

# **ICT Awareness among Faculty Members of The Public Sector Women Universities of Pakistan**

**Shahida Tabassum**

Lecturer, Department of Statistics  
The Women University Multan, Pakistan  
shahida.tabassum@wum.edu.pk

**Kiran Shehzadi**

Department of Statistics,  
The Women University Multan, Pakistan  
kiranshehzadi832@gmail.com

**ABSTRACT:** Information and communications technologies (ICTs) have been included as an essential part of teaching-learning process by a large body of learning institutions around the world. As a developing country, the use of ICTs in Pakistan is a new beginning and it will take time to be more developed. Women are the important part of society and they have to work efficiently side by side with men for having a developed society. So that, the main goal of our study is to check the awareness, attitude and competence level of using ICTs of faculty members of women universities of Pakistan. The analysis is based on Primary source of data collected from survey. Our target was the female faculty members of Public Sector Women Universities of Pakistan. Findings show that faculty members have positive attitude towards computers but unfortunately, they have a low competence level of using ICTs. Most of the respondents have never attended any training on ICTs. It is suggested to arrange trainings regarding ICTs for them to have a competent faculty to shape the future of the country.

**KEYWORDS:** Information and communication technologies (ICTs), Public Sector Universities, Female Faculty, Pakistan, Awareness, Attitude towards ICTs, Low competence level

## 1. Introduction

ICTs have a major impact in the context of university, organization, teaching and learning methods. Use of information and communication technologies in higher education has been promoted by a variety of stakeholders for at least two decades. Increasing reliance on technology is modifying student-teacher interaction with the passage of time (Gilmore and Halcomb 2004).

Information technology (Haag, Cummings, and Dawkins 1998) is defined as a “set of tools that can help provide the right people with the right information at the right time”. The use of ICT in teacher education has received a great attention for quality learning and teaching (Wee and Zaitun 2006). ICTs have been included as an essential part of teaching learning process by a large body of learning institutions around the world (Juang, Liu, and Chan 2008; Friedman et al. 2009). Because of the emergence of new technologies and new challenges to education, students-teacher education has passed through rapid development and transformation (Moon 2004) that resulted in the reorganization and restructuring of teaching methodology to prepare the students for future challenges by educational institutions (Auerswald and Magambo 2006).

If compared with other countries of the world Pakistan is ranked as 145<sup>th</sup> in the use of ICTs. The use of ICTs in Pakistan is a new beginning and it will take time to be more developed. There are many other factor affecting the awareness and attitude of a person towards ICTs. Most important factor is “Socio-cultural aspect” which is the most dominant factor especially for females in Pakistan. Women are the important part of society and they have to work efficiently side by side with men for having a developed society. Therefore to play a major role in the development of country, women should have a better understanding and competence level of using ICTs.

### 1.1. Problem of the statement and research questions

Given the importance of teachers’ awareness of ICTs, the purpose of this study is therefore to determine the awareness of faculty members of public sector women universities of Pakistan. More specifically, the study investigated the following research questions;

1. What are the attitudes of faculty members toward ICTs in Public Sector Women universities of Pakistan?
2. What are the teacher’s perceptions of;
  - a. Impact of ICTs on Education?

- b. Cultural relevance of computers to Pakistan's society and education?
- c. Their level of computer competence?

The study focused mainly on female faculty members of the public sector women universities of Pakistan.

## 2. Literature Review

Ntshakala (2016) designed a theoretical model of the factors influencing the awareness perceived of ICTs by the school teachers of physical education (PE). From one of the provinces of South Africa, 73 teachers were selected for survey. The Technology Adoption Model (TAM) was presented with the main factors which were having more effect on perceived awareness. Those factors include demographics, performance expectancy, social influence and computer attitude. As this study basically focused on the ICTs awareness of PE school teachers and did not cover the higher education faculty.

Kerckaert, Vanderlinde, and van Braak (2015) proposed a study based on the role of ICTs in early childhood education. They presented two types of ICTs use was being made in preschools. It was further examined that the first use i.e. "supporting basis ICTs use and skills" were more frequent than the second use i.e. "supporting content and individual learning needs". It is clear that the study only questioned preschool teachers but not higher education faculty.

Shin (2015) described two studies and examined the pre-service English teachers' awareness regarding three main issues i.e. digital literacy, fair use of digital material and e-safety. The participants of the first study prepared reading and listening lessons by using online material and then evaluated in terms of digital literacy and fair use. While in the second study, the participants prepared writing lessons by online network services and evaluated in terms of e-safety. The whole study concluded that most of the time pre-service teachers do not considered these issues while preparing class activities. Awareness of participants of critical, ethical and safe use of IT was also raised by evaluation activities.

Adu, Emunemu, and Oshati (2014) examined the role and need of information and communication technology (ICT) and higher education in sustainable development in Nigeria. The findings of the study show that the effective ICT policies and facilities of high technology would promote sustainable development. The development and adequate maintenance of infrastructure in learning institutions can also promote

sustainable development. It was also discovered that the promotion of government policies and operational procedures can also be a great contribution.

Thanuskodi (2013) investigated the usage of ICT among students of rural areas in Tamil Nadu India. By having survey through the questionnaire, it was indicated that more than half of the total participants got the training of internet skills from their college. It was also shown that majority of the students, about 56.53%, were using internet weekly and 73.91% respondents were using the internet to search the literature.

Rahim Sajid (2013) explored the major barriers to the integration of ICTs at secondary level learning in Pakistan especially in Punjab. The study mainly focused on education stakeholders i.e. school administrators, ICT coordinators, teachers and students. They showed positive attitude towards ICTs implications and also confirmed the benefits of ICT for overall improvement of education sector in secondary level.

Majoka, Fazal, and Khan (2013) explored the implementation of ICTs in education teachers training institutions in two provinces of Pakistan i.e. Khyber Pakhtunkhwa and Punjab. Findings revealed that in a few classrooms, different activities/ experiences as suggested in the unit were properly implemented but not in others like shortage of electric power supply, lack of ICTs tools and low level of skills in ICTs application.

Beena and Mathur (2012) highlighted different impacts of ICT on existing teacher training institutions of education and explored potential future developments in India. They argued the role of ICT in the transformation of teaching and learning process and to explore the awareness of teacher educators about the use of ICTs for effective teaching and learning process.

Bhuasiri et al. (2012) identified multiple critical factors that influence the success of e-learning systems from the literature and compared the relative importance among two stakeholder groups in developing countries i.e. ICT experts and faculty. Findings illustrated the importance of curriculum design for learning performance. Technology awareness, motivation, and changing learners' behaviour are prerequisites for successful e-learning implementations.

Safdar et al. (2012) examined the theoretical approaches of educated people about the role of ICTs in the development of education sector of Pakistan. About 91.7% of the respondents signify information technology as vital for educational development. The findings suggested organizing and publicizing a valuable campaign for the awareness of the people about the advantages of ICTs for the development.

Kaka and Pd (2008) talked about the role of Information and communication technology ICT in education sectors. They discussed some modern facts of education

about ICTs i.e. rapid increase of ICT, its influence, the presence of multimedia games and online games by internet and the less attention in implementation of ICT in education. The author discussed that the teacher should be aware of the social change in their teaching activities. They should be the agent of change from the classical method into the modern one.

Youssef and Dahmani (2008) discussed the impact of ICT on student performance in higher education. The basic purpose of their research was to examine the relationship between the usage of ICT and its impact on student performance in higher education sector. They argued on three different aspects in order to explain the lack of empirical evidence. According to them, ICT equipment and the use rate of them are growing fastly in European Union. But the adoption of complementary organizational designs is very slow and it varies from one institution to another.

Albirini (2006) discussed the new technology initiative in Syrian education. His study explored the attitudes of high school English as Foreign Language (EFL) teachers in Syria toward ICT. He investigated the relationship between computer attitudes and five independent variables i.e. Computer Attributes, Cultural perceptions, Computer competence, Computer access and Personal characteristics. One of the main barriers to technology implementation perceived by the teachers in this study was discovered as the mismatch between ICT and the existing curricula and the class-time frame. Other barrier reported in this study was teachers' low level of access to the facilities of computers.

Hennessy, Ruthven, and Brindley (2005) examined how secondary teachers of the core subjects of English, Mathematics and Science have begun to integrate information and communication technology (ICT) into mainstream classroom practice in English schools. The findings indicated that subject practices are in a considerable state of flux as they begin to adapt and develop in response to a new cultural tool. While there is little evidence of the transformation of certain fundamental aspects of subject cultures (goals, curricula), the impact here is severely constrained by nationally prescribed curriculum and assessment frameworks.

### **3. Research Methodology**

In order to solve the research problems and to collect the required data the questionnaires were distributed among all faculty members of the selected universities. The target population for this study comprised of 1047 faculty members of selected women universities of Pakistan. Stratified random sampling technique was chosen to select a more representative sample.

On the first stage, all women universities were divided into strata. From each stratum, by proportional allocation i.e.  $n_h = \frac{n.N_h}{N}$  the number of universities from each province was selected (Table 1).

**Table 1. Selected universities by proportional allocation**

Province	Universities	No. of Selected Universities
Punjab	8	2
Sindh	2	1
Balochistan	1	1
KPK	3	1
AJK	1	1

The sample size from each university was determined by the following formula proposed by Naing, Winn, and Rusli (2006) for finite population,

$$n = \frac{NZ^2P(1-P)}{d^2(N-1)+Z^2P(1-P)} \dots\dots\dots\text{Eq. 1}$$

Where n is the sample size, Z is the confidence level, P is the estimated proportion, d is the precision or acceptable margin of error and N is the population size. The value of n was calculated using the following parameters: Z=1.96, P=0.15, d=0.05 and N.

**Table 2. Selected sample size from each university**

Province	Selected Universities	Population size (N)	Sample Size (n)	Responses
Punjab	The Women University, Multan	209	80	80
	Lahore College for Women University, Lahore (Jhang Campus)	52	37	27
Sindh	Peoples University of Medical and Health Sciences for Women, Nawabshah	176	75	64
Balochistan	Sardar Bahadur Khan Women University, Quetta	350	91	73
Khyber Pakhtunkhwa	Shaheed Benazir Bhutto Women University, Peshawar	170	74	57
Azad Jammu & Kashmir	Women University of Azad Jammu & Kashmir, Bagh	90	53	41
<b>Total</b>		1047	410	342

Primary data was collected by means questionnaires. The questionnaire was adapted by Ntshakala (2016); Albirini (2006) and modified according to the context and objectives under consideration. All five sets of questionnaires had closed questions. The questionnaire used a Likert-type rating scale with the following categories: strongly disagree / disagree / neutral/ agree and strongly agree with numerical ratings from 1 to 5. Cronbach’s alpha was used to test the reliability of the questionnaire and it was about 0.883 which was sufficient for analysis.

## 4. Empirical findings and data analysis

### 4.1. Demographics

Table 3 shows the descriptive statistics of the demographic measures of the participants which shows that the respondents of this study are predominantly females (84%) because we have selected our target population the women universities of Pakistan.

**Table 3. Socio-demographic characteristics of the sample**

<b>Gender</b>	<b>Frequency</b>	<b>Percentage</b>
Male	54	15.8%
Female	288	84.2%
<b>Province</b>		
Punjab	107	31.3%
Sindh	64	18.7%
Balochistan	73	21.3%
KPK	57	16.7%
AJK	41	12.0%
<b>Age Group</b>		
Less than 30	182	53.2%
30 – 40	121	35.4%
41 – 50	24	7.0%
Above 50	15	4.4%
<b>Highest Level of Education</b>		
Masters	132	38.6%
M.Phil	166	48.5%
Phd	42	12.3%
Post Doc	2	.6%

<b>Designation</b>		
Associate Professor	3	.9%
Assistant Professor	60	17.5%
Lecturer	235	68.7%
Intern	44	12.9%
<b>Teaching Experience (years)</b>		
0 – 5	252	73.7%
6 – 10	50	14.6%
11 – 15	18	5.3%
16 – 20	10	2.9%
Above 20	12	3.5%
<b>Computer Usage</b>		
None	2	.6%
Daily	297	86.8%
Weekly	34	9.9%
Monthly	9	2.6%

#### 4.2. Attitude towards computers

Table 4 shows that the respondents of this survey have a positive attitude towards computers. Figure 1 also providing a quick view of the responses according to which we can say that most of the respondents are ready to learn more about computers. Most of them respond that computer motivates their students to do more study and it saves a lot of time and effort. Some other thinks that computers are fast and efficient means of getting information. Mostly respondents have neutral response on the statement that the computers do more good than harm because in their perception it is based on the situation. Figure 2 depicts the overall attitude of the faculty members which shows that on the average respondents have positive attitude towards computers.

**Table 4. Descriptive statistics of attitude of faculty members towards computers**

Sec B	Statement	SD	D	N	A	SA
		f	f	f	f	f
B1	Using computers allows me to be creative	18	18	36	137	133
B2	Working with computers do not isolate from other people.	31	83	65	116	47



<b>B3</b>	Using Computers saves a lot of time and effort	24	25	32	134	127
<b>B4</b>	Computers would motivate students to do more study	20	33	59	144	86
<b>B5</b>	Computers are a fast and efficient means of getting information	22	8	15	120	177
<b>B6</b>	Computers can enhance students learning	16	13	32	150	130
<b>B7</b>	Computers do more good than harm	21	22	91	134	74
<b>B8</b>	I would rather do things by hand than with a computer	38	84	88	73	59
<b>B9</b>	I would like to learn more about computers	20	3	7	35	134
<b>Total</b>		210	210	289	425	1043

SD= Strongly Disagree, D= Disagree, N= Neutral, A= Agree, SA=Strongly Agree

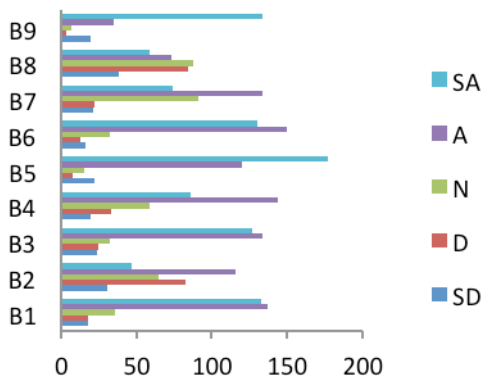


Figure 1. Attitudes of Faculty Members Towards Computers

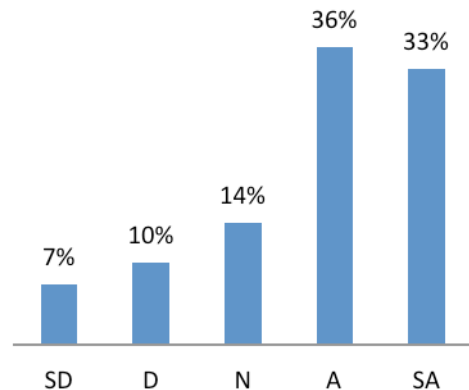


Figure 2. Overall Attitude of Faculty Members towards Computers

### 4.3. Impact of ICT on Education

Table 5 summarizes the perception of faculty members about the impact of ICT on education. The results of frequencies show that in their perception there is positive impact of ICT on education. Figure 3 also showing a quick depiction of the results from which we can see that the perceived impact of ICT on education is positive. Most of the faculty members think that it is important to use the computers in education as it improves the quality of learning but there is not enough time in class to use computers. Figure 4 shows that the overall perception of faculty members about the impact of ICT in education sector is positive.

**Table 5. Descriptive statistics of perception of faculty members about impact of ICT on education**

Section C	Statement	SD	D	N	A	SA
		f	f	f	f	f
C1	Teaching with computers offers real advantages over traditional methods of instruction	13	20	44	145	119
C2	Computer technology improve the quality of students' learning	16	11	41	156	118
C3	Using computer technology in the classroom would make the learning more interesting	15	10	27	150	137
C4	Computer use fits well into my curriculum goals	13	32	51	161	85
C5	Class time is enough for computer use	27	62	77	114	62
C6	Computer use suits my students learning preferences and their level of computer knowledge	16	29	69	167	61
C7	I have no difficulty in understanding the basic functions of computers	16	35	38	150	103
C8	Students need to know how to use computers for their future jobs	21	23	26	146	126
C9	Students prefer learning from teachers rather than computers	26	7	18	34	59
	<b>Total</b>	163	229	391	1223	870

SD= Strongly Disagree, D= Disagree, N= Neutral, A= Agree, SA=Strongly Agree

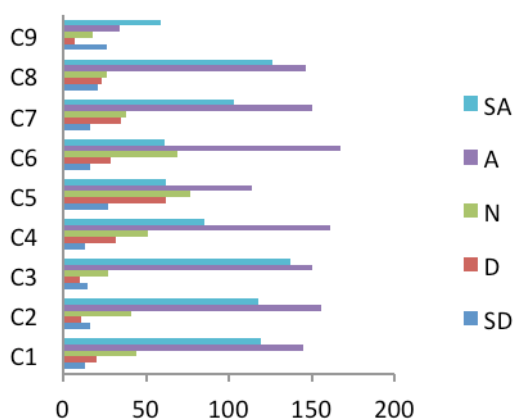


Figure 3. Perception of Faculty Members about Impact of ICT on Education



Figure 4. Overall Perception of Faculty Members about Impact of ICT on Education

4.4. Social influence

Table 6 shows that the respondents of this survey were receiving a low level of influence from other people with regards to the use ICTs. It also shows that the use of ICTs would hinder the generation from learning their traditions so other social issues that need to be addressed before implementing computers in education. Most of the respondents think that computers are making our lives easier but computers also affecting our relationships. Many participants agreed that the computers do not dehumanized the society.

Figure 5 and 6 also depicts the overall perception of the faculty members about the impact of ICTs of our social life which is found to be positive.

**Table 6. Descriptive statistics of perception of faculty members about the impact of ICT on social life**

Section D	Statement	SD	D	N	A	SA
		f	f	f	f	f
D1	Using computers would not hinder our generations from learning their traditions	27	53	98	126	37
D2	There are other social issues that need to be addressed before implementing computers in education	10	44	85	139	64
D3	The increased proliferation of computers will make our lives easier	7	39	70	171	55
D4	Computers do not dehumanize society	21	69	109	104	39
D5	Working with computers does not diminish people relationships with one other	35	90	70	123	24
D6	Computers do not encourage unethical practices	27	96	94	89	36
<b>Total</b>		127	391	526	752	255

SD= Strongly Disagree, D= Disagree, N= Neutral, A= Agree, SA=Strongly Agree

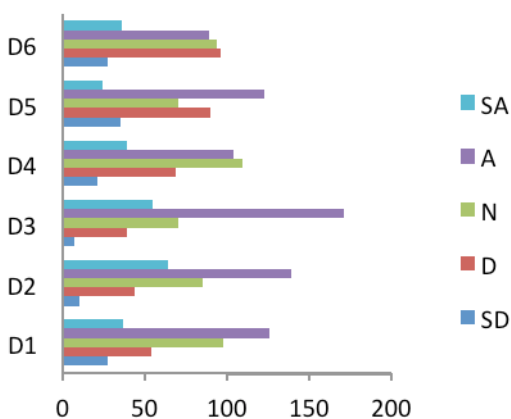


Figure 5. Perception of Faculty Members about Impact of ICT on Social Life

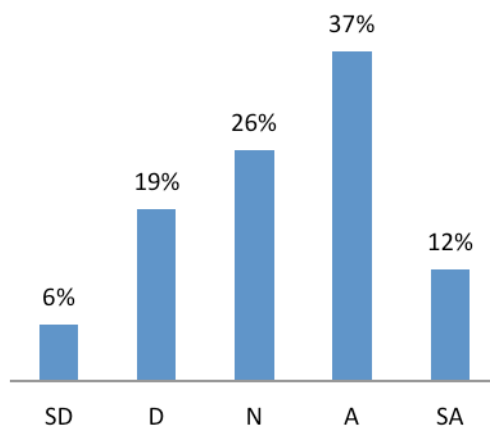


Figure 6. Overall Perception of Faculty Members about Impact of ICT on Social Life

#### 4.5. Competence level

Table 7 shows the competence level of the faculty members of Pakistan. The result shows that competence level of the faculty members is somehow at low level. Because most of the respondents could not install a software, most of them have not even idea of blogging, cannot remove viruses from their computers and most of them are not using the research profiling and referencing softwares which are most important in education and research. It is also found that they are familiar and able to operate MS Office, using search engines and electronic mails and using the internet.

Figure 7 and 8 also showing the results of competence level of faculty members of using ICTs. This shows that most of the respondents are at low level of using ICTs.

Table 7. Descriptive statistics of ICT competence level of faculty members

Section E	Statement	V.L	L	M	H	V.H
		f	f	f	f	f
E1	Install new software on a computer	39	56	91	80	76
E2	Operate a word processing, spreadsheet Presentation Software(e.g. Word, excel, p. point)	11	31	72	125	103
E3	Blogging	43	115	119	37	28
E4	Search Engines (Google, yahoo etc.)	10	13	62	117	140
E5	Select and evaluate educational software(i.e. EndNote, Latex, SPSS)	60	133	77	39	33

<b>E6</b>	Electronic Mails (Gmail, webmail, outlook etc.)	17	18	54	131	122
<b>E7</b>	Managing work by using various tools (Google drive, Dropbox, Cloud Storage etc)	58	119	73	28	64
<b>E8</b>	Overhead Projectors	21	153	73	47	48
<b>E9</b>	Use the Internet for communication (e.g., email & chatroom)	11	24	58	127	122
<b>E10</b>	Remove computer viruses	28	186	49	46	33
<b>E11</b>	Research Profiling (Academia, Linkedin, Zenodo)	54	132	79	45	32
<b>E12</b>	Referencing Citation (Endnote, Mendely, Zotero)	44	143	81	45	29
<b>Average</b>		263	468	955	1388	1029

V.L=Very Low, L=Low, M=Moderate, H=High, V.H=Very High

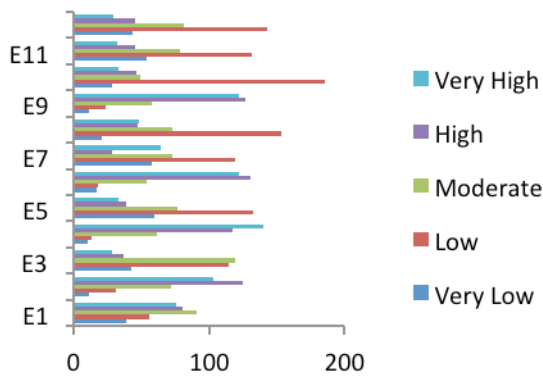


Figure 7. ICT Competence Level of Faculty Members

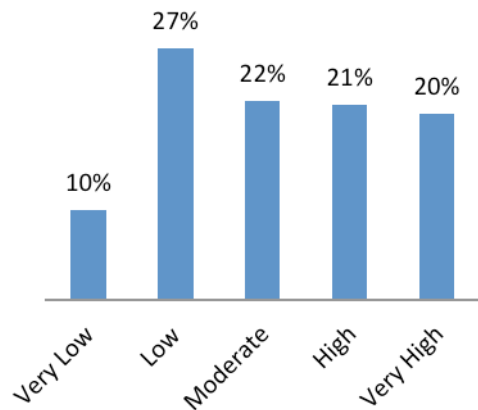


Figure 8. Overall ICT Competence Level of Faculty Members

#### 4.6. Inferential statistics results

Table 4.7 shows the output of the ANOVA analysis of the demographic factors i.e. gender, province, age group, education level, designation, teaching experience and computer usage with all variables of perceived awareness whether there is a statistically significant difference between our group means. From the results, it is clear that there is a statistically significant relationship of all described variables of perceived awareness with gender except competence level. here is a statistically significant relationship of all variables of perceived awareness with Province but the impact on education has insignificant relationship with Province. It can also be concluded that

there is a statistically insignificant relationship of all described variables with age group, education level and designation.

Table 8 is showing the findings correlation analysis of all variables of perceived awareness. Based on the results, we can conclude that all four variables of perceived awareness have a statistically significant linear and positive relationship (i.e.  $p < .001$ ). The strength of the association is high between attitude towards computers and impact on education while it is moderate for others.

**Table 8. Correlations results**

		<b>Attitude towards Computers</b>	<b>Impact on Education</b>	<b>Impact on Social Life</b>	<b>Competence Level</b>
<b>Attitude towards Computers</b>	R	1	.733**	.476**	.413**
	P-value		.000	.000	.000
<b>Impact on Education</b>	R	.733**	1	.512**	.381**
	P-value	.000		.000	.000
<b>Impact on Social Life</b>	R	.476**	.512**	1	.331**
	P-value	.000	.000		.000
<b>Competence Level</b>	R	.413**	.381**	.331**	1
	P-value	.000	.000	.000	
**		Correlation is significant at the 0.01 level (2-tailed).			

To check the effect of all three variables of perceived awareness on the attitude towards computers, we have run the multiple regressions. As a result of this R (coefficient of correlation) is found to be 0.729 which is clear evidence that the variables are strongly and positively related with the dependent variable. On the same way coefficient of determination ( $R^2$ ) is found to be 0.567 which means that 56.7% of total variations in dependent variable are explained by the explanatory variables. Table 4.15 is showing the regression test results which shows our fitted model to be

$$B = 4.63 + 0.62C + 0.19D + 0.10E$$

Where B=Attitude towards computers, C=Impact on education, D= Impact on social life and E= Competence level. It is clear from the fitted model that all the explanatory variables have positive effect on the dependent variable. More clearly if an explanatory variable increases then the dependent variable will also increase.

It can also be used to test the significance of the dependent variables. We can see that all independent variable coefficients are statistically significantly different from 0 as p-value is less than 0.05.

## Conclusion

The results show that the overall attitude of faculty members towards computers is positive. Most of the respondents are in favour of computers as they offer real advantages over traditional methods of instructions and improve the quality of students learning. Meanwhile some of them think that computers are not suitable according to their curriculum and class time is not enough for using computers.

It was also observed that they were receiving a low level of influence from other people with regards to the use ICTs and in their perception the use of ICTs would hinder the generation from learning their traditions so other social issues that need to be addressed before implementing computers in education.

The result shows that competence level of the faculty members is somehow at low level. Because most of the respondents could not install software and most of them are not using the research profiling and referencing softwares which are most important in education and research.

Finally, we can conclude that faculty members of the public sector women universities of Pakistan are aware of the requirement and significance of ICTs in education sector. They have positive attitude towards computers and age is one of the major factor which affect the attitude. Unfortunately, it is also noticed that their competence level of using computers is low. Most of them have never attended any training regarding ICTs, not even a single time. The institutions should arrange trainings regarding ICTs for them to have a competent faculty who have to shape the future of the country.

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## References

- Adu, EO, BO Emunemu, and T Oshati. 2014. "The Role of Information and Communication Technology (ICT) and Higher Education in Sustainable Development." *Journal of Communication* no. 5 (2):141-192.
- Albirini, Abdulkafi. 2006. "Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers." *Computers & Education* no. 47 (4):373-398.
- Auerswald, M, and J Magambo. 2006. "Fostering ICT use in teacher education in Africa." *Retrieved October* no. 12:2014.
- Beena, Ms, and Madhu Mathur. 2012. "A study on the ICT awareness of M. Ed. trainees." *International Journal of Business Management & Economic Research* no. 3 (4):573-578.
- Bhuasiri, Wannasiri, Oudone Xaymoungkhoun, Hangjung Zo, Jae Jeung Rho, and Andrew P Ciganek. 2012. "Critical success factors for e-learning in developing countries: A comparative analysis between ICT experts and faculty." *Computers & Education* no. 58 (2):843-855.
- Friedman, Adam, Cheryl Bolick, Michael Berson, and Erik Porfeli. 2009. "National educational technology standards and technology beliefs and practices of social studies faculty: Results from a seven-year longitudinal study." *Contemporary Issues in Technology and Teacher Education* no. 9 (4):476-487.
- Gilmore, Candace, and Charles G Halcomb. 2004. "Technology in the classroom: Investigating the effect on the student-teacher interaction." *Interaction* no. 399:221.34.
- Haag, Stephen, Maeve Cummings, and James Dawkins. 1998. "Management information systems." *Multimedia systems* no. 279:280-297.
- Hennessy, Sara, Kenneth Ruthven, and Sue Brindley. 2005. "Teacher perspectives on integrating ICT into subject teaching: commitment, constraints, caution, and change." *Journal of curriculum studies* no. 37 (2):155-192.
- Juang, Yih-Ruey, Tzu-Chien Liu, and Tak-Wai Chan. 2008. "Computer-supported teacher development of pedagogical content knowledge through developing school-based curriculum." *Journal of Educational Technology & Society* no. 11 (2).
- Kaka, Saverinus, and S Pd. 2008. "The role of ICT in education sector." *ICT in Education. Onitsha, Nigeria: Africana-First Publishers Limited.*
- Kerckaert, Stephanie, Ruben Vanderlinde, and Johan van Braak. 2015. "The role of ICT in early childhood education: Scale development and research on ICT use and influencing factors." *European Early Childhood Education Research Journal* no. 23 (2):183-199.
- Majoka, Muhammad Iqbal, Shawana Fazal, and Muhammad Saeed Khan. 2013. "Implementation of information and communication technologies (ICTs) in education course: A case from teacher education institutions in Pakistan." *Bulletin of Education and Research* no. 35 (2).



- Moon, Bob. 2004. Open Learning and ICTs: a radical solution to preparing teachers to meet the Universal Basic Education (UBE) Challenge. Paper read at Third Pan-Commonwealth Forum on Open Learning.
- Naing, L, T Winn, and BN Rusli. 2006. "Practical issues in calculating the sample size for prevalence studies." *Archives of orofacial Sciences* no. 1 (1):9-14.
- Ntshakala, Tholokuhle Thobile. 2016. *Using the technology adoption model for the modelling of teachers' technology awareness factors.*
- Rahim Sajid, Abdur. 2013. "ICTs in learning: Problems faced by Pakistan." *Journal of Research & Reflections in Education (JRRE)* no. 7 (1).
- Safdar, Muhammad Rizwan, Falak Sher, Shabbar Iqbal, Khaliq Ali Shakir, Wasif Ali, Malik Muhammad Sohail, and Sidra Saeed. 2012. "The role of information technology in education sector (A case study of Faisalabad-Pakistan)." *International Journal of Asian Social Science* no. 2 (8):1294-1299.
- Shin, Sang-Keun. 2015. "Teaching critical, ethical, and safe use of ICT to teachers." *Language Learning & Technology* no. 19 (1):181-197.
- Thanuskodi, S. 2013. "Awareness and Use of ICT among Under Graduate Degree Students of Rural Areas in Tuticorin District, India: A Study." *International Journal of Information Science* no. 3 (1):1-6.
- Wee, Mee-Chin, and Abu Bakar Zaitun. 2006. "Obstacles Towards the Use of ICT Tools in Teaching and Learning of Information Systems in Malaysian Universities." *Int. Arab J. Inf. Technol.* no. 3 (3):203-209.
- Youssef, Adel Ben, and Mounir Dahmani. 2008. "The impact of ICT on student performance in higher education: Direct effects, indirect effects and organisational change." *RUSC. Universities and Knowledge Society Journal* no. 5 (1):45-56.