficient they become. Even though research students had more access to digital resources, their output stayed the same. The study suggested that university administrators give incentives like certificates, awards, and scholarships to research students to get them to do more research. This could be done by checking to see if ICT infrastructure is being used correctly to get research students to a very high level of productivity and performance.*

Introduction

ICT stands for "Information and Communication Technology." When we say "ICT," we mean any tools used to talk to people and get information. The same as the IT business (IT). Nevertheless, puts more weight on communication technology than anything else. Including the Internet, wireless networks, cell phones, and other communication methods. In the last few decades, information and communication technology has given people many new ways to talk to each other. People worldwide can stay in touch through social networking sites like Facebook and share real-time news and information using technologies like instant messaging, voice-over IP, and video conferencing. As information and communication technologies have improved, the world has shrunk to the size of a village, and people can talk to people on the other side of the planet as if they were next door. Because of this, research on information and communication technologies is often framed in terms of how the fast growth of new forms of mass communication affects society (tech factor, January 04, 2010). ICT has made a huge difference in every industry around the world. The technology behind computers, laptops, smartphones, hardware, software, the Internet, search engines, and video conferencing makes it possible for us to do things with information, like create, collect, recover, activate, assign, and move data Lawal & Olawale,

(2020). The use of ICT in education, especially at the university level, has made the learning process more active by using new, innovative ways to deal with and share information and ways of teaching and learning (from teacher-focused to student-focused), such as by integrating communicative (interactive) classrooms, motivation, engagement, personalized, collaborative, and creative learning (Siddiquah & Salim, 2017).

So, the arrival of these interactive communication devices has completely changed how every business works. In the same way, it has changed everything about education, from how policies are made to how each student learns in the classroom. As a result of its implementation, almost every country's higher education system has changed in important ways (Chakraborty et al., 2018). So, given its important role in improving and changing cloud-based services like data storage, Google classrooms, e-portals, and digital course books, and in revolutionizing the education sector in terms of the teaching-learning process (Siddiquah & Salim, 2017), quick research, easy access to information, and making it easier to handle large amounts of data management and administration of education, such as collaborative work and easy assessment of learner performance, it is clear that the Internet of Things (IoT) is Because of this, governments all over the world have tried to get ICT into all levels and subjects of schools. Because of this, many countries work hard to ensure their schools have the most up-to-date technology. The most important are portable electronic devices like laptops and smartphones, stationary electronic devices like computers, the Internet, printers, scanners, and multimedia players. Using ICT makes students more interested, involved, and motivated, which helps them learn more (Pavel et al., 2015).

ICT, or information and communication technologies, is increasingly used in schools. So, students have been using ICT for a variety of academic purposes, such as file sharing, online quizzes, and tutorials, online access to course materials and outlines, online libraries (with digital books, journals, articles, and references), online forums and virtual social networks, emails, and course-specific websites (Shonola et al., 2016). Teachers use ICT for many things, including keeping up with developments in their fields, improving their skills, researching their fields, and giving lectures (Bhattacharjee & Deb, 2016). So, using ICT has a big, direct effect on how school works (Appiahene et al., 2016). So, students and teachers may find it helpful to use ICT in the ways listed above to improve their teaching, which could help them do better and learn more (Shamim & Raihan, 2016). Because of this, tertiary-level research students use ICT to improve their academic performance. Previous research has shown that students' grades improve using ICT. Students with access to and use digital tools are likelier to do well in school. Hadi and Muhammad (2019) used qualitative metrics to determine how well graduate students did in research (qualitative). Basri et al. (2018) say that students' grades, character growth, and academic growth show they have gained knowledge and skills in foreign studies. In some earlier studies, student's cumulative grade point averages, grade point averages, or subject test scores were used to measure how well they did in school (Talukder et al., 2015). ICT tools also help them do their jobs better and more quickly. Benitez et al. (2017) say that the success of a classroom teacher can be judged by how well the students do. It shows up when teachers show how good they are at what they do. It is also linked to how much students grow and change or how good education is, as shown by how well they do on their given tasks.

While according to Herandez (2012), the performance of teachers is primarily dependent on the following features:

- Information
- Features of students (like; learning, academic work)

- Characteristics of teaching (like; the arrangement of the lesson and communication)
- Learning features (e.g., management, classroom phenomena)
- Their responsibility, as well as imagination

Significance

- The findings of the present investigation will be useful for the following:
- Research students as it provides them with the knowledge that ICT impacts their performance and productivity.
- The Higher Education Commission (HEC) and university administration, that they enhance the provision and monitor the utilization of ICT resources in universities.
- The study findings will provide a baseline for future research and help researchers focus on additional aspects resulting in low academic performance and productivity of research students.

Objectives of the Study

1. To assess the performance and productivity of research students.
2. To explore the ways how students access information.
3. Highlights the acceptability of ICTs among schedules for getting information

Research Questions

1. How do the use of ICT influence universities' performance and productivity?
2. How can ICT be used for improving universities' performance and productivity?
3. What is the role of ICT in enhancing universities' performance and productivity?

Literature Review

ICT stands for "information and communications technology." This includes the devices, services, and apps that go with them, like video conferencing and distance learning. "Information and communication technologies are usually discussed concerning a certain field, such as ICTs in schools, hospitals, and libraries" (Margaret Rouse, September 2005). "ICT" stands for "information and communications technology" or "technologies." According to the Oxford English Dictionary, "ICT" is an umbrella term that includes any communication device or application, such as radio, television, cell phones, computer and network hardware and software, satellite systems, and so on. Information and communications technology (ICT) includes radio, TV, cell phones, computer and network hardware and software, satellite systems, and so on. ICT also includes all the services and applications that go with it, like videoconferencing and distance learning.

"Information and communication technologies are usually discussed about a certain field, such as ICTs in schools, hospitals, and libraries" (Abe & Adu, 2007). Researchers wanted to find out what parts of the topic had been missed by previous national or international studies that had been done from a different point of view. In this study, we used a literature review as a wide-angle lens to look at how and why ICT is used, focusing on how it affects the performance of research students and the output of universities. Information and communication technology (ICT) can be used in many different ways, especially in higher education. So, a thorough evaluation is needed to give a global view of this study. The study looked at how different kinds of schools used ICT and how it affected how well students did in school and how productive they were. Another reason for taking a broad look at the relevant literature was that it took much work to find information on performance and productivity variables. Until recently, there was no way to measure how ICT affects learning outcomes or how well an institution works. So, when making the comprehensive, relevant instrument, the researcher looked at all these things as a whole. There is a tension between the need to make sure

that people in developing countries, especially those with low incomes, girls and women, and unskilled workers, have access to quality education and the worry that a focus on quantity would weaken this access. Globalization has also led to "the demand to constantly acquire and use new talents." The International Labor Organization says that workers need "basic education for all," "core job skills for all," and "lifelong learning for all" to be able to compete in the global economy of today. Information and communication technologies (ICTs) include radio and TV and more recent digital technologies like computers and the Internet. These technologies are potentially important tools for changing and improving education. As the article says, "when used correctly, different ICTs are said to help increase access to education, make education more relevant to the increasingly digital workplace, and improve the quality of education by, among other things, making teaching and learning a more interesting, active, and real-world process."

Types of ICTs Used in Education

ICTs, which stands for "information and communication technologies," is a wide range of technologies that make it easier for people to talk to each other and for knowledge to be shared, shared, and managed. These technologies include computers, the World Wide Web, radio and TV broadcasts, and phones. In the past few years, there has been a growing movement to learn how to use computers and the Internet to their fullest potential in the classroom and beyond. "But ICTs are more than just these technologies. The report says that older technologies like the telephone, radio, and TV have been used as teaching tools for a longer time and in more depth," the report says. Even though print is still the cheapest, easiest to find, and most popular way to get information to people in both developed and developing countries, radio, and TV have been used for open and remote learning for more than 40 years. "Computer and Internet use is still in its infancy in underdeveloped countries, if at all," because there is not much infrastructure there, and it costs a lot to get to (Aribamikan, 2007).

E-learning

E-learning is any formal or informal learning that uses the Internet, a local area network (LAN), or a wide area network (WAN) in whole or in part for course delivery, engagement, evaluation, and facilitation. Some people call it "distance education. E-learning includes web-based learning, the learning process with the help of a web browser (such as Chrome, Firefox, or Internet Explorer). Another way to look at it is education, which is helped by technology.

Blended learning

Another idea that is becoming more common is the idea of "blended learning." This refers to teaching methods that combine face-to-face instruction with online resources and work well. In a traditional classroom, students might have to read and turn in assignments via email, sign up for a class email list, and chat with their teacher during online mentoring sessions. Or, "a Web-based training session can be complemented by frequent in-person lessons." The idea of blending came about when people realized that only some learning is best done with the help of technology, especially when a live teacher is absent. Instead, "the optimal mix of instructional and delivery modalities must be found by taking into account the subject matter, the learning objectives and outcomes, the characteristics of the learners, and the learning situation" (Asiabeka, 2010).

Open and Distance Learning

According to the Commonwealth of Learning, "open and distance learning is characterized by the separation of teacher and learner in time and place, or both time and place; learning that is certified in some way by an institution or agency; the use of a variety of media, including print and electronic; two-way communications that allow

learners and tutors to interact; the possibility of occasional face-to-face meetings; and the use of technology to help to learn."

Advantages of ICT

ICTs are getting a lot more attention than they used to. Many scientists all over the world think this is an important field. Over the past few decades, they have changed education in a very big way. In most European countries, the use of ICT in education and training has become more important over the past 10 years. But only a few people have yet to make any real progress. A few schools in some countries have gotten very good at using ICT to enhance and change how they teach a wide range of subjects. Many people are just starting to see how great modern ICTs can be. Traditional ways of learning, like getting information, make students "passive learners of knowledge" instead of "active producers of knowledge who can take part in the learning process." However, many professors use technology to supplement these methods. In a document called "Teaching and Learning with ICT" from 2002, Galea talks about how information and communication technologies (ICT) might make education better. She thinks that the United Kingdom should use information and communication technologies in the classroom more often for two main reasons. She started by talking about how ICT can speed up or slow down the pace of learning and how young people in today's world need to develop enough talents and skills to take full advantage of the new opportunities that ICT provides. "Second, there is a lot of interest among academic researchers in the UK in how technological tools could improve teaching and learning in schools, which would help students do better," Also, it has been shown that students learn a lot more when they use modern technology (Lawsent & Vincent, 1995).

ICT (Information and Communication Technology)

Even though many people started studying ICT in the late 1980s, it took off after 1997. According to researchers, information and communication technology (ICT) is important in many different fields (Pavel et al., 2015). Another study showed that information and communication technology (ICT) in education has been growing for over 20 years. This growth has changed how universities are run, and students are taught (Juma et al., 2016). Energy technology and growth (Jamil, 2022). ICT, organizational responsibility, and sustainability (Jamil, Rasheed, & Mukhtar, 2022). ICT, organization responsibility, and employee diversity (Mukhtar, Kazmi, Muhammad, Jamil, & Javed, 2022). ICT is used in education in two main ways: ICT for education is the development of ICT for teaching and learning, and ICT in education is using basic ICT for teaching and learning. Adeoye et al. (2013) say that ICT has become hard to tell apart from other parts of life. ICT use has changed how businesses, nonprofits, and schools do things. There is no question that it has changed the depth and breadth of teaching, learning, and research in higher education institutions. Victor and Bolanle both talk about the benefits of ICT in ways that are similar to this one (2017). Using ICT to improve the classroom experience makes it faster for students, teachers, and administrators to access and share resources like electronic books and journals. ICT is a great way to improve communication inside and outside a company. ICT, or information and communication technology, is now an important part of everyday life. It was made to speed up tasks, make them easier, and give instant solutions to problems. It has clear effects on businesses, but the democratization of knowledge also opens up opportunities (Lawal & Olawale, 2020). Researchers have found in the past that ICT helps with media distribution, communications, and managing audio and video transmissions Shahzad et al., (2020). Even though this statement is true, it is important to

note that Schmidt and Cohen (2015) also pointed to ICT as a way for students to get easy access to knowledge no matter where they are in the world. ICT is a game-changing innovation that no country can hope to survive without, both now and in the future (Suliman et al., 2014). There is no one definition of ICT that all academics agree on. Juma et al. say that computers and other electronic equipment are used in ICT to collect, store, and send data (2016). Others in the academic world have said that ICT is the computer and network system that makes it possible to share, store, and collect data. The study's authors define "Information and Communication Technologies" (ICT) as "any combination of hardware, software, the Internet, and/or telecommunications devices used to access, process, create, store, recover, and share information in order to improve teaching and learning" Studies that came before this one also found that the term "information and communication technology" (ICT) refers to the ability to record, produce, distribute, and retrieve data (Appiahene et al., 2016).

Impact of ICTs on Learning & Achievement

"There is a widespread belief that ICTs can and will empower teachers and learners, transforming teaching and learning processes from being highly teacher-dominated to student-cantered and that this transformation will result in increased learning gains for students, creating and allowing for opportunities for learners to develop their creativity, problem-solving abilities, informational reasoning skills, communication skills, and other higher-order thinking skills." However, there is currently very limited, unequivocally compelling data to support this belief. 2. ICTs are rarely seen as central to the learning process. "Even in the most advanced schools in OECD countries, ICTs are generally not considered central to the teaching and learning process". Many ICT in education initiatives in LDCs seek (at least in their rhetoric) to place ICTs as central to teaching and learning. 3. An enduring problem: putting technology before education. "One of the enduring difficulties of technology use in education is that educational planners and technology advocates think of the technology first and then investigate the educational applications of this technology only later."

Utilization Of ICT for General Academic and Research Activities

University Students can make good use of technology in their education at university. A study by Drain et al. (2012) showed that students did better when they used technology in the classroom. On the other hand, Hota and Naik (2015) found that even though there was enough ICT infrastructure, students still needed to use it well in the classroom. Mumba (2017) says that students use ICT for a wide range of schoolwork, like doing research and writing projects. Research in the past has shown how students use technology in the classroom, such as taking notes, taking part in online discussion forums, and using extra resources to find and get information. Bartlet et al. (2016) agree that ICT should be used in the classroom and for student research. Students do not just use ICT in school. They also use it when they study and do research on their own. Academics say that ICT is used for everything today, from making plans to analyzing data to using social media. ICT is the engine that gets the job done regarding research. Information and communication technology (ICT) and the tools that go with it help improve the quality and scope of scientific research. Information and communication technology (ICT) tools like computers and laptops are used a lot in this area of research to get hard tasks done quickly. Information and communication technology (ICT) can help with many research goals, such as finding information, avoiding plagiarism, analyzing data, processing data, storing data, recovering lost data more quickly, and spreading information (Marmat, 2013). The students did better in school using ICT to

download lectures and read digital books (Kumar, 2011). The results of Mtega et al. (2012) showed that students did use ICT (mobile learning apps) like cameras, voice/video calls, emails, GPS, creating, copying, uploading/downloading/sharing educational materials with peers, and so on. Many students also use smartphones and other forms of technology to do schoolwork and study (Sunnathi et al., 2018).

In the same way, students relied a lot on ICT, especially the Internet, to find research and study materials. On the other hand, the study's results did not show proof that ICT use led to its use in the classroom (Ayub et al., 2014). Researchers have found that college students often use mobile devices for various academic tasks, such as sharing files, taking online quizzes and discussions, and working on group projects. Mamudu and Oyewo (2015) say that students have used mobile phones as a form of ICT for many school-related tasks, such as looking for instructional materials. Other research has shown that many college students use email, websites, and search engines to research and do classwork on the Internet (Adekunmisi et al., 2013). In a 2013 study by Zainudin et al., it was found that students often used ICT to finish their assignments and do the background reading they needed to do.

The Impacts of ICTs on Students' Performance

The purpose of this research is to determine if there is a link between how well students do in college and how much they use ICT. According to the results of an economic study, it still needs to be made clear how ICT investments affect how well students do in school. Our paper aims to summarize the major literary conclusions and offer two other ways to look at them. In the first explanation, we look at how information and communication technologies (ICT) affect traditional explanations in a roundabout way. Since a student's performance can be largely explained by the student's personality, the learning environment, and the teacher, ICT may have an effect on these factors and, by extension, on the education results. So, the differences in how well students do in school can be traced back to how ICT affects more traditional variables differently. Information and communication technologies (ICT) are being used and invested in more and more across the European Union. However, complementary organizational designs are being adopted at a much slower rate and vary greatly from one type of organization to the next. This might explain why some students do better than others.

Role of Use of ICT In Students' Performance and Productivity

The accompanying section of the study is about the performance and productivity of students. Thus, the subsequent section provided the literature on the role of ICT in students' performance, students' productivity, and other indicators of productivity.

Role of ICT in Students' Performance

There are many ways to look at how well students do in their classes. "A selection of indicators of their educational attainment and progress" makes up a student's academic success Several studies looked at how ICT affected how well students did in school, and they came up with a wide range of results. Noor-Aul-(2013) and Amin's research also showed that ICT greatly affects how well students do in school. The study's authors say that a student's academic performance can be defined as "progress in the status of information and abilities reflected in GPA." This can describe the student's growth in character and intelligence as they move from elementary school to high school. The results showed a link between how much students used ICT and how well they did in a more traditional classroom (Basri et al., 2018). In the last inquiry, cumulative grade point averages were used to measure how well students did in school. According to research, a high cumulative grade point average is a sign of school success. Not only

that, but a low-grade point average shows that you did not do well (Talukder et al., 2015). Ullah et al. (2019) say that ICT greatly affects how well college students do in their classes. They found little of a link between how much ICT students used and how well they did in school. It showed that student's success in school was based on more than just how well they used ICT. Ishaq et al. (2020) found that ICT greatly affected how well students did in school. ICT also helped students learn more about computers and improve their skills. Findings showed that students were more likely to use ICT to finish their assignments when they could form and work in groups.

In the same way, the researcher found that ICT greatly affected how well students did in school. In the same way, the data showed a link between how much students use technology and how well they do in school. Eguavoen (2016) found in another study that there is a strong link between how much students use ICT and how well they do in school. Another study found that students did better in school using ICT (multimedia) tools (Akinoso, 2018).

The Impact of ICT on University Performance and Productivity

As was already said, the output, knowledge, and skills come from institutions of higher education. In the published literature, it was common for organizations to use information and communication technologies (ICT) like the Internet, smartphones, desktop computers, and laptops (Wasko et al., 2011). Researchers agreed with this point of view because people who worked in ICT had easy access to both other professionals and informational resources. ICT allows workers to get the information they need to make better decisions Coker (2011) said that ICT workers benefit from it, which leads to more work being done. Researchers Revenio and Nasra found that using information and communication technologies (ICT) directly affects productivity. Several studies have shown that adding ICT (computers) to businesses makes them more productive, proving what many people have thought for a long time. Their research also showed that the use of IT systems causes a company to be more productive. Eze and Olusola (2013) say that giving teachers access to the Internet and its wealth of information could improve the quality of higher education and scholarly publications. ICT has become the standard in higher education. This technology has many uses in higher education, including making course materials, distributing those materials, promoting open lines of communication between professors, students, and the general public, doing scholarly research, running academic institutions, and recruiting new students. Researchers have also found that professors often use ICT (Internet) devices to research. Similar studies have looked at how Google, Google Scholar, Yahoo, and Alta Vista are used by professors. ICT can be used in a smart way to help teachers be more intuitive (Alharbi, 2014).

Methodology

A quantitative method was used to collect data that could be used to figure out how the independent variables of the study affected the dependent variable. The literature review found that there was only a little real-world evidence in the field of psychological constructs, especially at the tertiary level. Five universities in Lahore were randomly picked using a method called "fishbowl sampling." The second thing is that the sample was taken from a population that was easy to reach. In total, 600 students filled out the poll. Also, the researchers were the ones who did the surveys. The tools were made with the study's goals in mind. Below, we explain each method used to get information for this study.

Results and Data Analysis

Table 1

Demographics Information of Research Students

Variable	f	%	Mean	Median	Mode	variance	SD
Gender							
Male	252	42					
Female	348	58	1.58	2	2	0.244	0.494
Age							
Below 22 years	89	14.80					
22-25 years	273	45.50					
26-29 years	159	26.50	2.423	2	2	0.979	0.989
30-34 years	53	8.80					

Table 1 Shows the descriptive statistics about gender and age.

Table 2

Normality Test of Research Students' Data

Indicators	Mean	Median	Skewness (SE)	Kurtosis
Utilization of ICT	62.52	63	0.043 (SE=0.100)	-0.472(SE=0.199)
Academic performance	140.27	137.50	0.014(SE=0.100)	-0.514 (SE=0.199)
Academic Achievement	3.43	3.50	-0.014(SE=0.100)	-1.048(SE=0.199)
Academic Productivity	77.17	77	−0.165(SE=0.100)	-0.384 (SE=0.199)
Research Productivity	7.57	6	2.026 ((SE=0.100)	8.851 (SE=0.199)
Research productivity transformed into log10	0.8	0.9	– 0.496 (SE=0.113)	-0.270 (SE=0.225)

The data in table 2 show that the data of indicators, i.e., utilization of ICT, academic performance, academic achievement, and academic productivity of research students collected from the questionnaire were normally distributed as follows: mean and median values were nearly the same, and skewness and kurtosis values were close to "0". Finally, the dots on the distribution plot did not deviate much from the standard deviation line in the Q-Q plot, so it satisfied the normality requirement.

Table 3

Faculty of Research Students and their Research Productivity

Faculty		Research Productivity				Total
		L	A	H	VH	
Sciences	f	69	62	47	57	235
	%	29.40%	26.40%	20.00%	24.30%	100%
Social Sciences	f	63	56	40	73	232
	%	27.20%	24.10%	17.20%	31.50%	100%
Total	f	132	118	87	130	467
	%	28.30%	25.30%	18.60%	27.80%	100%

Table 3 presents that most of the research students of the sciences faculty had high to very high research productivity 104(44.30%). Similarly, most of the research students of the faculty of social sciences also had very high research productivity, 73(31.50%). Overall, research students of the faculty of social sciences had very high research productivity.

Table 4

The Extent of Utilization of ICT Devices by Research Students

Use of ICT		L	A	H	VH	Total	Mode	Remarks	SD
Searching/Organizing Information	f	160	192	118	130	600	2	Average	1.09
	%	26.70	32	19.70	21.70	100		Extent	
Writing & Reading	f	168	145	151	136	600	1	Low	1.12
	%	28	24.20	25.20	22.70	100		Extent	
Digital Note Taking	f	154	167	141	138	600	2	Average	1.11
	%	25.70	27.80	23.50	23	100		Extent	
Uploading, downloading, and submitting data	f	184	142	150	124	600	1	Low	1.12
	%	30.70	23.70	25	20.70	100		Extent	
Utilization of ICT for general academic & research activities	f	162	141	147	150	600	1	Low	1.14
	%	27	23.50	24.50	25	10		Extent	

Table 4 presents that out of 600 research students, 162 (27%) research students used it low, 141 (23.50%) research students used it on average, 147 (24.50%) research students utilized ICT highly, and 150 (25%) used it very highly for their general academic and research activities. However, overall, the majority of responses fall into the low category. It means research students at a low-level use ICT devices. The SD value (1.14) presented more than one divergence in their use for general academic and research activities. Nevertheless, high responses are 30.7%, equivalent to 31%, and all responses are almost near to this, meaning there is little variance in the views about their use of ICT for general academic and research activities.

Discussion

In the last part of the study, the full results from the instruments used were given. The results of this study show how often ICT devices are used, how research students and universities see their performance and productivity in ICT, and how ICT devices affect these metrics. The results of both the quantitative and qualitative studies show that a large number of respondents use ICT in their studies and research. The people who participated in the study saw ICT as a way to improve traditional classroom practices by making it easier to share information and research. Based on these observations, more university students and research institutions in

Pakistan are more efficient and effective when they use ICT.

Conclusion

The results show that both regular and research students use ICT tools in their studies and research but in different ways. Most independent study students do their research on computers and the web. Most software and apps that use information and communication technology (ICT) depend heavily on survey and writing tools. From these conversations, it is clear that ICT and its use need to be fully understood. We have concluded that research students have low academic performance, academic productivity, and research productivity as a whole but excellent academic achievement (grades).

Quantitative (primary data) analysis shows that using ICT devices has a noticeable effect on performance but not on the research output. This trend shows that productivity has increased because more people are using ICT. Even so, it has yet to see a drop in the research it does. Interviews, on the other hand, show that ICT positively affects the performance and output of academic institutions. There is no statistically significant link between how universities use ICT and how well they do or how productive they are. This is based on data from annual reports (productivity) and annual ranking scores (performance) from secondary sources. This finding suggests that ICT's availability and use stay the same as how well universities work or how much they get done.

Recommendations

The present study recommends, based on the consequences of the present study and findings of interviews, that university administration may:

a) Provide more infrastructure for ICT (e.g., IT-based labs, big screens for display, multimedia, projectors, internet connection, cameras) to enhance the productivity of research students.

b) Facilitate, regulate, and monitor ICT resources to enhance ICT use.

c) Adequately check whether the ICT infrastructure is being utilized appropriately in their premises to attain a high level of research productivity and performance of research students.

d) Provide sufficient resources for ICT and training (workshops, conferences, seminars) and awareness about the efficient use of ICT to research students. This will expose them to best practices and proper utilization of ICT for their academic and research activities to enhance their performance and productivity.

e) Performance-based incentives (certificates, awards, scholarships) may be provided to research students to enhance their performance and productivity.

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