Impact Assessment of Project: Provision of Laptops to the Students of Public Sector Universities of Punjab (Pakistan)

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Abstract

Government of the Punjab (GOP) initiated a development project through which two hundred thousand (200,000) laptops were provided to meritorious students in two phases of the project along with free of cost on campus access to internet facility to cope with the challenges of the digitization brought about by the spread of Information and Communication Technology. The rationale behind the project was enhance the IT skills of students and to help students overcome the obstacles in the way of learning and professional growth in the modern times. It was envisaged that the laptops will improve the IT skills along with improvement in grades and outcomes of students'. At completion, the project was evaluated for assessment of outcomes and impact of the project on the beneficiaries. Moreover, the qualitative aspect of scheme was also analyzed, in terms of quality of laptops, warranty support, quality of internet connectivity, laptop distribution on merit and etc. Questionnaire was developed covering all the aspects of the project. Data was collected online from 3600 sampled students through Google form on a broad based methodology. Based on the data analysis, positive outcomes were observed almost in almost all quantitative and qualitative indicators defined for this evaluation. Detailed conclusions and recommendations are given in the last section of the paper.

Keywords: Punjab, development project, IT sector, laptops, Impact Evaluation.

Introduction

In this modern age, Information Technology (IT) plays a vital role (Quinonez, 2014).

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The overwhelming revolution of IT and its impact on the society has been experienced all over the world. Its role in the development and progress of any country cannot be overlooked. If rightly used, IT can be a powerful tool to propel change (Education and Manpower Bureau, 2004).

Information Technology as a tool, provides tremendous opportunities to overcome its historical disabilities and ensures leapfrog (by compressing time) to attain a position of economic strength and respect in the comity of nations. Its role has been significantly increased in the education sector. The role of Information Technology in Education is discovering the potential for technology to redefine the terms of teaching and learning (The Hitachi Foundation, 2010). The ways of education are changing as the modern world continues to grow in IT age. It is essential that students should have access to modern ways of education. So they are better prepared for the future. The students of today are the scientists, leaders, teachers, and businessmen of tomorrow. Without IT skills, these students will not have the preparation needed to survive in the future.

In most to the European public and private sector universities and colleges the entire campuses are provided wired or wireless infrastructure to provide access to information. Students are connected to the internet, e-learning and information portals through a high-speed Internet gateway. Moreover, these higher education institutions of different countries across the globe are emphasizing on the use of websites, electronic submission of assignments and online quizzes. In 2007 in Massachusetts Institute of Technology, a non-profit organization, One Laptop per Child Association (OLPC) was created with the concept of producing affordable laptops for the use of children less than twelve years in developing countries. It was observed after the OLPC model that students having long term access to the computer performed consistently well in their academic programs.

Context of the Study

In very context, it was planned by the Government of the Punjab to equip two hundred thousand (200,000) meritorious students in phase-I & II of the project entitled "Provision of Laptops" (Planning Commission Proforma-I, 2012-13). Further, it was also planned to provide free of cost on campus access to internet facility, where needed, to prepare them to cope with the challenges of the digitization brought about by the spread of IT. The rationale behind the provision of thousand laptops along with access to World Wide Web was to help students overcome the obstacles in the way of learning and professional growth in the modern times. Moreover, it was also envisaged to create IT skills and awareness among the students and teachers. The government's investment

in students, through direct subsidy in the shape of free laptops, is a public investment in human capital and a mean for ensuring better and competitive educational opportunities. It is an initiative to encourage and reward merit based achievers towards a larger goal of national economic development. The both phases of laptop scheme are continuation of many such efforts that has been done in the past around the world to overcome the digital divide.

Upon completion this project assigned to Directorate General Monitoring & Evaluation (DGM&E), Planning & Development Department, for the evaluation. The detailed, in-depth evaluation was conducted by the team of DGM&E.

Objectives of the Study

To measure pre versus post impact of the intervention (provision of laptops), the indicators were derived from the objectives mentioned below:

- Change in grades of students before and after the laptop
- Change in IT skills (operating system) before and after the laptop
- Change in IT skills (MS office) before and after the laptop
- Change in IT skills (Software proficiency) before and after the laptop
- Change in IT skills of families of beneficiaries before and after the laptop
- Change in computer usage time before and after the laptop
- Change in internet usage time before and after the laptop
- Satisfaction Level on the quality of laptop
- Satisfaction level on the specification of the laptop
- Satisfaction Level on the warranty claim
- Satisfaction on fairness of distribution criteria
- Average income level of beneficiaries
- Gender analysis
- Quality and functionality of laptop

Review of Literature

The role of IT in various sectors had been explored by various researchers. A meta-analysis of findings from 254 controlled evaluation studies revealed that computer-based instruction (CBI) created positive effects on students (Kulik & Kulik, 1991). They further explained that CBI programs raised student examination scores by 0.30 standard deviations in the average study, a moderate but significant effect. Sivin-Kachala & Biala (1994) reviewed 133 research studies to evaluate the effect of technology on learning and achievement. They concluded that students in

technology rich environments experienced positive effects on achievement in all major subject areas. Moreover, education technology had been found to have positive effects on students' attitudes toward learning and their own self-concept. Hill (1999) also identified that as information technology became advanced, it resulted in increasing opportunities, options and strategies for education. (Hill, 1999). A study conducted by Furneaux (2004) presented evidence that information technology affected changes in the methods, purpose and the perceived potential of education. (Furneaux, 2004)

On the other hand, Yusuf (2005) in his paper presented an analysis of the Nigerian National Policy for Information Technology. The analysis revealed that the policy was not adequate to impact positively on the Nigerian education system. (Yusuf, 2005)

Grinager (2006) investigated that the use of technology in education provided students with technology literacy, information literacy, capacity for life-long learning and other skills necessary for the 21st century workplace. (Grinager, 2006)

A study was conducted by Jumhur, Riza, Reynolds, & Olcay (2007) to find the opinion of undergraduate students on the role of the information technology (IT) in higher education. The analysis of the responses had shown, the students strongly agreed that computer labs, personal computers, internet and IT tools were necessary components of successful education. (Jumhur, Riza, Reynolds, & Olcay, 2007)

Negi, Negi, & Pandey (2011) explored that IT tools had some relative advantages as compared to conventional modes of information sharing. It was investigated that the combination of education and technology was the main key to human progress as it affected the methods, the purpose and perceived potential of education. Safdar, et al. (2012) found that about 91.7% of the respondents signified the information technology as vital for educational development (Safdar, et al., 2012). The research findings by Higgins, Xiao, & Katsipataki (2012) using experimental and quasi-experimental designs indicated that well use of technology to support teaching and learning made the difference. (Higgins, Xiao, & Katsipataki, 2012)

On the Other hand, Toni Mora and Joseph Oriel (2018) analyzed the impact of a "One Laptop per Child Program", introduced by the Catalan Government on student achievement in secondary education during the period 2009–2016. In contrast to the previous studies, the empirical results of this research consistently indicate that this program had a negative impact on student performance in the subjects of Catalan, Spanish, English and mathematics. Test scores fell by 0.20–0.22 standardized points, which represent 3.8–6.2% of the average test score. This negative effect was stronger

among boys than it was among girls (differences ranging from 10% to 42%). (Toni Mora, 2018)

Methodology

A well designed methodology was developed for this research followed by development of questionnaire, pre-test the questionnaire to validate questionnaire and for estimating response rate, determination of sample size for the survey, data collection and analysis, finalizing findings, conclusions and recommendations.

Questionnaire Design

The questionnaire was specially designed to cater all relevant information from primary beneficiaries of the project or scheme in the framework of objective indicators. The questionnaire contained questions pertaining to the participant's general information, income level, institution, grades and IT skills before and after the use of laptop. The questionnaire was broadly divided in three parts, i.e. i) Demographics, ii) Students' satisfaction and iii) Improvement in academics/IT skills as mentioned below;

Section - I (Demographics)

Name, institution, field of study, city, gender, age, income of head of family, telephone number which is used as unique ID in data analysis.

Section - II (Participant's Satisfaction over laptop)

Functioning, working, quality, warranty support, software provision, fairness of criteria of laptop distribution among students

Section - III (Change in academic grades and IT skills)

Type of previous computer, preparation of assignments, academic percentage (before and after use), improvement in overall IT skills, skills of operating systems, skills of MS Office, advanced software knowledge, internet and surfing skills, family IT awareness.

Pilot survey was conducted to validate the question and estimate the response rate for the probable survey.

Determination of Sample Size

Mwanzia suggested that calculated sample size should truly represent the population and should consider accuracy, confidence level, response rate, variability and population of survey (Mwanzia, 2014). Sample size for this evaluation was calculated by using the following formula.

$$n = \left[\frac{\dfrac{P(1-P)}{\dfrac{A^2}{Z^2} + \dfrac{P(1-P)}{N}}}{\mathrm{R}} \right]$$

Where, n is the sample size determined by the aforementioned relationship. 'N' is the number of people in the population. 'P' is the estimated variance for the population of survey, which was slightly high in our case as the population was slightly heterogeneous therefore taken as 70% i.e. 0.7. 'A' is the desired precision level of survey which is expressed as decimal in the formula and in this case it was taken as 5% i.e. 0.05. 'Z' is the required confidence level of the survey and its value is different for different levels. For 95% confidence level value of Z is 1.96 and for 99% confidence level, its value is 2.578. Since, high confidence level was required, so 99% confidence level was used for sample size calculations. 'R' is the response rate of the audience in the population which is given the questionnaire to fill and came out to be 50.5% on the basis of pilot survey. Since, the survey was conducted online, as described in next section therefore, response rate remained low. 'N' is the number of studied population and in our case, as describe above the population of survey was 200,000 since laptops were distributed to around 200,000 students of two phase of the project.

$$n = \left[\frac{\dfrac{0.7\,(1-0.7)}{\dfrac{0.5^2}{2.5758^2} + \dfrac{0.7\,(1-0.7)}{200,000}}}{0.5} \right]$$

$$n = 3600.033 \approx 3600$$

Data Collection

There were 200,000 beneficiaries of the project/scheme which were geographically dispersed. Therefore, an online survey, on Google Docs, was conducted to collect data from representative samples. The online survey link was shared with the Registrars and Vice Chancellors of the public universities and educational institutions in which laptops were distributed through E-mail to get the responses from the students. As described above that a sample size of 3600 students was selected for this evaluation and accordingly responses of 3600 students randomly selected (beneficiaries of the scheme) were recorded and automatically saved in Database developed by evaluating organization i.e. Directorate General Monitoring and Evaluation (DGM&E), Planning and Development Department, Govt. of Punjab (Pakistan). The recorded data was

further analyzed statistically for the evaluation of the scheme. Descriptive statistical analysis was made using Statistical Package for Social Sciences (SPSS).

Results & Discussions

By analyzing the data of responses, the following findings were made in terms of each indicator.

Skills of Operating Systems (Windows, Linux, etc.)

It was observed that after the initiation of this scheme IT skills of the students regarding operating windows and LINUX etc. has been improved significantly as depicted in figure 1.
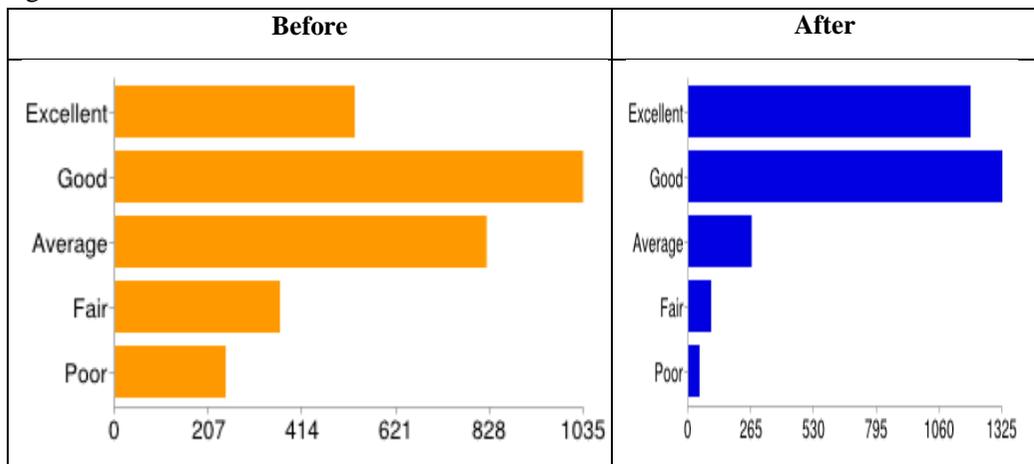
Figure 1: *Improvement in uderstanding of Operating System*

MS Office (Word, Excel, Power Point, Access) Skills

The data shows that the proficiency/expertise of participants in MS office has been improved after the intervention of the laptop scheme. The percentage on excellent and good scale has been increased from 22% to 35% and 37% to 44% respectively Table 1.

Table 1: *Improvement in understanding and know how of MS Office*

	Before			After	
1	Excellent	22%	1	Excellent	35%
2	Good	37%	2	Good	44%
3	Average	24%	3	Average	14%
4	Fair	11%	4	Fair	4%
5	Poor	6%	5	Poor	2%

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Advanced Software Skills of in Professional Field

Twelve percent (12%) of the student replied that they had already excellent skill on advanced tools / software. But after the initiation of the scheme 35% students had excellent skills on advanced tools / software, which is increased by 23%. On the other had before launching the scheme13% students had poor skills on advanced software but after the free laptop scheme it is observed that this percentage has been decreased up to 4 %,Which shows that student capabilities on advanced tools / software are gradually increasing as shown in Figure 2.
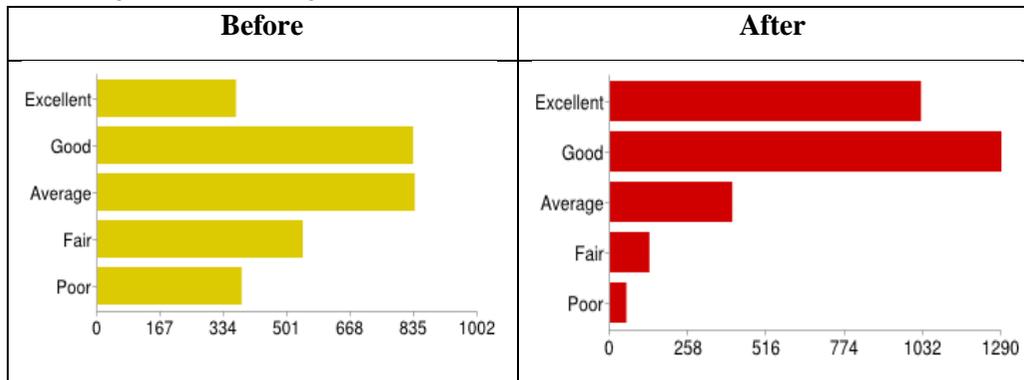
Figure 2*: Improvement in Advanced Software Skills*

Monthly Cumulative Income of Students' (sampled project beneficiaries)

The statistics revealed that a considerable percentage of students who received laptops under this project belonged to lower and middle income class families. Figure 3 shows that 35% of the students belong to families having monthly income less than Rs. 10,000 per month, while 48% belong to families having monthly income between Rs. 10,000 to 40,000 per month as shown in figure 3. Data was collected in 2013-14.


Up to Rs. 10,000 per month	35%
Rs.10,000 - 40,000 per month	48%
Rs. 40,000 – 70,000 per month	12%
Rs.70,000-100,000 per month	3%
Above Rs.100,000 per month	2%
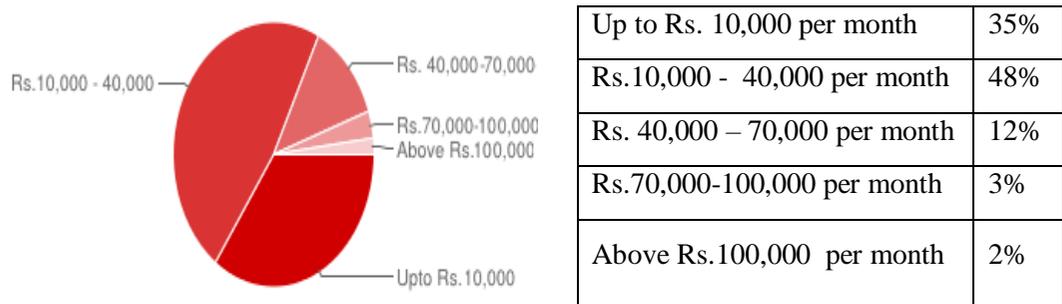
Figure 3: *Representation of students' house hold income*

Change in IT Awareness / Skills of Family

After the feedback from respondents it is observed that not only IT skills of students' was improved but IT skills and awareness of student's families was also improved significantly from 13% to 31%. Moreover, percentage of students was remarkably reduced having poor IT skills of family from 14% to 3% as shown in figure 4.

Before	**After**
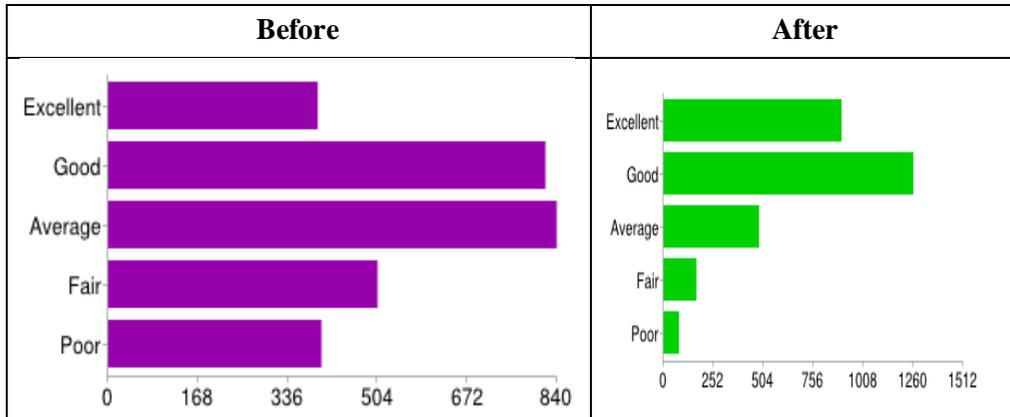
Figure 4: *Change in IT skills of students' family after getting laptops*

1	Excellent	13%
2	Good	28%
3	Average	28%
4	Fair	17%
5	Poor	14%

1	Excellent	31%
2	Good	44%
3	Average	17%
4	Fair	6%
5	Poor	3%

Changes in Students' Grades (pre and post laptop)

Laptops were given to the students' on the basis of selection criteria based approved in PC-I i.e. percentage of marks secured in last semester or exam should be more than 70% and 60% for semester and annual system respectively. Therefore, at the time of award of laptops results of students was recorded. At the time of evaluation, question was asked about the percentage of marks obtained by the students in the last semester or exams after award of laptops. Analysis and comparison of both (pre and post) results show that that student's overall class grading / percentage was improved as mentioned in figure 5 below. Before the award of laptops, 10% students secured more than 85% marks in their last semester, however, after one year of award of laptop i.e. at

the tie of evaluation, 12% students falling in sample size secured more than 85% marks in their semester / annual exam results.

Before			After		
1	60%	**10%**	1	60%	**11%**
2	60-65%	**10%**	2	60-65%	**8%**
3	65-70%	**12%**	3	65-70%	**10%**
4	70-75%	**19%**	4	70-75%	**16%**
5	75-80%	**21%**	5	75-80%	**23%**
6	80-85%	**18%**	6	80-85%	**19%**
7	>85%	**10%**	7	> 85%	**12%**
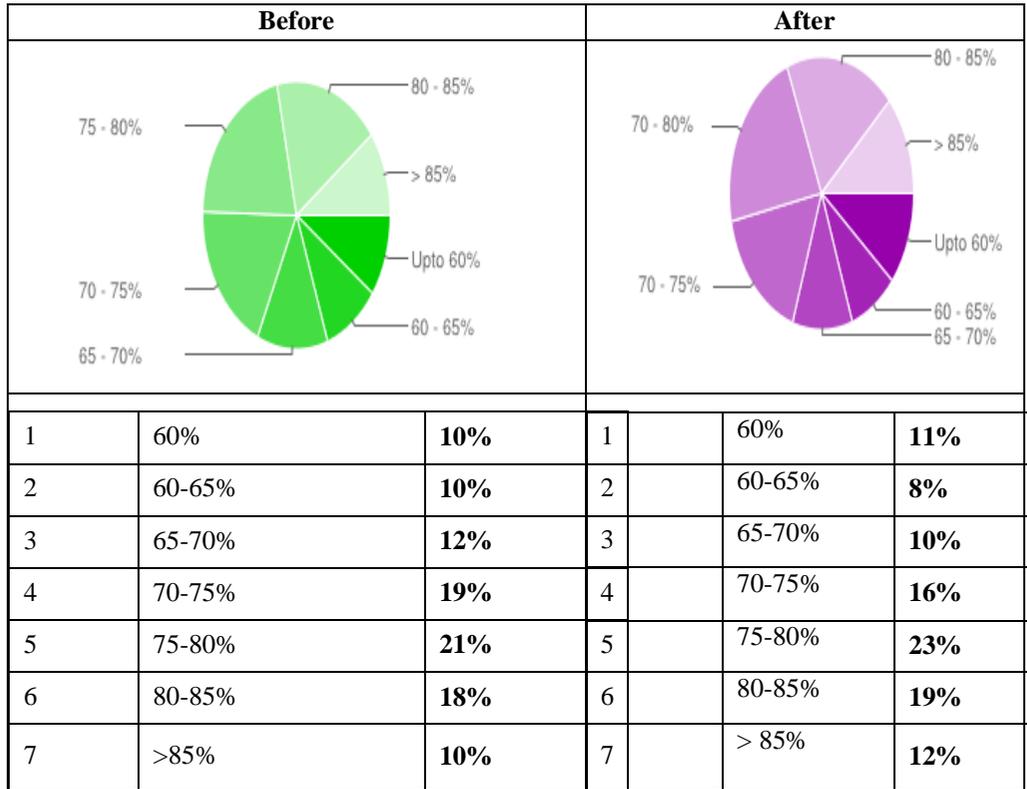
Figure 5: *Comparative analysis of change in grades of students before and after laptops*

Satisfaction on the Quality of Laptop

Quantitative analysis was also made to find the satisfaction level on the quality of laptops provided to   The Figure 6 shows that a
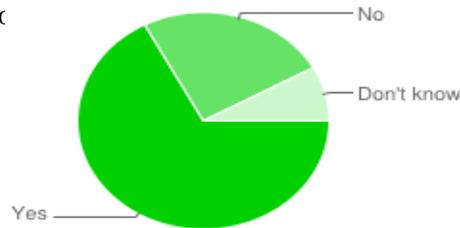
Yes(68%) No (24%) Don't know (8%)

Figure 6: *Satisfaction level over the quality of laptops*

Significant percentage of students i.e. 68% are satisfied with the quality of laptop while 24% students are not satisfied with the quality of laptop.

Fairness of the selection criteria for the Distribution of Laptops

In response of the above stated question, 82% students replied that selection criteria for distribution of laptop was fair which reveals the transparency of the scheme and participants confidence in it while and 13% are of the opinion that merit and selection criteria was not fair as shown in figure 7.
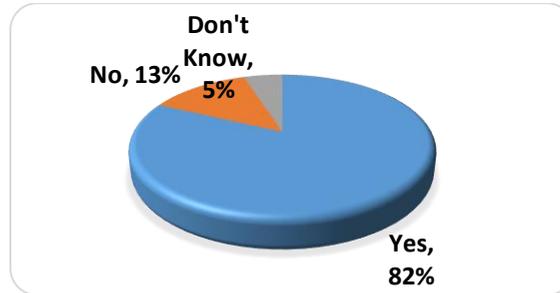

Figure 7: *Satisfaction over Laptop distribution criteria*

Which computer you had before this scheme?

The figure 8 shows that before the intervention of the scheme majority of the students were using desktop computers i.e. 63%. It is pertinent to mention that a very low percentage of the students were having laptops before the intervention of the scheme i.e. only 14% as shown in figure 11. Laptops far overweigh desktop computers in terms of benefits and perks because of the power bank (battery) system and portability they have. Students carry their laptops to their classrooms, libraries and other places for assistance in their academic activities. Because of internet service available in the universities, student s use laptops for preparing notes in their classrooms and their assignments while sitting anywhere in the university campus. Thus, there are many chances that laptops will improve knowledge and learning capabilities of students as compared to desktop computers.


Laptop (14%) Desktop (63%) None (22%)
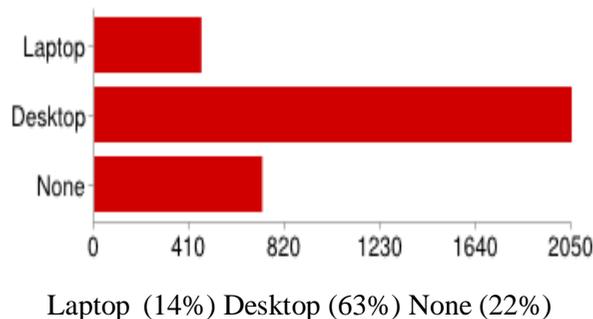
Figure 8: *Types of Computer already used before this Scheme.*

Preparation of Class Assignments

As analyzed and mentioned in figure 9 that a high percentage of students i.e. 71% used laptop computer for the preparation of assignments. Therefore, it has been observed that provided laptop under the project has made things easier for the students in terms of improvements in digitization, IT skills and by and large preparation of class assignment as shown in figure 9.
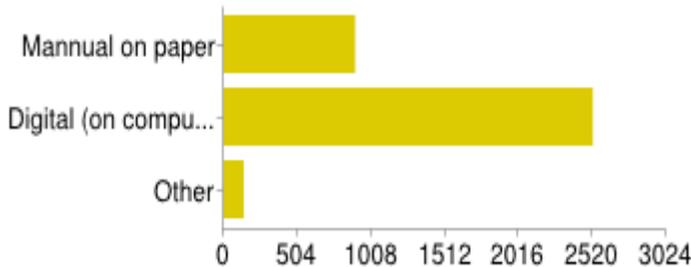
Manual/Paper (25%) Digital/computer (71%) Other (4%)

Figure 9: *Mode of Assignment Preparation*

Satisfaction on the specification of Laptops and fulfilment of the academic needs of students

Figure 10 shows that a considerable majority of students i.e. 83% are satisfied with the specification of laptops. This shows that the machine provided to the students is compatible with the prevailing standards/trends of the market.
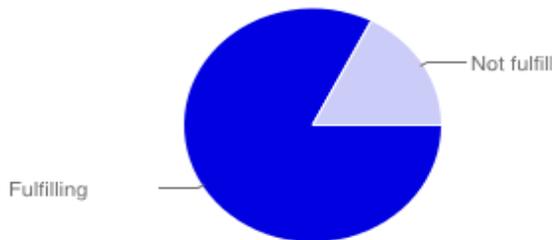

Fulfilling (83%) & Not Fulfilling (17%)

Figure 10: *Satisfaction over the specification of Laptop*

Satisfaction of the working / functionality of laptops

Figure 11 shows the satisfaction of participants regarding the working and functioning of laptops. The results show that a good percentage of students have shown their satisfaction over the working and functioning of laptops. However, a significant

number of students (21%) were not satisfied with quality, working and functionality of laptops.
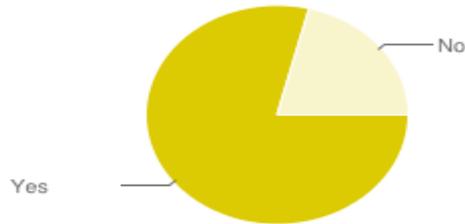
Yes (79%) & No (21%)

Figure 11: *Satisfaction over the functioning of laptop*

Satisfaction on the Warranty Support of Laptops

Figure 12 shows the satisfaction of the participants over the warranty provided by the company. The statistics shows a mixed trend of responses. The reason could be that some proportion of the students is not much familiar with the warranty provisions of the company. But still a fair amount of students are satisfied with the warranty of the machine provided.
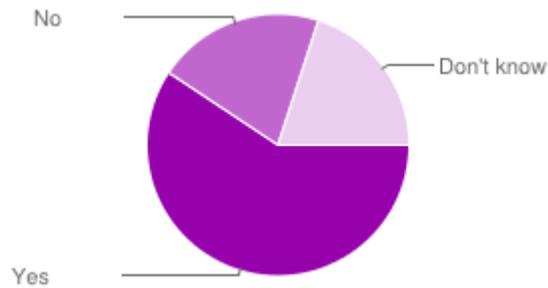

Yes (59%), No (21%) & Don't Know (20%)

Figure 12: *Satisfaction over the warranty support of the Laptop*

Gender Analysis

The Figure 13 shows that a high percentage of male participants i.e. 61 % participated in the survey while 39 % of female students took part in assessment survey of project titled "Provision of laptop".

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Male (61%) & Female (39%)
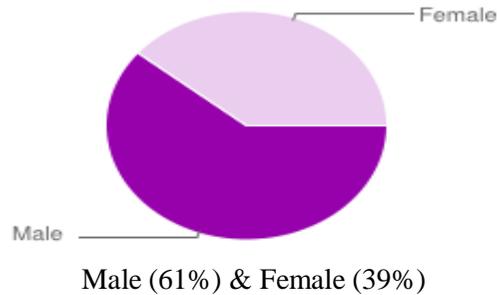
Figure 13: *Gender wise participation of students in the survey*

Conclusion and Recommendations

Almost in all parameters, the positive change and impact was observed including grades of students, IT skills (operating system and MS office), gained knowledge as an indirect measure of computer and internet usage time. Majority of students' showed satisfaction on the quality of laptops, specification of the laptop, warranty claim, fairness of distribution criteria of laptops among students. Not only IT skills of the individual students were improved but also IT skills of their families were also enhanced. Majority of students are now preparing their assignments in digital form which is a positive move. Laptops are again fulfilling their requirements as responded by 83% of sampled students. After having laptops, grades of the sampled students were improved which may be due to the following factors and co-relation may be developed in this regard during further studies.

Further studies may be conducted to exactly find out the reasons for improvement in students' performance, however, followings factors may be considered and linked for this improvement.

- Internet and laptop / computer usage was increased so it is presumed that students acquired more knowledge and skills and that enhance students' performance and grades.
- Laptops are helping the students to learn the course material through internet surfing through web browsing. It has also been observed that due to provision of laptops, students are using computer and internet more than they used before getting laptops.
- Due to battery backup time, students may be working in downtime of load shedding to learn their course material or doing class assignments.
- Easy using of internet for research work, convenience for writing and editing of research assignments and better presentations.

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Gender analysis showed equitable distribution of laptops between males and females. Majority of the students were satisfied with the selection criteria for the provision of laptops therefore, it may be concluded that true merit was adopted for n accordance to predefined criteria given in project documents. Similarly, around 83% students were those whose family cumulative income was less than PKR 40,000 per month therefore, it may concluded that the laptops were distributed I majority of the cases to the beneficiaries from middle income families and seems to be best use of the resources among middle class and left behind segment of the society with meager opportunities. It is pertinent to mention here that not only IT skills of the students, who received laptops under the project, were improved but also significant positive change and improvements were observed in the IT skills of the other family members of students after receiving and usage of laptops. It is positive step that after getting laptops, majority of students are making their assignments on laptops which is way forward for digitization and advancement in technology.

Government should take necessary action to improve the quality of laptops and the support provided by vendors in term of warranty in next phases of same project of similar projects. Economic return of the scheme is not possible in that case where laptops are provided to the students of public universities who already possessed laptops. There were 14% such students were found in the survey. Therefore, a strategy may be developed for those students already having laptops in future similar schemes. Future studies may also be conducted to study the impact on income / earnings of beneficiaries with the provision of laptops in their professional jobs since more than 8 years have been passed after the completion of first phase of project and majority of students, who received laptops under this project must be working in their respective fields.

Acknowledgment

References

Education and Manpower Bureau. (2004). *Information Technology in Education-Way Forward.* Hong Kong: Education and Manpower Bureau. Retrieved 1 17, 2015, from http://www.info.gov.hk/archive/consult/2004/wayforward-e.pdf

Furneaux, C. (2004). How does Information Technology impact the methods, potential and purpose of education? *ETL Conference.* Australia: Griffith University Logan Campus.

Grinager, H. (2006). How Education Technology Leads to Improved. *Education Issues*. Washington DC, USA: National Conference of State Legislatures. Retrieved 1 18, 2015, from http://www.ncsl.org/portals/1/documents/educ/item013161.pdf

Higgins, S., Xiao, Z., & Katsipataki, M. (2012). *The Impact of Digital Technology on Learning: A Summary for the Education Endowment Foundation.* Durham: Education Endowment Fund. Retrieved 1 17, 2015, from http://educationendowmentfoundation.org.uk/uploads/pdf/The_Impact_of_Digital_Technologies_on_Learning_FULL_REPORT_(2012).pdf

Hill, M. (1999). *The Impact of Information Technology on Society.* London: Bowker Saur.

Jumhur, Riza, A., Reynolds, K. M., & Olcay. (2007). The Role of Information Technology in Higher Education: Motivation and Enhancement of Student Learning. *4th International Silk Road Symposium* (pp. 219-227). Georgia: International Silk Road Symposiumm. Retrieved 1 17, 2015, from http://silkroad.ibsu.edu.ge/previous/fourth/8_02.pdf

Kulik, C., & Kulik, J. A. (1991). Effectiveness of Computer-Based Instruction: An Updated Analysis. *Computers in Human Behavior, 7*, 75-94.

Negi, P. S., Negi, V., & Pandey, A. C. (2011). Impact of Information Technology on Learning, Teaching and Human Resource Management in Educational Sector. *International Journal of Computer Science and Telecommunications, 2*(4), 66-72.

Planning Commission Proforma-I. (2012-13). Provision of Laptops Phase-I & II. Lahore, Government of the Punjab, Pakistan.

Quinonez, N. (2014, 5 23). *The Importance of Information Technology and Its Disadvantages.* Retrieved 1 17, 2015, from Udemy: https://www.udemy.com/blog/importance-of-information-technology/

Safdar, M. R., Sher, F., Iqbal, S., Shakir, K. A., Ali, W., Sohail, M. M., & Saeed, S. (2012). The Role of Information Technology in Education Sector (A Case Study of Faisalabad - Pakistan). *International Journal of Asian Social Science*, 1294-1299. Retrieved 1 17, 2014, from http://www.aessweb.com/pdf-files/ijass%20pp.%201294-1299.pdf

Sivin-Kachala, J., & Biala, E. R. (1994). *Report on the Efectivenes of Technology in Schols, 1990-1994.* New York: Interactive Educational Systems Design. Retrieved 1 18, 2015, from http://0-files.eric.ed.gov.opac.msmc.edu/fulltext/ED371726.pdf

The Hitachi Foundation. (2010). *The Role of Information Technology in Education.* Retrieved 1 17, 2015, from The Hitachi Foundation: http://www.hitachifoundation.org/our-work/business-and-work-grants-program/initiatives/past-initiatives/24-the-role-of-information-technology-in-education

Toni Mora, J.-O. E. (2018). Computers and students' achievement: An analysis of the One Laptop per Child program in Catalonia. *International Journal of Educational Research,*, 145-157.

Yusuf, M. O. (2005). Information and Communication Technology and Education: Analysing the Nigerian National Policy for Information Technology. *International Education Journal, 6*(3), 316-321.