

FACTORS INFLUENCING SUCCESSFUL IMPLEMENTATION OF ONE LAPTOP PER CHILD PROJECT IN PUBLIC PRIMARY SCHOOLS IN RWANDA: A CASE OF GASABO DISTRICT.

RITA KABANYANA

Jomo Kenyatta University of Agriculture and Technology,, Kigali, Rwanda.

Dr. MIKE IRAVO (PhD)

Jomo Kenyatta University of Agriculture and Technology,, Juja Kenya.

Nkechi Euginia

Jomo Kenyatta University of Agriculture and Technology,
Kigali, Rwanda.

ABSTRACT

Education sector in Rwanda has undergone a major transformation due to amongst other factors, changing patterns of curriculum delivery and technological innovations. One of such initiatives is the IT curriculum implementation to primary schools which is a key development pillar in line with Vision 2020. The introduction of one laptop per child to public primary schools in Rwanda has been a long-term development since inception in year 2008. This study sought to assess the factors influencing implementation of one laptop per child project in public primary schools in Rwanda; a case of Gasabo District. The independent variables in the study included procurement procedures, financing issues, teacher's capacity, and power supply. Cross sectional descriptive design was adopted in this study. The study specifically targeted head teachers and teachers of public primary schools in Gasabo District as well as the education officials of MINEDUC. The study adopted cluster sampling to pick the head teachers and teachers from the sectors in Gasabo District. However, simple random sampling was used to select the head teacher, ICT teacher and the finance officer; one head teacher and three regular teachers; from every sampled school; giving a total of 180 respondents. The study used a semi-structured questionnaire for the teachers and an interview guide for the officials. The researcher used both qualitative and quantitative analysis. The variables were subjected to correlation analysis and the Software Package for Social Sciences (SPSS) was used to analyze data. Frequency distribution tables and percentages was adopted to present the data. The relationship between the variables will be tested using the Pearson's correlation technique. Ethical issues related to the study will be addressed by maintaining a high level of confidentiality of the information given by the respondents. From the findings, the researcher thus concluded that procurement procedures, financial constraints and teacher's capacity had the major impact on implementation of the laptop project. Since the value of R square is less than 50%, the researcher deduced that the proportion of variation associated to the independent variables had a moderate effect. Some of the factors mentioned by the MINEDUC officials as hindering the implementation of the process include political interference, corruption, poor oversight, procurement bottlenecks, and lack of funds, poverty, laptop security, electricity and rampant impunity. Out of the listed factors, the main cause of slow implementation of the laptop project according to most respondents was corruption and rampant impunity. An important finding is that the explanatory variables in the model result in the direct influence on the implementation of the school laptop project. Study recommends that: the government of Rwanda strengthens the POA (procurement oversight authority) to come up with mitigation measures to control the external factors that interfere with procurement procedures and processes for the laptop project with a possible measure to cushion the entire laptop project from international monetary fluctuations; political control and moderation

Key words: procurement procedures, financing, teacher's capacity, power supply, one laptop per child, Project Implementation.

1.1 Introduction

Information and Communication Technology (ICT) is an effective educational technology tool which promotes dramatic changes in teaching and learning processes (Brittain, 2011). The use of ICT offers powerful learning environments and can transform the learning and teaching process so that students can deal with knowledge in an active, self-directed and constructive way. Friedman (2006) posits that present ICT is considered as an important means to promote new methods of instruction (teaching and learning). It should be used to develop students' skills for cooperation, communication, problem solving and lifelong learning (Voogt, 2003).

Like many educational reform efforts, the introduction of technology in schools has been less than successful. Over the last century there were several waves of massive investment in technology to improve education, but none has had significant lasting impact on education (Zhao, Pugh, Sheldon & Byers, 2002). Despite the generous investment in, and increased presence of, computers in schools (Becker, 2000; Cattagni & Farris, 2001), computers have been found to be unused or underused in most schools (Cuban, 2001). Through evaluations of several educational technology initiatives, especially the Boulder Valley Internet Project in America, Sherry (2007) found that teachers generally go through four distinct stages as they develop expertise with the Internet and the World Wide Web: a learning and adoption trajectory. In other words, a cyclic process in which teachers evolve from learners to adopters of educational technology, to co-learners and, finally, to a reaffirmation or rejection decision.

Prior experience with ICT in education has demonstrated that integration of ICT into the traditional school curriculum, especially in developing countries, is not always a smooth process (Tabb, 2008). High costs, infrastructural issues, improper training and familiarization of teachers and students, inappropriateness of the technology to local conditions and other factors hinder ICT adoption and integration efforts in developing countries. Cristia et al., (2012) suggest that middle and higher-income countries may benefit from laptop projects provided they lay a good foundation, but poor countries should aim lower.

In 2005, Nicholas Negroponte, the founder of OLPC, announced the launch of the XO to the World Economic Forum (WEF) (Luyt 2008). Shortly thereafter OLPC began selling the laptops directly to governments, who would distribute them to primary school students with the help of their national deployment teams (Luyt 2008), with Rwanda joining in 2007. At the beginning, Negroponte sought OLPC manufacture and distribute 100 million laptops at 100USD apiece to the world's poorest children. By 2010 the website announced that approximately two million laptops had been distributed to more than thirty countries (at about 188USD each), the five largest deployments being in Uruguay, Peru, Argentina, Mexico, and Rwanda. For countries signing on to the program, the appeal of OLPC rests mainly in two things: the cost of the laptop, which although is greater than the anticipated 100USD price tag is much more affordable than most other laptops on the market, and the potential for the laptop to aid in the improvement of childhood education in poor countries.

The introduction of computers in schools in Malaysia recorded serious challenges in the curriculum, teaching practices, reallocation of resources, and even rearranging the fundamental structure of the schools (Merrow, 2005). Besides the inherent resistance to change, schools are also said to have a structure that prevents wide spread uses of computers. Collins (2006) in his reflective essay on his experience with the

Apple Classroom of Tomorrow (ACOT) project cites limited classroom space, bulky computers, teachers' unwillingness to take the students to the lab, and lack of access to computers at home as factors that limit the use of technology in schools in Ghana.

Rwanda's Vision 2020 which was published in 2000, outlining an agenda to transform the country into a medium-level, knowledge-based economy by the year of 2020. Due to the lack of sea-access and few natural resources, it was acknowledged that ICT would have to play a central role in this transformation. The Vision 2020 plan declare ICT as crucial in two out of six main areas; among them education, where an increased use of computers in schools hope to improve ICT skills among the young. Based on such expectations, the Rwandan government has collaborated with the One Laptop per Child (OLPC) association, a non-profit US-based organization focused on the creation of educational tools for use in the developing world. Together they have initiated a project to deploy "low-cost, low-power, connected laptops with content and software designed for collaborative, joyful, self-empowered learning" in primary schools around Rwanda. As of 2013, the project had distributed over 115,000 computers in primary schools across the country and with the aim of having half a million of the laptops distributed, and at least one million by 2017.

One Laptop per Child (OLPC) founder Nicholas Negroponte has constantly fought against the perception that poor countries have no business investing heavily in laptops. Negroponte strongly believes that the OLPC program is essential to bridge the yawning digital divide existing between the developed and developing world, and children should

not be denied an opportunity to interact with technology due to their economic status (Valiente, 2010). One Laptop per Child projects from other countries, especially developing countries with conditions almost similar to Rwanda, hold valuable lessons on

how to successfully implement, what challenges to expect and how to tackle them. Therefore, there is a vibrant need to assess the importance of the OLPC project in enhancing Public primary education in Rwandan context. Hence this research will be focused on factors influencing implementation of one laptop per child project in public primary schools in Gasabo District, Rwanda.

1.2 Statement of the Problem

Access to educational opportunities is not only important for adopting and adapting ICTs to promote economic growth, but ICTs can also improve the quality of education a country provides. The education sector in Rwanda has undergone a major transformation due to amongst other factors, changing patterns of curriculum delivery and technological innovations. One of such initiatives is the IT curriculum implementation to primary schools which is a key development pillar in line with Vision 2020. The introduction of one laptop per child in public primary schools in Rwanda where OLPC pilot project was officially launched in the country in 2008. Since 2007 the Government of Rwanda has invested a lot in the OLPC to the extent 4000 laptops have been distributed to 52 public primary school in Gasabo District.

The Government of Rwanda embarked on a One-Laptop-Per-Child (OLPC) ICT program which was one of the initiatives in their 'Vision 2020' blueprint. They envisioned a Rwanda with every child in school having a laptop and enriching its new generation with ICT skills. The OLPC project in Rwanda, being one of the largest ICT projects to date in the country, inevitably faced many challenges

Rolling out of laptops in primary schools require training of teachers and students, skills to supply a technical infrastructure, and maybe most importantly, an ability to support and maintain these on a continued basis. There are questions about the viability of the project about availability of electricity, security of the laptops, teacher's capacity, and the educational impact of the computers in terms of improved test scores by school children, of which many doubts have been raised borrowing examples from other countries.

To be successful, the one laptop per child (OLPC) experiment cannot end at the distribution of the laptops to the countries. There is a myriad of further logistical problems, as well as implementation and adoption hurdles to overcome. From a purely logistical view, the laptops must be transported within the country to the students, probably using existing textbook distribution methods. The "bitfrost" security features on the laptop require some effort (and ideally Internet connections) to activate the laptops, but this hinders mass theft of the machines (Buchele, 2009).

Research on integration of technology in education prior to launching large-scale laptop projects is scarce, not just in Rwanda but in other implementing countries as well. The dearth of research disadvantages one-to-one computing projects manifold: governments are oblivious to public demands even as they spend large amounts of taxpayers' money, while stakeholders are not sure what exactly to expect from these projects and how to contribute. Without research, both government and citizens lack the necessary knowledge about the intricacies and complexities of projects of such magnitude, and may find it difficult to initiate and sustain them. Therefore, this study seeks to establish the factors influencing implementation of one laptop per child project in public primary schools in Gasabo District, Rwanda.

1.3 Objectives of the study

1.3.1 General objective

The general objective of the study was to establish the factors influencing implementation of one laptop per child project in public primary schools in Gasabo District, Rwanda.

1.3.2 Specific objectives

The specific objective of the study was:

1. To determine the influence of procurement procedures on implementation of one laptop per child project in case of Gasabo District.
2. To examine the influence of financing on the implementation of one laptop per child project in case of Gasabo District.
3. To examine the influence of teacher's capacity on the implementation of one laptop per child project in case of Gasabo District.
4. To assess the influence of power supply on the implementation of one laptop per child project in case of Gasabo District.

1.4 Research questions

The following research questions guided the study:

1. How do procurement procedures, influence the implementation of one laptop per child project in case of Gasabo District?
2. What is the influence of financing on the implementation of one laptop per child project in case of Gasabo District?
3. How does teacher's capacity influence the implementation of one laptop per child project in case of Gasabo District?

4. How does power supply influence the implementation of one laptop per child project in case of Gasabo District?

2.0 Literature Review

2.1 Conceptual Framework

Mugenda and Mugenda (2003), define a conceptual framework as a hypothesized model identifying the concepts under study and their relationships. It is a set of broad ideas used to explain the relationship between the independent variables (factors) and the dependent variables (outcome) (Coulthard, 2004). The conceptual frame work of this study is based on four variables namely;

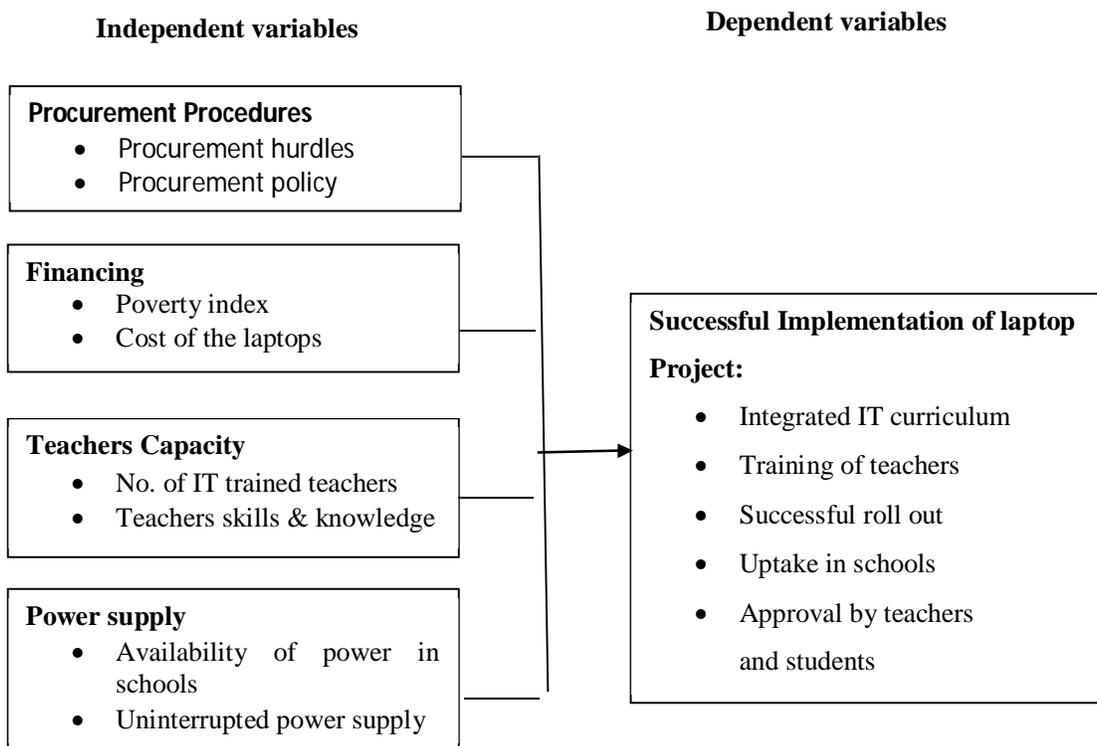


Figure 2.1: *Conceptual framework*

According to Mugenda and Mugenda, (2008) Conceptual framework involves forming ideas about relationship between variables in the study and showing these relationships graphically or grammatically. Therefore, it is used in research to outline choices or to present a preferred approach to an idea or thought.

3.0 Methodology

3.1 Research design

Cross sectional descriptive design was adopted in this study. This design was suitable for this study because it involves collection of cross-sectional data at one point in time. It did not require time series over several monitoring rounds of data. Zikmund (2003) says surveys provide quick, inexpensive, efficient, and accurate means of accessing information about the population. According to Kothari (2004), descriptive research studies are concerned with describing the characteristics of a particular individual or group of people.

3.2 Target population

A population refers to an entire group of individuals, events or objects that have a common observable characteristic (Orodho, 2003). A population describes the parameters whose characteristics the research will attempt to describe. The population for this study will be the education officials in Gasabo District. The study specifically targeted head teachers, ICT teacher and the finance officer of public primary schools in Gasabo District that has the programme of OLPC as well as the education officials of MINEDUC. In Gasabo 52 public primary schools received 4000 laptops. Therefore, for purpose of this study a total of three officials were selected from each school and Ministry of education officials in Gasabo district. Hence the total target population will be 180 respondents

3.3 Sample size and sampling procedure

Sampling is defined as the process of selecting several individuals for a study in such a way that they represent the larger group from which they are selected (Mugenda & Mugenda, 2003). The study adopted cluster sampling to pick the head teachers, ICT teacher and the finance officer in each school with OLPC programme in Gasabo District. The study purposively picked the ministry of education officials implementing the OLPC project in Gasabo District.

A sample size of respondents was determined from a total population of 180 individuals using the formula by Yamane (1967).

$$n = \frac{N}{1 + N (e)^2}$$

Where:

n = the desired sample size

e= probability of error (i.e., the desired precision, e.g., 0.05 for 95% confidence level)

N=the estimate of the population size.

$$n = \frac{180}{1 + 180 (0.05)^2} = 125$$

3.4.1. Sample Frame

Sampling frame is a list of all the population subjects that the researcher had targeted during the study. Using the Yamane's formula, the proportions of the sample size the computed sample strata are shown in Table 3.1

Table 3.1: Sampling frame

	Target population	Proportion
Head teachers	52	36
ICT teachers	52	36
Finance officer	52	36
MINEDUC officials	24	17

Total	180	125
--------------	------------	------------

4.0 RESEARCH FINDINGS AND DISCUSSION

4.1 Implementation of the One laptop per child

The study sought to determine the factors that influence the implementation of the school laptop project. The four factors studied include procurement procedures, financing issues, teacher’s capacity and electricity supply.

4.1.1 Procurement Procedures and One laptop per child

The study sought the view of the respondents regarding procurement factors that derail the one laptop project implementation

Table 4.2: Procurement Procedures and the implementation of One Laptop Per Child project

Statements	1	2	3	4	5	Mean	Std. Dev
A Specific procurement policy is available for use in the One Laptop Per Child project	27.27%	45.45%	27.27%	0%	0%	2	0.77
Previous procurement attempts for the laptop project have been very successful	0%	9.09%	18.18%	36.36%	36.36%	2.7	1
There are no reported cases regarding procurement bottlenecks for laptop project	45.45%	36.36%	9.09%	9.09%	0%	1.8	0.98
Previous court cases have delayed supply and delivery of procured goods and services for the laptop project	54.54%	27.27%	18.18%	0%	0%	2.6	0.81
Current procurement policy does not engage all the stakeholders	27.27%	54.54%	9.09%	9.09%	0%	2.0	0.89

Vested interests cause procurement

delays rather than policy

17.31%	64.51%	18.18%	0%	0%	2.4	0.79
--------	--------	--------	----	----	-----	------

From the findings presented in Table 4.5, the respondents agreed that a specific procurement policy is available for use in the One laptop per child implementation, the mean was 2. This is in line with the government procurement regulations to ensure cost cutting and increased efficiency. The respondents were also asked to rate if previous procurement attempts for the laptop project have been very successful. They disagreed. The mean of the responses was 2.7 denoting disagreement; checks and balances are essential to ensure right applications to the procurement processes and the eventual tender

award of the entire laptop project. Asked whether budget there are reported cases regarding procurement bottlenecks for laptop project, respondents agreed; the mean response was 1.8. This is in line with high procurement stakes associated with the implementation of the laptop project. Court injunctions are a slowing factor to project implementation in any organization. The respondents answer to previous court cases having delayed supply and delivery of procured goods and services for the laptop project had a mean of 2.6 which denoted neutrality. Slightly more than half of the respondents agreed that court cases have delayed supply and delivery of procured goods and services with the rest being neutral or disagreeing.

Another factor was that the current procurement policy does not engage all the stakeholders; the study sought to establish whether it was an important factor to consider

in successful laptop project implementation. The mean was 2, indicating that the respondents believe that current procurement policy does not engage all the stakeholders.

Making stakeholders more accountable involved and in control can help increase laptop project procurement success. Asked whether procurement delays are caused by vested interests rather than policy, the mean was 2.4 indicating that respondents agreed. This basically implies that political interests override strategic plans thus leading to flawed procurement procedures and corruption that result in serious delays.

4.1.2 Financial Constraints and the One laptop per child

Table 4.6 presents findings of perception on financial constraints factors that derail the one laptop per child project implementation;

Table 4.3: Financial Constraints and the implementation of One Laptop Per Child project

Statements	1	2	3	4	5	Mean	Std. Dev
The poverty levels in this area slacken the laptop project	72.27%	27.27%	0%	0%	0%	1.2	0.47
The school fund is not adequate to cater for the laptop project	27.27%	36.36%	27.27%	9.09%	0%	3.1	0.99
The laptops recommended for the project are too expensive	0%	0%	0%	81.82%	18.18%	4.8	0.4
The software associated with the project is too expensive to maintain	72.27%	27.27%	0%	0%	0%	1.3	0.47
The cost associated with repairing and servicing the laptops is high	36.36%	45.45%	18.18%	0%	0%	4.2	0.75

All the respondents strongly agreed that the poverty levels in the area slacken the laptop project implementation. The mean score was 1.2 denoting strong agreement. Asked whether the school fund is not adequate to cater for the laptop project, the mean score was 3.1 denoting neutral. The respondents strongly disagreed that the laptops recommended for the project are too expensive, the mean score was 4.8. Asked whether the software associated with the project is too expensive to maintain, the respondents strongly agreed; with a mean of 1.3. However, the respondents disagreed that the cost associated with repairing and servicing the laptops is high; the mean was 4.2.

4.1.3 Teacher Capacity and the One laptop per child

Table 4.7 presents findings of perception on procurement factors that derail the one laptop per child project implementation; a more detailed discussion of the findings is presented later.

Table 4.4: Teachers Capacity and the implementation of One Laptop Per Child project

Factor	Response	Percent	Valid	Cumulative
Teachers are properly trained in the basic IT skills	Yes	19.35%	19.35%	19.35
	No	80.65%	80.65%	100.00
Majority of the teachers are equipped with the I	Yes	32.26%	32.26%	32.26
	No	67.74%	67.74%	100.00
Teacher's capacity determines the success of the	Yes	87.10%	87.10%	87.10
	No	12.9%	12.9%	100.00
Trained under supervision of instruction for the laptop	Yes	32.26%	32.26%	32.26
	No	67.74%	67.74%	100.00

From the findings above, over 80% of the respondents declined that teachers are properly trained in basic IT skills, thereby casting doubt on the success of the One laptop per child

implementation since the teachers are one of the core implementers of the laptop project. When asked whether majority of the teachers are equipped with IT curriculum, more than half of the respondents (67%) declined implying that most of the teachers are not well equipped with the IT curriculum. This further casts doubt on the laptop project readiness hence implementation.

Majority of the respondents (87%) confirmed that indeed teacher's capacity determines the success of the laptop project, with only a small number (12%) declining. However, only 32% of the respondents had been personally trained under supervision of instruction for the laptop project indicating that over half of the respondents were not adequately prepared to offset the laptop project.

4.1.4 Electricity and the One laptop per child

This section was meant to establish the electricity challenges to school laptop implementation.

Table 4.5: Electricity and the implementation of One Laptop Per Child project

Statements	1	2	3	4	5	Mean	Std. Dev
Lack of power supply in this area slackens the laptop project	27.27%	54.54%	27.27%	0%	0%	1.9	0.7
The school runs on a generator which is not adequate for the laptop project	58.06%	41.94%	0%	0%	0%	1.5	0.52
Frequent power interruptions in the area affect the laptop project	27.27%	36.36%	27.27%	9.09%	0%	3.1	0.91
The area is inaccessible for power lines and cannot support the laptop project	54.54%	18.18%	27.27%	0%	0%	3.1	0.94
Frequent power surge and power outs impair the laptops	9.67%	80.64%	6.46%	3.23%	0%	2.1	0.6

The respondents agreed that the lack of power supply in an area slackens the laptop project; the mean response was 1.9, denoting agreement. The respondents strongly agreed that indeed some schools run on a generator which is not adequate for the laptop project; the mean score was 1.5. Good organizational leadership involves analysis of value addition by any new project. Asked if the frequent power interruptions in the area affect the laptop project, the respondents were not sure; the mean response was 3.1 denoting that they were neutral. The respondents disagreed that the area is inaccessible for power lines and cannot support the laptop project, the mean score was 3.1 denoting disagreement. However, when asked if frequent power surge and power outs impair the laptops, the mean score was 2.1 denoting agreement. This implies that electricity is a very important factor in Laptop project implementation.

4.4 Regression analysis

Table 4.9 below presents the regression analysis.

Table 4.6: Regression model summary showing the combined effect

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.790 ^a	.780	.680	.235

a. Predictors: (Constant), Procurement procedures, Financial constraints, Teachers capacity, Power supply

According to results in above Table 4.9, factors discussed influencing implementation of one laptop per child project in public primary schools in Gasabo District, Rwanda where (R=0.790) with all factors (Procurement procedures, Financial constraints, Teachers capacity, Power supply) contributing (78%) of the implementation of one laptop per child project in public primary schools.

Table 4.7: Regression analysis showing the combined effect

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.194	.050		1.887	.061
	Procurement procedures	.587	.036	.062	1.923	.001
	Financial constraints	.251	.040	.850	20.790	.000
	Teachers capacity	.293	.034	.079	2.449	.015
	Power supply	.196	.026	.010	.363	.020

a. Dependent Variable: Implementation of one laptop per child project

Using linear regression analysis from SPSS data bases, the factors were regressed to find out how they influenced implementation of one laptop per child project in public primary schools in Gasabo District, Rwanda.

$$=0.194+0.587x1+0.251x2+0.293x3+0.196x4$$

The beta coefficients give the rate of deviations or change on the dependent variable (implementation of the laptop project) that was produced by a change on the independent variables. Here, procurement procedures

take a lead with 0.587 deviation followed by teachers capacity at 0.293, then financial constraints at 0.251 and power supply at 0.196. The researcher thus concluded that procurement procedures, financial constraints and teacher's capacity had the major impact on implementation of the laptop project.

5.0 Conclusion

The number of female respondents was higher than that of their male counterparts. This was not purposive or preplanned but occurred randomly. Approximately most of the respondents (75%) were below 40 years thus young and with a fast hand grasp on IT related issues since the introduction of ICT training in the teacher training colleges is a recent phenomenon. Approximately all of the respondents were literate and with a fast hand grasp on IT project implementation.

Based on the results of the regression analysis, procurement procedures take a lead followed by teacher's capacity, then financial constraints and power supply in terms of deviations on the implementation of the laptop project. The researcher thus concluded that procurement procedures, financial constraints and teacher's capacity had the major impact on implementation of the laptop project. However, since the value of R square is less than 50%, the researcher deduced that the proportion of variation associated to the

independent variables had a moderate effect

5.1. Recommendations

1. This study recommends that: the government of Rwanda strengthens the POA (procurement oversight authority) to come up with policies to control the external factors that interfere with procurement procedures and processes for the laptop project with a possible measure to cushion the entire laptop project from international monetary fluctuations.
2. The study further recommends that the Ministry of education develops a policy framework that outlines the readiness indicators for each primary school with regard to the laptop project implementation. Conclusively, government should implement policies that will check on procurement policy manipulation, regulate political interference through infrastructural development and improved standards of management.
3. This study also recommends the introduction and critical analysis of theories relating to One laptop per child implementation in primary schools in third world countries with the focus being on ICT school readiness theory, ICT stakeholder involvement theory and ICT financing theory.
4. In terms of practice, the study recommends that the Ministry of education approaches the laptop project with political goodwill, proper organization, and workable timeframe. Moreover, the government should build the capacity of the teachers to better prepare them to handle the new ICT curriculum. Creation and strengthening of an independent public institution to monitor project time lines and even provide framework for handling delayed projects in Rwanda just like the National Bank of Rwanda does to banks would go a long way in enhancing the laptop project implementation. Also, electricity roll out to rural schools should be enhanced in order to ensure preparedness, involvement and acceptance of the One laptop per child.

6.0 REFERENCES

1. Akpan, P. (2000). Africa in the age of a global network society. *African Studies Quarterly*, 4(2).
2. Al-Bataineh, A., Anderson, S., Toledo, C., & Wellinski, S. (2008). *A Study of Technology Integration in the Classroom. International Journal of Instructional Media*, 35,381-387.
3. Becker, H. J. (2000a). Findings from the Teaching, Learning, and Computing Survey: Is Larry Cuban Right? *Education Policy Analysis Archives*, 8(51), 2-32.
4. Berman, B.J. & Tettey, W.J. (2001). African states, bureaucratic culture and computer fixes. *Public Administration and Development*, 21, 1-13
5. Brand, G.A. (1998). What research says: Training teachers for using technology. *Journal of Staff Development*, 19(1), 10-13.
6. Bregman J and Stallmeister S (2002). *Secondary Education in Africa: Strategies for Renewal*. Africa Region Human Development Working Paper Series, Washington, DC.
7. Brown, E., & Hyer, S. (2010). *The Effects of Ubiquitous Procurement on Technology Learning Projects: A Systematic Review*.
8. Cattagni, A. L., & Farris, D. (2001). *What factors facilitate teacher skill, teacher morale, and perceived student learning in technology-using classrooms?* *Computers & Education*, 39, 395-414.
9. Chandra, G. A. (2008). *Teacher Adoption of Technology: A Perceptual Control Theory Perspective*. *Journal of Technology and Teacher Education*, 9(1), 5-30.
10. Chen, C. (2008). *Why do teachers not practice what they believe regarding technology integration?* *Journal of Educational Research*, 102 (1), 65-75.
11. Collins, B. (1996). *Using technology to support education reform*. Washington, DC: Office of Educational Research and Improvement.
12. Collins, M.P., & Berge, Z.L. (2003). *Using instructional design for faculty development in a post-secondary, technology-enhanced environment*. *Educational Technology*,43(6), 21-27.
13. Compeau, D.R., & Higgins, C.A. (1995). Computer self-efficacy: Development of a measure and initial test. *Management Information Systems Quarterly*, 19(2), 189-211.
14. Cristia, P. Ibararan, P, Cueto, S, Santiago, A, and Severin, E. (2012). *Technology and Child Development: Evidence from the One Laptop per Child Program*. Discussion Paper No. 6401, Bonn: Institute for the Study of Labour.
15. Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies
16. Cuban, L., Kirkpatrick, H., & Peck, C. (2001). High access and low use of technologies in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal*, 38(4), 813-834.
17. Dooley, K.E. (1999). Towards a holistic model for the diffusion of educational technologies: An integrative review of educational innovative studies. *Educational Technology & Society*, 2(4).
18. Driscoll, M.P., & Dick, W. (1999). New research paradigms in instructional technology: An inquiry. *Educational Technology Research & Development*, 47(2), 7-18.
19. Eads, G. M. (1984). Manipulation of innovation attributes and impact on attitude Formation. *Dissertation Abstracts International*, 45, 2325A. (University Microfilms No. 84-26, 311).
20. Ertmer, P. A. (2005). Teacher pedagogical beliefs: The final frontier in our quest for technology integration? *Educational Technology Research and Development*,53(4), 25-39.
21. Fabry, M., & Higgs, K. (1997). Commonalities and distinctive patterns in teachers' integration of computers. *American Journal of Education*, 101(May 1993), 261315.

22. Fitzgerald, M. A., & Branch, R. M. (2006). *Educational media and technology yearbook* Westport, CT: Libraries Unlimited.
23. Fox, R., & Henri, J. (2005). Understanding teacher mindsets: IT and change in Hong Kong schools. *Educational Technology & Society*, 8(2), 161-169.
24. Fredland O'Creevy, M. (2000). Middle Management Resistance to Strategic Change Initiatives: Saboteurs or Scapegoats? In: Flood, P.C., Dromgoole, T., Carroll, S.J
25. Friedman, T. (2006). *The World is Flat: The Globalized World in the Twenty-First Century*. New York: Farrar, Strauss and Giroux.
26. Gakenia K. N. (2008). Corporate Projects and Performance in the Education Sector in Kenya. Unpublished MBA Project, Kenyatta University.
27. Githui W. M. (2006). Public Projects in Public Primary School in Isiolo. Unpublished hMBA Project, Maseno University.
28. Glennerster, J., & Kremer, Y. (2011). *The digital pencil: One-to-one computing for children*. Mahwah, NJ: Lawrence Erlbaum.
29. Gorman, L. (Eds.) *Managing Strategy Implementation*. Oxford: Blackwell Publishers.
30. Government of Rwanda, 2006: The NICI-2010 plan, Kigali: The Rwanda Information Technology Authority, 2006.
31. Government of Rwanda, *Rwanda Vision 2020*, 2000, Kigali: *Ministry of Finance and Economic Planning*.
32. Grabe, M., & Grabe, C. (2001). *Integrating Technology for Meaningful Learning*. Houghton
33. Hackbarth, R. A., Grover, J. B. and Yi P., (2003), "Segmentation: Identification, Intuition, and Implementation of Computer technology," *Industrial Business Management*, 33 (NOV), 779-85.
34. Hall, G.E., Wallace, R.C., & Dossett, W.A. (1973). *A developmental conceptualization of the adoption process within educational institutions*. Austin, TX: Research and Development Center for Teacher Education, The University of Texas.
35. Harison, C. (2002). *The Effects of Ubiquitous Projects: A Systematic Review*.
36. Heeks, R. (2002). Information Systems and Developing Countries: Failure, Success, and Local Improvisations. *The Information Society*, 18(2), 101-112.
37. Hennessy, S., Ruthven, K., & Brindley, S. (2005). *Teacher perspectives on integrating ICT into subject teaching: Commitment, constraints, caution, and change*. *Journal of Curriculum Studies*, 37(2), 155-192.
38. Holloway, R. E. (1977). Perceptions of an innovation: Syracuse university Project Advance. *Dissertation Abstracts International*, 39, 572-573A. (University Microfilms No. 78-11, 656).
39. Howland, J., & Wedman, J. (2004). A process model for faculty development: Individualizing technology learning. *Journal of Technology and Teacher Education*, 12(2), 239-263.
40. Hudson, H.E. (2000). From African village to global village: Lessons in bridging the African digital divide. in high school classrooms: Explaining an apparent paradox. *American Educational Research Journal*, 38(4), 813-834.
41. Jamali, A., Mirshak, O (2007). Muligheter prosjekter - Del II ("Opportunities in projects - Part 2", in Norwegian). *Prosjektledelse* (4), 28-30.
42. Jensen, M. (2002). Information and communication technologies (ICTs) in Africa-A status report. UN ICT Task Force, "Bridging the Digital Divide in the 21st Century". Third Task Force Meeting, United Nations headquarters. 30 September-1 October 2002.

43. Karagiorgi, Y. (2005). Throwing light into the black box of implementation: ICT in Cyprus elementary schools. *Educational Media International*, 42(1), 19-32.
44. Kebede, N. O. (2004). IT Adoption in Africa. Cambridge University Press
45. Kombo, D., & Tromp, D. (2006). Proposal and Thesis Writing: An Introduction. Nairobi: Pauline's Publications Africa
46. Korac-Kakabadse, N., Kouzmin, A., & Korac-Kakabadse, A. (2000). Information technology and development: Creating "IT harems", fostering new colonialism or solving "wicked" policy problems? *Public Administration and Development*, 20(3), 171-184.
47. Kothari, C.R., 2004. Research Methodology: Method and Techniques. 2nd Edn., New Age International (P)Ltd., New Delhi
48. Look D. (2005). Discussion Paper: *Impact of Technology on Education, PUSD Excellence Committee, December 2005.*
49. Merrow, J. F. (1995). Technology in its place: Successful technology infusion in schools. San Francisco: Jossey-Bass.
50. Mutua, K. (2013). Review of Harmonization Curriculum for One Laptop Per Child project.
51. Muffin Company. USA. Hadley, M. & Sheingold, K. (1993). *Commonalities and Distinctive Patterns in Teachers' Integration of Computers*, American Journal of Education, 101(3), 261315. Unpublished article.
52. Nugroho, D. and Lonsdale, M., 2009: *Evaluation of OLPC programs globally: a literature review.* Australian Council for Educational Research.
53. Odedra, M., Lawrie, M., Bennett, M., & Goodman, S. (1993). Sub-Saharan Africa: A technological desert. *Communications of the ACM*, 36 (2), 25-29.
54. Okumu Mc. P. (2009). Procurement Hitches Affecting Ministry of Education Projects in Kenya. Unpublished MBA Project, Daystar University.
55. Oladele, B.A. (2001). *The imperatives of challenges for Africa in the knowledge age: Status and the role of national information policy. Proceedings of the 67th IFLA Council and General Conference, August 16-25.*
56. Olick, F. (2013). *Laptop project is unstoppable,*
57. Onyango, R.A.O. (2000). Global information and Africa: On the crest of a mirage? *Library Management*, 21(4), 197-204.
58. Orodho, A. J. (2008). Techniques of Writing Research Proposals and Reports in Education and Social Sciences. Maseno: Kanezja Publishers.
59. Raps, Y., S., & Kauffman, J. (2005). Conditions for Classroom Technology Innovations. *Teachers College Record*, 104(3)
60. Rogers, E. M. (1995). Diffusion of innovations (4th ed.). New York: The Free Press.
61. Ryan, B. & Gross, N. C. (1943). The diffusion of hybrid seed corn in two Iowa communities. *Rural Sociology* (8) 15-24.
62. Sachs, S. G. (1993, February). The Diffusion of Innovations: The Overlooked Literature. Paper presented at the meeting of the Association for Educational Communications and Technology, New Orleans, LA.
63. Saettler, P. (1990). *The evolution of American educational technology.* Englewood, CO:Libraries Unlimited, Inc.
64. Schneiderman, M. (2004). *What does SBR mean for educational technology? THE Journal.* 31(11), 30-36.

65. Sherry, L. (1998). An integrated technology adoption and diffusion model. *International Journal of Educational Communications*, 4(2/3), 113-115.
66. Snoeyink, R., & Ertmer, P.A. (2001-02). Thrust into technology: How veteran teachers respond. *Journal of Educational Technology Systems*, 30(1), 85-111.
67. Surry, L. (1993, August 4, 1999). The Technology Puzzle: Why Is Greater Access Not Translating Into Better Classroom Use? *Education Week*, pp. 68, 47
68. Tabb, L. (2008). A Chicken in Every Pot; One Laptop per Child: The Trouble with Global Campaign Promises. *E-Learning and Digital Media* 5 (3): 337-351.
69. Thompson, A.D., Simonson, M.R., & Hargrave, C.P. (1996). *Educational technology- A review of the research* (2nd ed.). Bloomington, IN: Association for Educational Communications and Technology.
70. Udo G. J., & Edoho, F. M. (2000). *Information technology transfer in African nations: An economic development mandate. The Journal of Technology Transfer*, 25 (3), 329- 342.
71. United Nations Economic Commission for Africa. (2001). African Information Society Initiative: An Action Framework to Build Africa's Information and Communication Infrastructure.
72. Venkatesh E.M and Morris R.K. (2000). *Effective computer adoption in project management : traditional, agile, extreme*. Fifth ed. Indianapolis, Wiley Technology Pub.
73. Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, emotion into the technology acceptance model. *Information Systems Research*, 11 (4), 342-365.
74. Weinstein, B. A., (1986). *Information Ecologies: Using Technology with Heart*. Cambridge, MA: MIT Press.
75. Wiley, T. (2005). Integrating Projects into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Educational Technology Research & Development*, 55, 223-252.
76. Wilson, D. B., & Wong, L. (2003). *Tinkering toward utopia: a century of public school reform*. Cambridge, Mass: Harvard University Press.
77. Wilson, O. C. (2008). *Business Strategy: Planning and Implementation*. 3rd ed. New York: McGraw-Hill College Div.
78. Wyner, N. B. (1974). A study of diffusion of innovation: Measuring perceived attributes of an innovation that determine rate of adoption. *Dissertation Abstracts international*, 35, 3583A. (University Microfilms No. 74-26, 628).
79. Zhao, D. L., Pugh, F. A., Sheldon, J. D., & Byers, S. M. (2002). Does technology integration work when key barriers are removed? *Educational Media International*, 45, 195-213.
80. Zhao, Y, & Frank, K. A. (2003). Factors Affecting Technology Uses in Schools: An Ecological Perspective. *American Educational Research Journal*, 40
81. Zhao, Y., & Cavusgil, K. A. (2002). Teacher Adoption of Technology: A Perceptual Control Theory Perspective. *Journal of Technology and Teacher Education*, 9(1), 5-30.
82. Zikmund, W.G. (2003). *Business Research Methods*. 7th Edition, Oklahoma State University.