Gender, subject and degree differences in university students' access, use and attitudes toward information and communication technology (ICT)

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ABSTRACT

This study reports the findings of a questionnaire survey conducted to see the gender, subject and degree differences in access, use and attitudes toward information and communication technology (ICT) of 625 students of the University of the Punjab, Lahore, Pakistan.

INTRODUCTION

Information and communication technology (ICT) has brought about a revolution in every walk of today's life. Particularly it has become an integral part of education and its impact on teaching and learning is widely accepted. In Pakistan, although the economy is still largely based on low-tech, low-value industries, but there is an awareness in government quarters of the importance of ICT in the country's development. After announcing an 'Information Technology Policy' in 2000 the public sector has initiated many projects to train manpower in the use of ICT. Educational institutions are being funded to provide with ICT equipment and Internet connectivity. The Higher Education Commission (HEC) has subscribed for all universities access to digital libraries with thousands full text journals and books. The HEC's PERN project (Pakistan Educational Research Network) is working to link all universities in the country.

Established in 1882 at Lahore, the University of the Punjab is the largest and oldest seat of higher learning in Pakistan. It has above 26,000 on campus students. There are above 5000 computers with Internet access available to university faculty and students in 64 departments. An Internet Lab with 100 terminals is also set up in the Central Library. The Internet bandwidth of 9MB is the highest in any university in Pakistan.

This study reports the results of a survey conducted to explore the gender, subject (academic discipline) and degree (graduate vs. undergraduate) differences in access, use and attitudes toward information and communication technology (ICT) of the students of the University of the Punjab.

LITERATURE REVIEW

After 2000 the widespread use of ICT among students was seen throughout the world. The low price of computers and Internet connectivity brought this technology not only to university campuses but also to the homes of students. Even middle class university students in developing countries now own computers. ICT use by students has expanded to Internet, e-mail, chat, programming, graphics, spreadsheet, online shopping, online literature searching, and other educational materials. Students' gender, age and year of study have no significant effect on their computer use and attitudes. One worth mentioning finding of recent literature is that the students mostly use ICT for general purpose, i.e., communication, word processing, entertainment, etc.

rather than educational purpose. Even students of professional subjects do not use ICT excessively for accessing educational materials. Findings of some recent studies on students' ICT use and attitudes are presented here.

Staehr, Martin and Byrne (2001) surveyed the attitudes to computers, and the perceptions of a computing career, of students enrolled in an introductory computing course at La Trobe University, Australia. Previous programming experience had a positive effect on computer confidence, and ownership of a home computer had a positive effect on computer anxiety and computer confidence. There was a gender difference in computer attitudes and perception of a computing career, with females scoring significantly lower than males on all measures.

Lau and Au (2002) asked tertiary students in Hog Kong to state what they used the home computer for. The respondents said they used computer for doing homework (89%). The other major purposes for using the computer at home were "using e-mail/ newsgroup/ sending e-cards" (83%), "surfing World-Wide Web" (79.4%), "typing/word processing" (77%) and "using ICQ/Chat room" (66.5%), downloading software/music/photos (50%). Less than 10% of respondents used the Internet for shopping and buying.

Mattheos et al. (2002) surveyed 590 students of 16 European dental schools from 9 countries. The results suggest that 60% of students use computers for their education, while 72% have access to the Internet. Students in Northern and Western Europe seem to rely mostly on university facilities to access the Internet. The same, however, is not true for students in Greece and Spain, who appear to depend on home computers. Less than half the students have been exposed to some form of computer literacy education in their universities, with the great majority acquiring their competence in other ways.

Naqvi et al. (2002) surveyed computer use amongst undergraduate medical students at the Aga Khan University, Karachi. They found that students were using computers more for word processing, data analysis, presentations and emails. The entry-level students were conducting electronic literature searches more frequently than the outgoing classes.

Seyal, Rahim and Rahman (2002) studied computer attitudes of 268 non-computing students in three technical colleges in Brunei Darussalam. The findings show that computer experience and educational qualification are associated with students' computer attitudes. In contrast, variables such as gender, age, ownership of a personal computer, geographical location of institution, and prior computer training appeared to have no impact on computer attitudes.

Havelka (2003) compared beliefs and attitudes about information technology between management information systems (MIS) majors and other business students at Miami University, Ohio. Although both groups held predominantly positive beliefs toward information technology, the specific beliefs that they held were different and those that were common had different levels of importance to the groups.

Ogur et al. (2004) surveyed students' use of computer and Internet at a Turkish military medical school. The reasons for students to use computers included hooking up to the Internet (91.9%), listening to music (70.5%) and watching videos (69.6%). The most common use of the Internet was e-mail communication (81.6%).

In a survey of 1159 medical students in Denmark, Dorup (2004) found that 71.7% respondents had access to a computer at home. Approximately 90% of students used e-mail regularly, 80% used the Internet regularly, and 60% had access to the Internet from home. Significantly more males than females had access to a computer at home, and males had a more positive attitude towards the use of computers in their medical studies.

Mizrachi and Shoham (2004) studied Israeli B.Ed students' computer attitudes. The most common computer use was word processing, followed by games, spreadsheet, Internet and programming. No significant differences were found in gender, age and year of study groups in regard to computer attitudes. However, more computer use leads to more positive computer attitudes.

Laouenan et al. (2006) studied 548 students of health schools in France. The majority was familiar with ICT for health education, 72.3% had a personal computer, 91.6% used the Internet, and 78.8% had an e-mail address.

Uribe and Marino (2006) surveyed 162 students at the School of Dentistry, University of Valparaiso, Chile to describe their use of ICT. All participants had access to a computer, and 96.4% used the Internet. Most students had home Internet connections (73.4%). The most commonly used Internet sites on at least a weekly basis were: email (92.2%); and search engines (88.3%). However, a very few (21.1%) used the Internet to search for dental information for their studies.

Smith and Oosthuizen (2006) surveyed entry-level students' attitude towards computers at two South African universities. The results showed that there is a greater appreciation of the benefit of computers, less fear of computer power, a more realistic view of computers and also a lesser impression of computer power. The conclusion is reached that less time should be spent in the syllabi on convincing students as to the benefits of computing machinery, as well as allaying fears about computing power.

Gay et al. (2006) surveyed management students at the University of the West Indies, Barbados. The majority expressed favorable attitudes to the use of ICT within the academic environment. Particularly, students were more inclined to use computers for typing assignments (92%), part of their studies (95%), supplementing other teaching activities (72%), emailing questions to teachers (90%) and distance education from home (68%). No significant gender and age differences were found on most of the attitudinal ICT statements.

Inoue (2007) studied 174 male and female students of the School of Education at University of Guam. It was found that students' attitudes toward information technology were highly positive. There were no differences in students' perceptions of computer technology experiences between females and males as well as among various academic status groups.

In Divaris, Polychronopoulou and Mattheos' (2007) study, the positive attitudes towards the necessity and value of IT for the practicing dentist as well as an important educational supplement in the dental curriculum were reaffirmed by the fact that two-thirds or more of the Greek post-graduate dental students strongly agreed with the statements for computer attitudes, whereas no negative response was given.

Teo (2008) and Teo and Lee (2008) found a high level of positive computer attitudes in higher education students in Singapore. There was no significant differences in computer attitudes by gender although male students reported more positive attitudes towards the computer than female students. Significant differences in computer attitudes were found between students who own computers at home and those who do not. Students who own a computer at home also reported a lower level of computer anxiety compared to those who do not.

A study of British students, by Conole et al. (2008), reveals that students are learning in a complex and changing environment, using a plethora of technological tools to support their learning. Computer ownership is high and students have become accustomed to being able to

electronically access information or people on demand. The data demonstrates that students are using technologies to support all aspects of their learning processes, i.e., communication with tutors and other students, keeping abreast of course administration, finding and managing learning materials, processing data, and creating assignments/ presentations.

Ghabili and Alizadeh (2008) surveyed 800 students of Tabriz University of Medical Sciences, Iran. They found that approximately 45% of medical students used computers for less than one hour per week. The most common usage of computers involved connecting to the Internet (80%). However, of the 320 students who used the Internet, a third did so for recreational purposes. Nearly 35% and 5% indicated that they connected to the Internet in order to check e-mails and read electronic newspapers, respectively, and 32% mentioned the Internet as a resource for searching for medical articles. Among these, nearly 40% visited medical sites while they were surfing the web.

Popovich, Gullekson, Morris and Morse (2008) compared attitudes towards computer usage by undergraduates from 1986 to 2005. They found that the importance and use of computers has increased dramatically over the last two decades. Males and females no longer significantly differ in their attitudes toward computers and amount of time spent using computers.

METHOD

To achieve the objective of this study a questionnaire survey was designed. Based on the literature review a data collection instrument, having questions on the access and use of ICT, was designed. A 33-item list of beliefs and characteristics related to information and communication technology (ICT) developed by Havelka (2003) was used to assess students' attitudes toward ICT. He employed nominal group technique (NGT) to develop this list. A 2-point "agree/disagree" scale was used to measure attitudes toward statements.

Fifteen students each from all 64 departments were randomly selected to participate in this study. The questionnaire was distributed with the help of the students of Master of Library & Information Science. Sixty-five percent students responded (n=625).

Gender, subject and degree were independent variables while access, use and attitudes were dependent variables. To see the significant difference in dependent variables based on independent variables Pearson chi square (χ^2) was calculated with the help of SPSS (version 12.0). The results are shown at 0.05 and 0.01 levels of significance.

RESULTS AND DISCUSSION

Of 625 respondents 45 percent are male students while 55 percent are female. Fifty-seven percent participants belong to the social sciences departments while 31 percent and 12 percent are from science & technology and arts & humanities faculties respectively. A large majority (73%) are studying in graduate classes (Master, MS/MPhil and PhD) while 27 percent are from undergraduate classes (BS, BCS, BCom, BBA, etc.) (Table1). The reason for difference in the sample is the non availability of undergraduate programs in most of the departments.

Table 1: Demographic profile of students

Variables	Percent
Gender	
Male	45
Female	55
Subject	
Arts & humanities	12
Social sciences	57
Science & technology	31
Degree	
Graduate	73
Undergraduate	27

Access to Computer

The results (presented in Table 2) show that a large majority of the respondents have access to computers at home (73%) and university (72%). The gender based analysis reveals a significant difference in male and female students on their access to computers. Seventy-seven percent female students have computers at home as compared to 68 percent male students. On the other hand, 77 percent male students have computers at university as compared to 68 percent female students. The reason of this difference might be cultural. In the Pakistani Muslim society female students are not allowed to spend more time in the university campus. They come to the campus just for class work using university buses or their fathers' or brothers' motor vehicles and hardly find time to use department or library computer labs.

Table 2: Access to computer at home and university

Access to Computer at	Percent Yes	Gender χ^2	Subject χ^2	Degree χ^2
Home	73	6.598*	1.015	5.057*
University	72	5.659*	24.602**	1.420

* Significant at p < .05
** Significant at p < .01

Subject based analysis shows a difference in computer access at university among three groups. Students from science & technology (76%) and social sciences (75%) departments have significantly more computer access at university than students from arts & humanities departments (48%). This is due to the public policy which prefers to develop science & technology with more funding and ignores humanities. The other reason might be the nature of work in humanities which does not need ICT equipment as compared to other disciplines.

Degree based results show a difference only in home access to computers. Seventy-nine percent undergraduate students have computers at home as compared to 70 percent graduate students.

ICT Use

The frequency of computer use at home and university is presented in Table 3. Seventy-eight percent students use computer at home at least a few times a week as compared to 72 percent students who use computers at the same frequency at the university. The chi square value indicates a significant difference in the frequency of computer use between male and female. More male students (82%) use computer at home at least a few times a week as compared to female students (76%). More male students (83%) use computer at university at least a few times a week as compared to female students (63%). The result clearly indicates that although female students have more home access to computer but male students are more frequent users. The reason might be other responsibilities of the female students, i.e. household, etc.

Table 3: Frequency of computer use at home and university

Frequency of use	Statistics Home	Statistics University
Almost every day	39%	33%
A few times each week	39%	39%
Between once a week and once a month	12%	11%
Less than once a month	10%	17%
Gender χ^2	9.455*	38.386**
Subject χ^2	8.484	9.444
Degree χ^2	8.388*	30.805**

* Significant at $p < .05$
** Significant at $p < .01$

No significant difference is found among three groups of students based on their academic disciplines. However, a difference is found between graduate and undergraduate level students. Graduate students (80%) use computers at home more than the undergraduate students (75%). Graduate students use computers at university more than the undergraduate students. There are 78 percent graduate students who use university computers at lease a few times a week as compared to 57 percent undergraduate students. The reason for this difference might be the nature of work of graduate students which demands more ICT use. Another reason might be more accessibility of ICT equipment to graduate students in the departments.

Use of ICT Services

The students in this study use ICT for various purposes. The most preferred service is the Internet which is used by 93 percent respondents. Eighty-five percent students use ICT for educational purposes. E-mail and word processing are used by 81 percent respondents (Table 4).

Table 4: *Students' use of ICT services*

Rank	Service	Percent Yes	Gender χ^2	Subject χ^2	Degree χ^2
1	Internet	93	4.676*	11.571**	0.553
2	Using educational material	85	1.185	3.505	0.716
3	E-mail	81	4.481*	7.045*	0.022
4	Word processing	81	0.598	1.880	0.553
5	Games	69	3.339	4.999	0.724
6	Drawing, painting or graphics	65	2.482	2.239	18.858**
7	Spreadsheets (e.g., MS-Excel)	62	1.830	2.366	11.486**
8	Other	61	0.003	2.019	1.681
9-10	Programming	60	0.028	0.848	15.330**
9-10	Chat	60	4.581*	3.811	1.681

* Significant at $p < .05$
** Significant at $p < .01$

Male and female students are not different in using various ICT based services except Internet, e-mail and chat where they are significantly different at $p < 0.05$. Male students use these services more than female students. There are 95 percent male users of Internet as compared to 90 percent female users. Similarly male users of e-mail are 85 percent as compared to 78 percent female users and 65 percent male users of chat service as compared to only 56 percent female users.

The analysis based on academic disciplines reveals significant difference in the use of only Internet and e-mail services. Students of arts & humanities are fewer users of both technologies than their counterparts in social sciences and science & technology. There are 83 percent users of the Internet in arts & humanities as compared to 94% and 93% in social sciences and science & technology respectively. Similarly only 73 percent students from arts & humanities use e-mail as compared to 80% and 87% in social sciences and science & technology respectively.

The analysis for level of degree reveals statistically significant difference ($p < 0.01$) in the use of drawing, spreadsheets and programming. The graduate students are more users of these facilities than undergraduate students. Sixty-nine percent students use ICT for the purpose of drawing, painting or graphics as compared to only 51 percent undergraduate students who use technology for this purpose. The percent scores for graduates and undergraduates regarding the use of spreadsheets are 66 and 51 respectively. Similarly 65 percent graduate students do some sort of programming as compared to only 48 percent undergraduate students.

Students' Attitudes Toward ICT

The analysis of data on 33 statements used to assess students' attitudes toward ICT (presented in Table 5) reveals that overall attitudes of the students are positive. They show their agreement with affirmative statements about ICT more than the negative statements. More than 90 percent students say 'yes' to the ability of ICT to provide access to information, help in learning new things and improve communication.

The chi square scores for male and female students show difference between two groups in 10 statements where female students are found more in favor of the statements than males. The statements on which gender has an effect include 'ICT improves communication' (female = 95%

and male = 87%), 'ICT gives us choices to know other cultures' (female = 89% and male = 84%), 'ICT provides more services' (female = 89% and male = 82%), 'ICT is a sign of development' (female = 88% and male = 79%), 'ICT can be used as an instructional tool' (female = 84% and male = 77%), 'ICT is constantly changing' (female = 86% and male = 77%), 'ICT improves our leisure time' (female = 79% and male = 70%), 'ICT ties us to machines' (female = 71% and male = 64%), 'ICT is addictive' (female = 70% and male = 52%), and 'ICT inhibits human critical thinking' (female = 61% and male = 51%).

Table 5: Students' attitudes toward ICT

Rank	**Characteristic or feature** *Information and communication technology*	**Percent Agree**	**Gender** χ^2	**Subject** χ^2	**Degree** χ^2
1	allows us to have access to more information	93	1.359	5.844	0.111
2-3	causes us to constantly learn new things	91	0.868	1.666	8.153**
2-3	Improves communication	91	12.702**	1.094	0.101
4-8	affects the quality of life	87	2.118	7.563*	0.239
4-8	allows better jobs	87	5.370*	7.106*	0.006
4-8	gives us choices to know other cultures	87	4.315*	1.264	0.029
4-8	Improves our ability to learn	87	2.895	16.110**	0.015
4-8	Makes work more effective	87	1.788	10.027**	0.239
9	Provides more services	85	6.518*	14.801**	0.282
10-13	affects the environment	84	0.063	6.528*	0.143
10-13	helps to advance science	84	0.012	1.277	0.180
10-13	makes it easier to obtain learning materials, e.g. books	84	2.744	1.311	2.377
10-13	Makes us more successful	84	0.326	25.337**	0.984
14-15	Improves work efficiency	83	3.229	9.387**	0.108
14-15	Is a sign of development	83	8.344**	1.803	0.562
16	Improves products	82	0.122	3.854	0.829
17-19	Can be used as an instructional tool	81	4.719*	3.337	1.042
17-19	Is constantly changing	81	8.356**	16.903**	2.183
17-19	Makes life more convenient	81	1.266	5.110	1.712
20	Can be used to be more organized	80	0.081	3.045	0.644
21	affects the way people behave	76	2.385	6.922*	0.006
22-23	Can be used to save time	75	1.413	4.356	0.044
22-23	Improves our leisure time	75	7.263**	10.491**	0.261
24	Makes us dependent on computers	73	1.464	1.102	2.726
25	helps us make better decisions	72	0.123	1.199	0.559
26	has a financial impact	70	2.204	0.170	0.374
27	Ties us to machines	67	4.085*	0.141	0.015
28	saves lives, i.e. medical uses	65	0.323	28.102**	0.251
29	Is addictive	62	18.925**	0.135	0.164
30	Can be used to invade our privacy	59	0.425	2.979	0.220
31	Inhibits human critical thinking	57	5.777*	2.191	5.791*
32	helps us live longer	41	0.297	2.468	5.434*
33	causes fear and anxiety in people	39	0.351	0.441	0.003

* Significant at p < .05
** Significant at p < .01

Academic subject based analysis shows difference among three groups of students regarding their opinion on 12 statements. The students belonging to arts & humanities subjects show significantly low level of agreement for eight statements as compared to the students from other faculties. These statements include 'ICT improves our ability to learn' (arts & humanities = 73%, social sciences = 90%, science & technology = 87%), 'ICT makes work more effective' (arts & humanities = 76%, social sciences = 90%, science & technology = 87), 'ICT provides more services' (arts & humanities = 71%, social sciences = 88%, science & technology = 85%), 'ICT makes us more successful' (arts & humanities = 64%, social sciences = 88%, science & technology = 82%), 'ICT improves work efficiency' (arts & humanities = 71%, social sciences = 85%, science & technology = 84%), 'ICT is constantly changing' (arts & humanities = 64%, social sciences = 84%, science & technology = 84%), 'ICT improves our leisure time' (arts & humanities = 60%, social sciences = 78%, science & technology = 75%), and 'ICT saves lives' (arts & humanities = 39%, social sciences = 67%, science & technology = 72%). The students from arts & humanities more agree (93%) to the statement 'ICT affects the quality of life' than the students from social sciences (88%) and science & technology (82%).

The ability of ICT to allow better jobs is more preferred by the students from social sciences (91%) than the students from arts & humanities (85%) and science & technology (83). The students from science & technology show their less agreement with the statements 'ICT affects the environment' and 'ICT affects the way people behave' (arts & humanities = 89%, social sciences = 85%, science & technology = 78% and arts & humanities = 76%, social sciences = 79%, science & technology = 69% respectively).

The degree level analysis shows no difference in the students' attitudes except for only three statements. Undergraduate students are more in favor (96%) of the statement 'ICT causes us to constantly learn new things' than graduate students (89%). On the other hand, students from graduate classes agree with the statements 'ICT inhibits human critical thinking' and 'ICT helps us live longer' (graduate = 60% , undergraduate = 49% and graduate = 43% , undergraduate = 33% respectively).

CONCLUSION

The results of this study mostly correspond with the same studies in other parts of the globe. The cheap ICT equipment and Internet connectivity has enabled middle and lower middle class students to enjoy the fruits of this technology. Internet and email are the most common facilities used by the students. They have very positive attitudes toward technology. One finding which is much encouraging is the use of ICT for educational purposes.

Some differences are found based on gender, subject and degree levels. Female students, although having strongly positive attitudes toward ICT, but still fewer users than males. Students from arts & humanities disciplines are not well aware of the benefits of ICT. Similarly, undergraduate students are less users of technology. The findings of this study can be useful in planning and designing better ICT facilities for female, art & humanities, and undergraduate students of Pakistani universities as well as the universities of other developing countries.

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