

## **Assessing the Potential of ICT Education at Secondary Schools in Pakistan: A Comparative Study**

**Atia Bano Memon** (Corresponding Author)

Assistant professor

Department of Computer Science, University of Sindh, Pakistan

[atia.memon@usindh.edu.pk](mailto:atia.memon@usindh.edu.pk)

**Muhammad Nawaz Tunio**

Assistant Professor

Muhammad Ali Jinnah University, Karachi, Pakistan

[mntunio@gmail.com](mailto:mntunio@gmail.com)

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### **KEY WORDS**

Assessment of ICT education, Digital literacy, ICT potential, School education, capacity development

### **ABSTRACT**

This paper corresponds to the assessment of potential of ICT education at secondary schools in Pakistan. In this esteem, paper has twofold objectives. The first and foremost objective is to assess and cross compare the students' potential towards learning ICT in public and private sector schools. In doing so, employing a variant of survey methodology comprised of orientation classes and subsequent objective type tests, the study elucidates that whilst the students at both sites demonstrate much potential and enthusiasm towards learning ICT, the potential of students of public schools is relatively much lower than the students of private schools. Accordingly, the second objective of this study is to determine the possible causes of lower potential for ICT education at public schools. In this regard, through expert interviews with the heads of schools, the study reveals several financial, human, physical, and information related factors that ground the lower potential for ICT education. As a conclusion, the study aids the government, school administration, and other education policy makers in understanding the needs of schools regarding ICT education, and provides the basis for envisaging the improvement plans and new initiatives for enhancing the ICT adoption, implementation, learning, and management at all secondary schools.

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## 1. Introduction

Within the present digital era, solid Information and Communication Technology (ICT) knowledge is mandatory, therefore, ICT education has become an important concern for education systems to prepare students for future technology trends and associated challenges. Previous research (Crawford, 1999; Pelgrum, 2001; Sang et al., 2011; Veen, 1995; Yusuf & Balogun, 2011) have stressed the importance of different factors (provincial governments, school board and management, teachers, students and their parents) towards successful and fruitful ICT education at schools. However, it is unanimously concluded that in spite the availability of adequate infrastructure, policy visions, and teaching skills; the effectiveness of ICT education highly relies on students' attitude and potential towards learning ICT (Boser et al., 1998).

The present paper is concerned about assessing the potential of secondary school students towards ICT education in a developing country of Pakistan which is an agricultural country with comparatively high illiteracy rate (Choudhry, 2006; Jafri et al., 2011). In Pakistan, education system is differentiated in public and private sectors whereby they neither deliver same quality nor maintains equality in education services. In the same way, potential and attitude of their students towards learning ICT also varies leading to varying learning output (Pritchett & Viarengo, 2013).

In this esteem, the objectives of this paper are twofold. Firstly, the paper aims to assess and cross compare the students' potential of learning ICT in public and private schools in Pakistan. In doing so, a variant of survey methodology was employed at two public and one private schools. The results elucidate that the attitude of public school students is relatively lower as compared to the private school students (cf. section 4.1). Secondly, the paper aims to spot the differentiating factors among public and private schools that ground relatively lower ICT adoption and implementation at public schools. In order to achieve this, expert interviews were conducted with heads of three private and two public schools along with personal observation of school environment, and teaching/learning facilities available therein. The results reveal differences in terms of financial, human, physical, and information resources (cf. section 4.2). As a result, the study aids the government, school administration, and other education policy makers in understanding the needs of schools regarding ICT education, and envisaging improvement plans and new initiatives for enhancing the ICT adoption, implementation, learning, and management at all secondary schools across the country.

## 2. Background

### 2.1. *ICT Education at Secondary Schools*

Nowadays, physical objects and activities are frequently mediated by ICT tools and interventions (Martin & Grudziecki, 2006) which enable the generation, formulation, and communication of information from one place to other (Kumar, 2008; Razak et al., 2019). A generation ago, these tools were merely considered as means of distance communication, but now with the proliferation and advancement of ICT applications, ICT has pervaded in all spheres (Al Sulaimani, 2010) and greatly influenced the way people live, work, and play (Abdullahi, 2014; Memon & Meyer, 2017) and has enabled the creation of many new products, services, and jobs (Kozma, 2008). Therefore, acquiring technology skills has become mandatory (Martin & Grudziecki, 2006), as they improve work efficiency and productivity (Oluwatayo, 2012) and enable to think better, master content faster, and solve problems more efficiently (Katz & Macklin, 2007). ICT skills are necessary even for learning other science, arts, humanities and language related subjects and are an important factor for transforming traditional classroom learning into a more interactive and dynamic learning environment (Čok, 2016; Lin et al., 2014). Broadly speaking, ICT literacy is proficiency in working with digital technologies to generate, collect, integrate and evaluate information (Panel, 2002). Thus, it includes the mastery of technical and cognitive skills, capability of applying these skills to problem solving (Katz & Macklin, 2007) and achieving goals (Bawden, 2008; Catts & Lau, 2008), and sense of responsibility and desire to accomplish tasks (Bratina, 2017) at homes, workplace, and society (Buckingham, 2015; Fraillon et al., 2013).

From the foregoing, ICT education has become an important concern for education systems at national and international levels. Thus, several initiatives towards reforming education systems have been designed around three complementary, yet overlapping approaches of knowledge acquisition, knowledge deepening, and knowledge creation (Kozma, 2008). There have been various ways of implementing ICT education: as standalone subject of computer literacy, as practical training on using ICT tools, and by leveraging ICT tools in teaching other mandatory subjects (Chen & Wu, 2020; Ioannidis & Garyfallidou, 2001). While there are varying perceptions regarding the most effective way (Ioannidis et al., 2001); these methods are not mutually incompatible, and thus multiple can be adopted in school curriculum simultaneously.

Regarding the ICT implementation at schools, many factors are of relevance such as school board members and coordinators, teachers, students, and

parents. According to few studies, school factors and commitment and decisions of school management are more affecting (Crawford, 1999; Solar et al., 2013), whereas others have advocated the importance of teacher factors and determined that the lack of teachers' knowledge and ICT skills, and unwillingness to adopt ICT may constitute a major obstacle in the implementation of ICT in secondary schools (Afshari et al., 2009; Pelgrum, 2001; Sang et al., 2011; Veen, 1995; Yusuf & Balogun, 2011). Increasingly, research has shown the students' attitude, motivation, and potential towards ICT has a direct positive influence on the extent of their ICT learning and application (Boser et al., 1998; Mooij & Smeets, 2001). There are a number of factors identified that influence students' attitude and potential towards learning ICT (Jan, 2018) such as computer ownership (Seyal et al., 2002), frequency and time spent on using computers (Ching et al., 2005; Hargittai, 2005), prior ICT training, education, and guidance (Brock et al., 1992; Ng, 2012; Rex & Roth, 1998), breadth of technology access (Klomsri & Tedre, 2016; Prensky, 2001; Wang et al., 2013), age (Lee et al., 2015; Reed & Giessler, 1995), gender (Attuquayefio & Addo, 2016; Houtz & Gupta, 2001), years of study (Kubiato, 2010), and proficiency in English language (Hepworth & Walton, 2013).

## ***2.2. ICT Education at Secondary Schools in Pakistan***

Until recently, only few highly developed countries have mastered the incorporation of ICT into their education systems. Whereas, developing countries including Pakistan are still struggling to compete in global marketplace and have become anxious about the widening gap between their position and the comprehensive policies of developed countries (Hepp et al., 2004).

Pakistan is basically an agricultural country whereby more than half of the country's population lives in the rural areas and illiteracy rate is very high (Jafri et al., 2011) due to the lack of awareness, poverty, weak government policies, inadequate teachers training programs, and non-punctuality (Choudhry, 2006). The education system of Pakistan is structured within five levels: a) primary - from grade 1-5, b) middle - from grade 6-8, c) high – from grade 9-10, d) intermediate – from grade 11-12, and e) university – undergraduate, graduate, and higher degrees (Hassan, 2007).

In Pakistan, two forms of school education systems are running; i.e. public sector schools and private sector schools. As, unfortunately, the budget allocation to the public schools is low in Pakistan, the private sector plays an important role in elevating the access to education in far flung areas of the country. They are thus gaining an increasing attention and popularity among

people to get quality education and meet future education challenges. Research shows that there is wide variation in the output of public and private schools (Pritchett & Viarengo, 2013). Private sector schools in Pakistan, in addition to urban areas, have substantially pervaded in rural areas as well in order to provide quality education. However, the private schools are profit oriented in nature and thus they charge very high fees which are not affordable for the low income families to get quality education. The private schools, thus, embark disparity and socioeconomic discrimination in the society (Hill et al., 2006; Save the Children, 2002). Whereas, public schools are always considered to tie the haves and have nots, and thus balance the social inequity (Harper, 2003; Warschauer et al., 2004). Accordingly, private sector schools can be established in Pakistan to complement the education system, but they cannot address all the issues causing low literacy rate in the country. Rather, they can be treated as a challenge and example by the government for the provision of quality education in the public sector schools of the country.

### 3. Research Design

Given the two-fold research objectives, the study was undertaken in two phases employing a mixed methods approach (cf. Figure 1).

Initially, a survey based research was conducted with students of two public and one private schools located in Hyderabad district of Sindh province of Pakistan. The students were selected following convenience sampling from different classes (age groups); however, an equal ratio of each class was included in order to balance any age related factors affecting students' learning. Equal number of students was recruited in each group as a) who do not have computer and internet facility at home, (b) who have computer at home but no internet facility, and (c) who have computer as well as internet facility at home. In total, 80 students (40 from each sector) were included (cf. Table 1). Successively, an orientation class was conducted regarding computer hardware, software, and computer-based communication. The class was lecture-based and multimedia and handouts were used to aid in teaching and comprehension. Afterwards, a practical training was conducted followed by an open discussion session. Following this, an objective type test was conducted whereby a pool of questions was derived from topics discussed in the class, training session, and follow-up discussion, and then a random selection of 40 questions was presented to each student. The data was analyzed through Microsoft Excel and conclusions were drawn in terms of response rate and overall test score.

Subsequently, in-depth expert interviews (Coombes et al., 2009; Kumar, 2011) were conducted with school heads to determine the possible causes of lower ICT potential at public schools. Interviews were conducted face to face

within school premises along with personal observation of school environment and infrastructure, teaching approaches, and other facilitating conditions. The school heads were contacted to participate one by one and then an interview meeting was scheduled. Data saturation was achieved after including 2 public and 3 private schools as subsequent discussion and observation points were generating similar views. Interviews were convened in semi-structured style following a grounded theory approach (Corbin & Strauss, 1990). Each interview lasted for 30-40 minutes, and began with the question ‘to what extent and in what manner, the school is teaching ICT to the students and implementing ICT in enhancing teaching and learning approaches?’ Afterwards, it continued with question probing and fact finding techniques to reveal the competencies and shortcomings of different schools. Interviews and observations were recorded in form of hand-written notes, and resultant data was analyzed following thematic data analysis approach (Bryman, 2012) through the stages of familiarization, coding, generating themes, reviewing themes, defining and naming themes and writing up as in Ullah and Ullah (2021). The final key constructs and sub-themes were identified based on repetitive terms and views across all interviews data.

Table 1

Details of survey participants of the study

Criteria	Survey data set breakdown (N=80)					
	Public schools (n=40)			Private schools(n=40)		
Sector						
Gender	Male (n=22)	Female (n=18)		Male (n=21)	Female n=19)	
Class	6 <sup>th</sup> class (n=10)	7 <sup>th</sup> class (n=15)	8h class (n=15)	6 <sup>th</sup> class (n=12)	7 <sup>th</sup> class (n=15)	8h class (n=13)
Computer facility	Without computer and internet facility at home (n=31)	With only computer facility at home (n=7)	With computer as well as internet facility at home (n=2)	Without computer and internet facility at home (n=9)	With only computer facility at home (n=12)	With computer as well as internet facility at home (n=19)

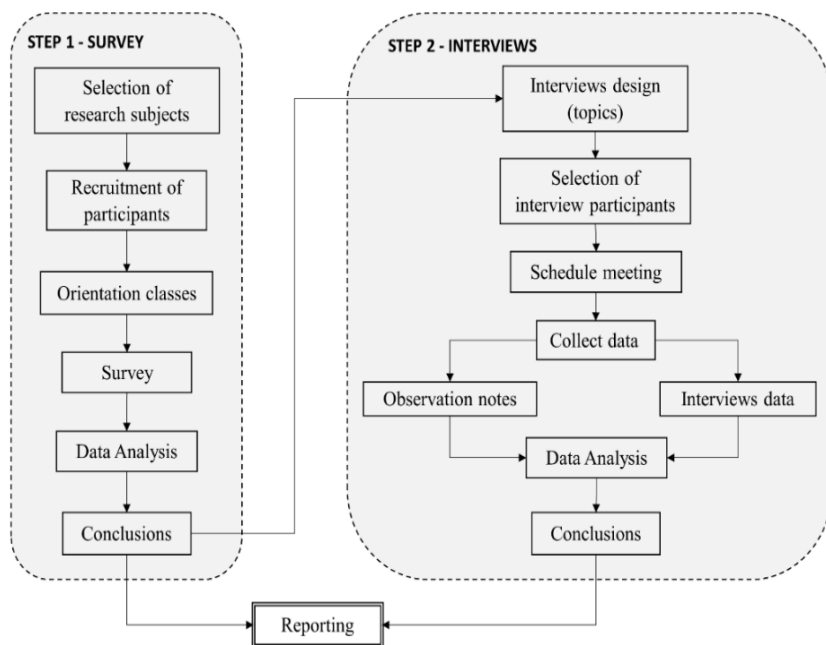


Figure 1 - Research design of the study

## 4. Results and Discussion

### 4.1. Comparative evaluation of potential of ICT education at secondary schools

Figure 2 shows the response rate meaning the percentage of questionnaire attempted by students. The response rate is measured and divided in four categories: less than average (attempting up to half of the questionnaire), average (attempting 51-60% of the questionnaire), good (attempting 61-70% of the questionnaire), and excellent (attempting 70% or more of the questionnaire). The results reveal that the response rate of public school students is relatively lower than private school students. More than half of public school students (i.e. 58%) attempted only up to half of the questionnaire. Further, as we observe an increasing number of questions, the number of attempting students declines for public schools and is only around 15% in each category. Whilst the results do indicate students' interest to some extent towards learning computers at public schools; they indicate the need for taking measures to enhance it for enabling optimum and desired ICT education. The higher number of students attempting fewer questions and the researchers' personal observations while administering tests reflect three possible shortcomings of students at public schools; the lack of knowledge

that they do not know the right answer, the lack of confidence as they decided even not to attempt the question when in doubt of right answer, and insufficient English language proficiency (as they were repeatedly asking for the meaning of words and translation of questions in local language) which made it difficult for them to understand the question and thus answer it accordingly.

In contrast, 38% of the students of private schools attempted up to half of the questionnaire. The number of students attempting questions in middle categories is almost the same as public school. However, an interesting finding is that the number of students in 'Excellent' category is very much higher than public school (i.e. 40%). This postulates that in general the potential of students at private schools is high. Furthermore, the results show almost the equal number of students who attempted less than half of the questionnaire and who attempted more than 70% of the questionnaire. This indicates that a substantial number of students have ICT and learning facilities available at home and schools (as discussed in the next section) and thus given the provisions they are motivated and possess high attitude (including knowledge, confidence, motivation, and English language skills) towards learning ICT.

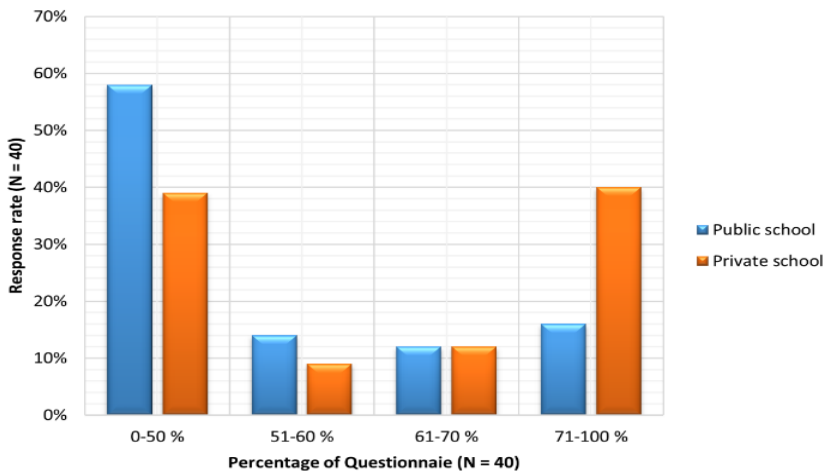


Figure 2 - Response rate of the test questionnaire

Figure 3 presents the results of summative evaluation scores for objective type test of students of public and private schools conducted at the end of orientation class. The score is organized in eight stages each with increments of 5 ranging from 0 to 40 marks. As shown the score of public schools is very much lower than the students of private schools. The score of public school



students ranges from 6 (1 student) to 30 (1 student). The test score gradually ascends from 6 (1 student) going up to 25 (14 students); however, it suddenly declines to only one student answering questions in the range of 26-30. It is interesting to note here that no student of public school was capable of answering more than 30 questions. In contrast, the test scores of students of private school are relatively high and much satisfactory. The minimum score is seen as 16 and 2 students answered more than 35 questions correct; while the majority answered around 25 questions correctly.

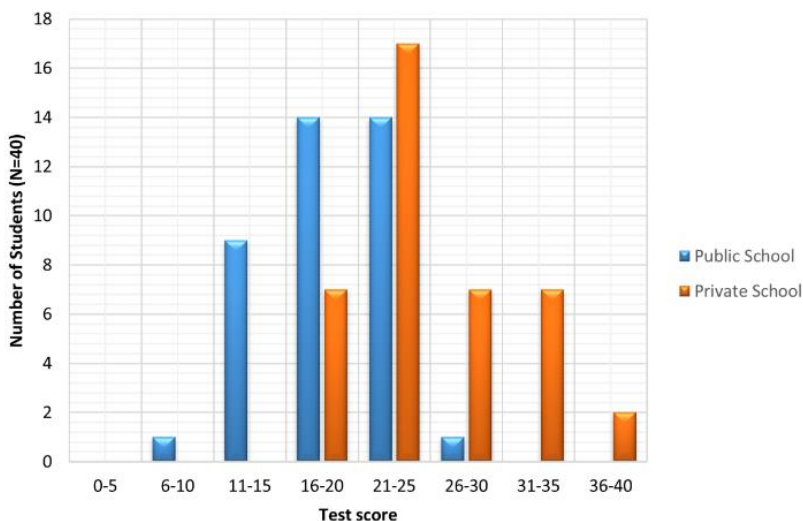


Figure 3 - Test score comparison of public and private schools

The bar chart clearly indicates a huge disparity between the potential of ICT education among students of public and private sector schools. The students of public school tend to be on lower edge (i.e. near to average at maximum) while the students of private school seem to be on higher edge (i.e. above the average in general). This is a serious concern for the educationists and policy makers of Pakistan as this largely predicts the inability of future graduates in general and of public schools in particular to compete in the work market and win suitable jobs. This also indicates that the quality of education and facilities being provided at public schools and private schools across the country are not uniform and thus there is a need to take measures to offer ICT education at public schools with the same quality and attention as is being offered at private schools.

#### 4.2. Factors Causing Lower Potential of ICT Education at Public Schools

In the light of Figures 2 and 3, the second objective of this study was to investigate the causes of lower potential of students at public schools as compared to private schools. In this realm, thematic analysis of interviews has revealed various factors that can be oriented around four categories; financial, human, physical, and information factors (cf. Figure 4).

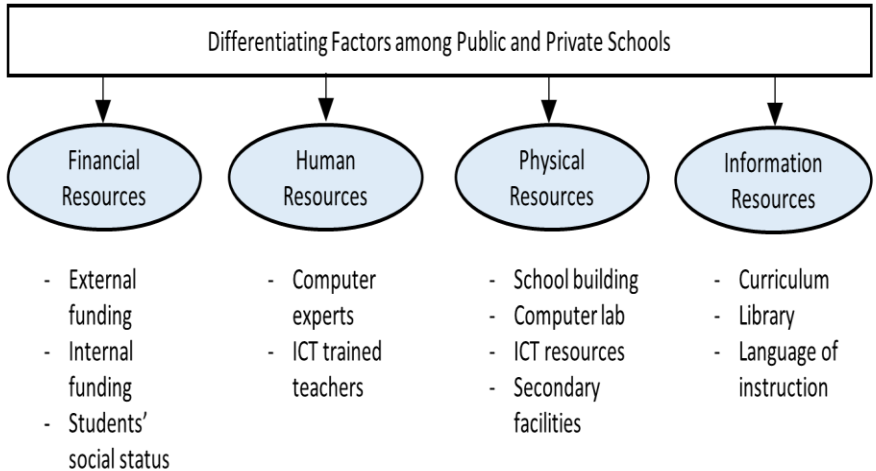


Figure 4 - Factors influencing the potential of ICT education at secondary schools

The first and foremost factor responsible for lower ICT potential at public schools is the financial resources. It was revealed that public schools mainly depend on funds allocated in annual budgets by the government and there is no any other source of revenue generation. Government funds allocated for education sector are usually less than required and are thus hardly enough to fulfill the usual school requirements such as school renovation, furniture replacement, salaries, etc. Furthermore, funds are not properly utilized due to malpractices, lack of proper policy and auditing procedures, and improper distribution at different education levels. In contrast, private schools generate enough income from students' fees and are thus capable of providing enough ICT resources at school. The adequate availability of ICT resources motivates school teachers to learn and adopt these advanced tools in teaching process and thus their teaching becomes more standardized and efficient. Besides, provision of ICT resources attracts students' interest and thus they get motivated and familiar with ICT tools.

The second obstacle responsible for lower ICT potential at public schools is the shortage of skilled human resources. In public schools, there is scarcity of

teaching staff because of fewer appointments of teaching staff and also the high rate of their absence as a result of no proper monitoring of school operations. Increasingly, teaching staff is also not capable of adopting modern ICT tools in the teaching-learning process. They are neither already trained on how to use and teach computers, nor they are offered proper training at the schools. In such situations of not having any computer literate teacher at school or any computer literate person in the families who can guide and motivate students towards ICT, the students largely remain unaware and unwilling to learn computers. In contrast, private school teachers are well equipped with ICT skills and are offered enough training for embodying recent tools and applications in the classroom. Most of students also have computer and computer literate people in family, and schools organize periodic meetings with their parents in order to share students' progress which enables the parents to know where to focus and target students' learning at home for more fruitful results of schooling.

The third category of factors hindering ICT education at public schools are the inadequate physical resources. It was observed that public school buildings are very old styled and vulnerable, and have not been renovated since constructed. The school buildings have caught no attention from government regarding their time to time renovation or even the necessary repair required to reverse the damage from any natural calamity. Furthermore, there is also a lack of basic facilities including the furniture (chairs, desks, writing boards), electricity equipment (fans, lights), cafeteria, and clean drinking water, etc. The number of enrolled students is more than the seating places available in the class. As a result, many students were seen attending class while sitting in extra on a desk or on the floor. The writing boards in class are still mainly the blackboards and they are not properly painted in black so that the writing is clear to every student. Besides, the public schools are also lacking proper science and computer laboratories. In some cases, where the schools do have a room as a laboratory, still they are lacking the useful equipment and other resources to be useful and efficient in achieving laboratory goals. As regards the computer laboratory, one of the participant schools does have a computer laboratory with 30 functional computers available. Whereas, one participant school did not have any computer laboratory available and had only one computer for the administrative use. Many public school students lack physical resources at their home also. During the survey with students, it was found that only a few students had computers at home. The majority could not afford a computer at home and thus had no experience with computers at all. Furthermore, the public schools are also lacking libraries with updated books, daily periodicals, research magazines, etc. As a result, students get very limited access to the theoretical concepts and information about recent trends and techniques in science and computers.

In contrast, the private school buildings are very well maintained and attractive. The walls are painted multi-colored and decorated with different paintings of informational messages for fostering the students' knowledge and creative thinking. Enough furniture of good quality is also available which makes students' stay and learning at schools very comfortable and interesting. Furthermore, private schools have fully equipped science and computer laboratories, and ICT resources are abundantly available that even the early age students of play groups are also provided computer for an hour just to play computer games in order to develop and enhance their interest towards computers. In higher classes, the computers are taught together with recent ICT inventions and applications in a very proper way.

The fourth set of factors inhibiting ICT education at public schools are the inadequate information sources. Firstly, the public schools are not frequently revising their curriculum, whereas the private schools are continuously updating their curriculum with recent advancements and inventions and new future oriented subjects are being added therein. As a result, the curriculum and its syllabus throughout the country are not uniform which results in vast differences in students' knowledge and skills. This turns the students passing from public schools relatively less competitive and thereby they fail to catch good employment opportunities in marketplace. Furthermore, as discussed above with regard to physical resources, the absence of a proper library with recent study material at the public schools also limits the students from gaining information about ICT. Secondly, ICT education requires a good command of English language because generally the upper case language and functions of computers are in English language. In this regard, it was observed during the survey stage with students and also from interviews with school heads that the students and teachers of public schools are not good at English language. It is thus difficult for them to learn about computers. Whereas the private school students and teachers seem to have very good command on English language as most of private schools are English medium and teachers and administrative staff are good at using English as a secondary language.

## 5. Conclusions

This paper has presented the results of a comparative evaluation of the potential of ICT education at public and private sectors schools of Pakistan. The first objective of study was to assess and cross compare the students' potential towards learning ICT at public and private schools. In this regard, through survey with students, the study has revealed that while the students at both sites show much interest and enthusiasm, the potential of students at public schools is much lower as compared to the students at private schools in terms of knowledge, available facilities, as well as confidence and capabilities (cf. Figure 2 and 3). The resulting disparity calls for serious

attention from government, school administrators, and other education policy makers to offer ICT education at public schools with the same quality and attention as is being offered at private schools in order to be able to prepare their students for competing in work market and win suitable jobs. As such, the second objective of this paper was to explore the main causes of lower potential of ICT education at public schools. In this esteem, expert interviews were conducted with school heads in concurrence with personal observations of school environment. The interviews have revealed that public schools are lagging behind private schools due to inadequate availability of financial, human, physical, and information resources (cf. Figure 4).

The present study makes several policy recommendations: 1) the current school curriculum should be revised wherein ICT education should be incorporated as a compulsory component, and a uniform curriculum should be adopted across all schools, 2) the buildings of all public schools should be properly structured and furnished with creativity and learning stimulating infrastructure as in private schools, 3) public schools should be facilitated with adequate computing facilities, 4) public school teachers should be well educated and trained for proper ICT implementation in teaching-learning process, 5) all public schools should receive adequate funds together with proper monitoring for carrying out their general as well as ICT education related activities, and 6) parents of public school students should be engaged and informed about their childrens' progress so that the students may receive enough facilities and motivation outside the school premises as well.

The study has yielded significant results concerning the potential of ICT education at secondary schools in Pakistan, however, it has some limitations which in turn present avenues of future research. Firstly, the sample size (80 survey and 5 interview participants) is apparently small; however, as all public schools are controlled at provincial and federal levels with same administrative rules and procedures, the authors are convinced that the sample size is enough to reveal important points and thereby the results are generalizable. Further investigation on a larger sample covering more schools is certainly necessary to test the comprehensiveness of findings and establish a larger evidence. Secondly, as the orientation class and subsequent test were conducted by researchers themselves, the findings are subjected to the personal biases. Also, testing students' attitude only after a single orientation class has limitations on its own. Therefore, the actual ICT teaching at schools by the concerned teachers for a substantial period of time and then a summative testing of students' potential should be done in order to verify the accuracy and credibility of conclusions drawn herein.

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