

Full Length Research Paper

The relationship between principals' access to information and communication technology (ICT) and school performance in Kenya

Everlyne Makhanu¹ and Gerrit Kamper^{2*}

¹Department of Humanities and Social Sciences Strathmore University, Nairobi, Kenya.

²Department of Educational Studies, University of South Africa, PO Box 392, Pretoria, 0003, South Africa.

Accepted 24 August, 2012

In recent years, Information and Communication Technologies (ICTs) have gained an increasing role in education in Kenya. As a result, there is a need for reliable data and indicators on the access and use of ICTs, and their impact on school performance. Such data and indicators help the government to design and evaluate ICT policies and strategies, compare its ICT development with those in other countries and adopt solutions to reduce the digital divide in the education sector. This article reports on an investigation of the relationship between principals' ICT access and school performance; because principals play an important role in influencing ICT use in schools. The research was triggered by the need for ICT integration in school operations and secondary school principals' preparedness to cope with technology change. A quantitative research project was conducted, involving 188 secondary schools in the Western province of Kenya. Closed-ended and open-ended questionnaire items were used to obtain data. Findings revealed that about 42% of principals had access to basic ICT facilities in school and a principal's ICT access correlated positively with school performance. This study could be employed as a useful reference for the distribution of ICT infrastructure in schools in Kenya for performance improvement.

Keywords: *school performance, ICT access, school principals*

INTRODUCTION

Secondary school principals require access to Information and Communication Technology (ICT) infrastructure for a number of reasons. These include their need to adjust to the world of technology change, their need to embed ICT use in their teaching and administrative duties and increasingly, their need to use ICT in their professional studies. Much has been written about the need for ICT use across our school systems and the infrastructure required to allow this to happen has been investigated through research. This paper reports on the findings of a survey to investigate the relationship between ICT access to principals and secondary school performance in the Western province of Kenya.

ICT access

The data reported in this article were obtained as part of a larger investigation into the ICT literacy of secondary school principals. Access to ICT infrastructure was a technical factor hypothesised as a necessary, but probably not sufficient, precondition for principals to influence ICT integration in school operations. In view of the importance of ICT in the carrying out of administrative duties, it is necessary to be aware of the extent to which the principals have access to the appropriate ICT.

In the study, ICT access meant awareness and availability of appropriate hardware and software. Pernia (2008:14) reports that the access dimension of ICT is characterised by a user's awareness of ICT and the availability and the relevance of these ICT items in both her/his personal and professional life. She adds that access refers to the ways and means in which individuals, communities and institutions are exposed to

*Corresponding Author E-mail: kampegd@unisa.ac.za Tel: +27 12 429 4300

ICT. For the purposes of this study, the following ICT items were considered: electricity, computer, printer, scanner, Internet/e-mail connection, digital/video camera, fax machine, surveillance camera and digital projector. In terms of software, the following were considered: Word processing, spreadsheets, databases and PowerPoint. The ICT items considered in this research are similar to those in a study done in a West England school where access to word-processing, spreadsheets, and databases, Internet/e-mail and PowerPoint among teachers was considered (Selwood *et al.*, 2003: 142).

The study focused on determining the actual statistical correlation between the ICT access and school performance, as supported by quantitative data. School performance was investigated in terms of product outcomes, student-focused outcomes, financial and market outcomes, workforce-focused outcomes, process effectiveness outcomes and leadership outcomes. The level of school performance was determined by converting the responses to a school performance index which was then correlated with each aspect of ICT access.

The relationship between ICT access and performance

The importance of access to digital/video cameras, printers, scanners, fax machines, copiers and projectors in contributing to performance in educational institutions cannot be ignored (Mahmud & Ismail, 2008:4). Selwood *et al.* (2003:63) assert that empowering school leaders with skills in ICT would allow them to access information that is otherwise not easily available. In addition, the increased access of school leadership to ICT has a direct impact on student achievement (Valle, 2007:1). Cheung and Atjonen (2006: 185) suggest that the success of ICT integration in schools depends on proactive school leaders who will make ICT access possible and ensure effective implementation in the curriculum.

The principal's role in ICT integration

An increasing number of scholars agree that leadership plays a major role in ICT implementation at schools, especially in its integration into the curriculum (Mulkeen 2003; Tondeur *et al.* 2008). The success of implementing ICT use in schools depends on the leadership role of school principals in managing change (Kaplan & Norton, 2008:20). The secondary-school principal as a leader plays a crucial role in taking positive action to facilitate the coping with technology change. Dawson and Rakes (2003) support that amongst other things, ICT access to school principals plays a role in determining to what extent computers can be integrated in school operations. The management of an organisation must participate in

the quality programme, because today's world demands a workforce that understands how to use technology as a tool for increasing productivity and creativity (Wilding & Blackford, 2006:1-3). However, despite the large investments in ICT infrastructure across school systems, there is reason to question whether principals have ready access to that infrastructure, and whether the access that they do have is adequate for their teaching and administrative needs (Kay, 2006; Zhao & Frank, 2003).

In Kenya, the secondary-school principal has several leadership functions, including the organisation and management of the approved school curriculum, the management and control of school finances and stores, the management and motivation of human resources in the school, secretary to the Board of Governors (BOG) and the Parents Teachers Association (PTA) of the school, and the management and maintenance of the school plant and equipment (TSC, 2007:9-11). By having access to ICT facilities, the school principal can influence the school performance through effectively carrying out the aforementioned administrative functions. ICT integration has become a global issue and the process of integrating ICT into school leadership involves a paradigm shift, where new insights and information facilitate new forms of understanding (Persaud, 2006:23-24). This kind of paradigm shift requires principals who can cope with technology change in school leadership. There is therefore the need to take action towards increasing ICT access to educational leaders (Selwood *et al.*, 2003:65). Policymakers can lead the way by making a concerted and comprehensive commitment in order to deal with the lack of access to technology that is a barrier to 21st-century learning and skills.

The success of ICT is determined by proactive school leaders who give timely support to the integration of ICT into school operations, because these leaders have a responsibility to encourage teachers, students and other school personnel to appreciate technology integration (Davies, 2002:8; Persaud, 2006: 180). Today's school principals are expected to be familiar with ICT to be able to cope with emerging technology changes, because successful change flows from learning, growth and development (Mitzberg, *et al.*, 1998:325; Bober, 2001:2). Technology-driven change has nothing to do with igniting a transformation in an organisation, but can change an organisation from good to great (Collins, 2001: 11). Greatness is not a function of circumstance, but a matter of conscious choice and to be successful in initiating change, leaders must understand the context within which the change takes place (Wango, 2009:255).

Conceptual framework for investigating secondary-school principals' ICT access

The conceptual framework used in the study was informed by three theories, namely: Actor Network

Theory (ANT), Total Quality Management (TQM) and Kurt Lewin's force-field analysis. ANT is important to leaders of technology change because it makes them conceptualise the heterogeneous link of human and non-human actants in order to respond to technology challenges in improving organisational quality (Waryznski, 2006: 5-9). ANT as an approach shows the relationship between the human aspect and technology. Visionary leadership establishes institutional ideals and creates policy as a mission to respond to change and continuous improvement in the school environment. In addition, TQM is an approach to organizational efficiency and effectiveness and is a philosophy with core values for continuous improvement. The purpose of TQM is to provide quality service at a reasonable cost (De Feo & Barnard, 2005: 213). TQM is the most important and thought-provoking revolution in the world of modern management, because improving the quality of leadership influences organisational and institutional (school) performance (Cotton, 2001:4; Besterfield et al., 2003: 1). The leader in a quality-oriented organisation seeks ways not merely to change, but also to manage change and instil the process of change itself (Cotton, 2001: 4).

Kurt Lewin's force-field analysis is a problem-solving tool for helping change to occur (Steyn, 2000:8). It entails the managing of change for improving quality in leadership, and subsequently improving an organisation's output. Lewin's contribution on group dynamics applies to group structure and its leadership, and his model features basic-skills training intended to help an individual function as a change agent (Smith, 2008:6). In this regard, school principals are considered to be change agents who need ICT-access and training, and thus influence technology change in schools.

METHODS

Research objective and hypothesis

The main research aim was to ascertain the ICT access levels of principals in order to establish the potential of integrating technology in secondary school leadership for improving school performance. In order to describe the role of a principal's ICT access in improving school performance, the specific study objective was to investigate how ICT access of a principal relates to school performance. In order to test the statistical relationship between ICT literacy and school performance, hypothesis testing was used. The research hypothesis was H_{a1} : *There is a statistically significant relationship between ICT access of a principal and school performance.* The null hypothesis tested was H_{a0} : *There is no statistically significant relationship between ICT access of a principal and school performance.*

Research design

The survey design was chosen to carry out the study on ICT access of secondary-school principals in the Western Province of Kenya. A descriptive study was used to outline and present circumstances and relationships concerning the research problem. This involved collecting data in order to answer the research questions. In this study, the quantitative approach was applied through use of questionnaires. Data obtained from the questionnaires was analysed using statistical analysis to answer the research question and verify the null hypothesis. The reported ICT access levels were analysed and correlated with school performance. The research methodology in this study was divided into a literature study and an empirical investigation. The study used two questionnaires, in which the first one had 13 items that investigated ICT access and a second questionnaire with 30 items investigated the level of school performance.

The sample

The study population involved 220 secondary schools in the Western Province of Kenya. The focus on this province was for convenience sake, but was nevertheless valid, due to this province's representativeness of the secondary-school situation in semi-rural and rural settings in Kenya. The schools were randomly selected from two strata, namely the high-achieving schools (110 schools) and the low-achieving schools (110 schools). High-achieving schools were those schools that according to an official standardised score scale had consistently been among the top in ranking for the previous five years. Low-achieving schools were those schools that for the previous five years had consistently been among the bottom in ranking in the province in the Kenya national examinations (KNEC, 2007:1-6). Out of the 220 schools sampled, 10 schools were used for the pilot study, and 210 schools were used in the main survey. Each school received two questionnaires, namely one for the principal, and the other for the deputy principal. The principals responded to items in the first questionnaire investigating ICT access, while the deputy principals from the selected schools responded to items in the second questionnaire that investigated school performance. Deputy principals were involved because they work closely with principals in school administration and play a significant role in influencing school performance. The researcher eventually used an even number of completely filled in questionnaires (188) of ICT access and 188 of school performance for data analysis.

The ethical acceptability of the study was assured through a research permit issued by the Kenyan National Council for Science and Technology. Research permission was also obtained from the Provincial Director of Education of the Western Province of Kenya. The

respondents were provided with written background on the research aim and assurance of confidentiality, as well as with a consent form. No one in the sample opted to withdraw from participation in the surveys.

Data analysis

The quantitative data was analysed using descriptive statistics through the Statistical Package for Social Sciences (SPSS). The data was recorded as frequencies (N) and percentages (%) and presented in table form, while the statistical relationship was calculated using Spearman's Rho. The relationship between ICT access level and school performance was presented using a bar graph.

Validity and reliability

The current study focused on face and content validity. The instruments were given to an expert to check their face validity. The expert checked on face value whether the first questionnaire tested ICT access and whether the second questionnaire was adequate in terms of measuring school performance. The adequacy with which items on ICT access and school performance were covered, determined the content validity (Saunders *et al.*, 2007: 366; Mugenda & Mugenda, 2003: 100). With hindsight, it can be stated with confidence that content validity was indeed secured in this way.

In the analysis of the quantitative data the split-half technique was used for obtaining X and Y scores. X distribution took odd-positioned items, whereas Y distribution took even-positioned items. Pearson product-moment correlation (r) was used for calculating the reliability coefficient. The coefficient obtained was then converted into an appropriate correlation for the entire test, using the Spearman-and-Brown prophecy formula. The reliability coefficient of 0.5 and above is accepted as a good measure of reliability (Saunders *et al.*, 2007: 368). Computation using the above formula yielded a reliability coefficient of 0.7, which was judged a good measure of reliability. The researcher increased the reliability by having a large number of items for analysis. In addition, data was collected from a heterogeneous group in terms of school achievement. The more heterogeneous a group is on the trait being measured or the greater the range of scores, the higher the reliability (McMillan & Schumacher, 2001:230). The measuring instruments were administered only once for practical reasons - hence the test-retest method of determining reliability was not employed.

FINDINGS AND DISCUSSION

The data obtained for ICT access are discussed in the

subsections that follow with reference to the school performance index, and with appropriate references to the theoretical framework for this research, as already presented. The data on ICT access was summarised in frequencies of positive and negative responses (No = 1 or Yes = 2). The level of school performance was determined by indicating Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4 and Strongly Agree = 5. The responses were then converted to a scale: Poor = 1, Average = 2, Good = 3. The findings are presented in tabular form using frequencies (N) and percentages (%) and the correlation co-efficient is determined using spearman's Rho and presented in a graph.

In the following sections, attention is firstly given to access to ICT hardware, and subsequently to the access to ICT software.

Access to ICT hardware

The study investigated the relationship between access to each ICT hardware item mentioned, and school performance.

Access to electricity infrastructure

The data indicates that 119 (63.3%) of principals had access to electricity infrastructure, while 69 (36.7%) did not. It was observed that most rural schools had recently acquired electricity infrastructure through the Kenya rural electrification programme. There was a statistically significant strong positive relationship ($p < .05$) between access to electricity and school performance and the effect size ($r = .436$) was big. This implies that a principal's access to electricity infrastructure in a school plays a role in influencing school performance.

Access to computer

There were 104 (55.3%) principals who had access to a computer, while 84 (44.7%) did not. The collected data revealed that in five of the poorly performing schools, the computers were not yet in use as schools had only recently obtained electricity through the rural electrification program. It was also observed that in two of the poorly performing schools, there was no electricity, but the schools used diesel generators as a source of energy for their computers and in one other school there were solar panels used as a source of energy. It was further noted that some principals in well performing schools had computers in their offices and most of those in poorly performing schools did not. In any case, there was a statistically significant strong positive relationship ($p < .05$) between a principal's access to a computer and school performance and the effect size ($r = .428$) was big. This implies that a principal's access to a computer plays

Table 1. Relationship between access to electricity infrastructure and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Electricity infrastructure	No	N	47	15	7	69
		%	25.0%	8.0%	3.7%	36.7%
	Yes	N	32	31	56	119
		%	17.0%	16.5%	29.8%	63.3%
Total	N	79	46	63	188	
	%	42.0%	24.5%	33.5%	100.0%	

Spearman's correlation co-efficient ($r = .436, p = .000$)

Table 2. Relationship between access to a computer and school performance

Computer	Response	Frequency	School performance index			Total
			Poor	Average	Good	
	No	N	48	18	18	84
		%	25.5%	9.6%	9.6%	44.7%
	Yes	N	31	28	45	104
		%	16.5%	14.9%	23.9%	55.3%
Total	N	79	46	63	188	
	%	42.0%	24.5%	33.5%	100.0%	

Spearman's correlation co-efficient ($r = .428, p = .000$)

Table 3. Relationship between access to Internet/e-mail connection and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Internet/ e-mail infrastructure	No	N	2	11	17	30
		%	1.1%	5.9%	9.0%	16.0%
	Yes	N	77	35	46	158
		%	41.0%	18.6%	24.5%	84.0%
Total	N	79	46	63	188	
	%	42.0%	24.5%	33.5%	100.0%	

Spearman's correlation co-efficient ($r = .298, p = .000$)

a role in influencing school performance.

Access to Internet/e-mail connection

There were 158 (84.0%) principals who had access to Internet/e-mail infrastructure in their schools, while 30 (16.0%) did not. The collected data revealed that only five schools had Internet/e-mail connection from a landline, about eighty three used wireless networks on computers and the rest used their mobile phones to access the Internet. There was a statistically significant very weak positive relationship ($p < .05$) between a principal's access to Internet/e-mail infrastructure and school performance and the effect size ($r = .298$) was moderate. The proportions of the numbers in Table 3 imply that access to Internet/e-mail connection is not closely associated

with school performance; hence Internet/e-mail access to a principal can play a minimal role in influencing school performance. Contrary to these findings, Mahmud and Ismail (2008:5) argue that access to Internet facilities, ICT equipment and multimedia facilities play an important role and influence the integration of ICT in general organisational operations.

Access to digital/video camera

The study investigated the relationship between a principal's access to the digital/video camera and school performance and the distribution of responses is summarised in Table 4.

A small number of principals 16 (8.5%) had access to digital/video cameras in their schools while the rest 172

Table 4. Relationship between access to a digital/video camera and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Digital/video camera	No	N	79	45	48	172
		%	42.0%	23.9%	25.5%	91.5%
	Yes	N	0	1	15	16
		%	0%	0.5%	8.0%	8.5%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient (r= .356, p= .000)

Table 5. Relationship between access to a printer and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Printer	No	N	40	25	3	68
		%	21.3	13.3	1.6	36.2
	Yes	N	39	21	60	120
		%	20.7	11.2	31.9	63.8
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient (r= .436, p= .000)

Table 6. Relationship between access to a scanner and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Scanner	No	N	73	27	47	147
		%	38.8%	14.4%	25.0%	78.2%
	Yes	N	6	19	16	41
		%	3.2%	10.1%	8.5%	21.8%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient (r= .210, p= .004)

(91.5%) had none. There was a statistically significant weak positive relationship ($p < .05$) between a principal's access to a digital/video camera and school performance and the effect size ($r = .356$) was moderate. This implies that the access to the cameras is positively associated with school performance, but a principal's access plays a role in influencing school performance to a small extent. Mahmud and Ismail (2008: 4) assert that teachers need to be exposed to the latest updates in ICT such as access to digital cameras for multimedia-based teaching and learning in order to improve on their ICT literacy. (table 5)

Access to a printer

Most principals 120 (63.8%) had access to printers in their schools, while 68 (36.2%) had none. It was

observed that printers were available in schools which had computers and electricity and were almost in equivalent proportions. The frequencies indicate that well performing schools had more printers compared to the poorly performing schools. There was a statistically significant strong positive relationship ($p < .05$) between a principal's access to a printer and school performance, where the effect size ($r = .436$) was big. This implies that access to a printer plays a big role in influencing school performance, because printing documents like receipts, examinations and school reports enhances effectiveness in school operations. (table 6)

Access to a scanner

The majority of principals did not have access to scanners in school, only 41 (21.8%) had scanners in their schools. Out of the available scanners, only 35 were in

Table 7. Relationship between access to a fax machine and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Fax machine	No	N	75	45	51	171
		%	39.9%	23.9%	27.1%	91.0%
	Yes	N	4	1	12	17
		%	2.1%	0.5%	6.4%	9.0%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient (r= .197, p= .007)

Table 8. Relationship between access to a surveillance camera and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Surveillance camera	No	N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient was not found

Table 9. Relationship between access to a projector and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Projector	No	N	74	38	48	160
		%	39.4%	20.2%	25.5%	85.1%
	Yes	N	5	8	15	28
		%	2.7%	4.3%	8.0%	14.9%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient (r= .215, p= .003)

working condition and while six were not. There is a statistically significant weak positive relationship ($p < .05$) between a principal's access to a scanner and school performance, where the effect size ($r = .210$) was moderate. This implies that a principal's access to a scanner plays a minimal role in influencing school performance. (table 7)

Access to a fax machine

The majority of principals 171 (91.0%) did not have a fax machines in their schools and only 17 (9.0%) had. The data shows that the proportions varied with school performance. There was a statistically significant very weak positive relationship ($p < .05$) between a principal's access to a fax machine and school performance, and the effect size ($r = .197$) was small. This implies that access to a fax machine plays a very small role in influencing school performance. (table 8)

Access to a surveillance camera

The collected data revealed that none of the 188 (100%) principals had access to a surveillance camera in school. The schools employed security officers who communicate with the principal using a telephone installed at the gate or using mobile phones. This being the case, Spearman's correlation could not be calculated because the value for the responses is a constant. In the current era of insecurity in schools, it is advisable to have such cameras installed, to enable principals to monitor classroom operations and general security matters in the school. (table 9)

Access to a digital projector

There were only 28 (14.9%) of school principals who had access to a projector, but the rest 160 (85.1%) did not. In the observation schedule it was notable that there were

Table 10. Relationship between access to word processing and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Word processing	No	N	53	19	7	79
		%	28.2%	10.1%	3.7%	42.0%
	Yes	N	26	27	56	109
		%	13.8%	14.4%	29.8%	58.0%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient ($r = .488$, $p = .000$)

Table 11. Relationship between access to spreadsheets and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Spreadsheets	No	N	66	20	13	99
		%	35.1%	10.6%	6.9%	52.7%
	Yes	N	13	26	50	89
		%	6.9%	13.8%	26.6%	47.3%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient ($r = .551$, $p = .000$)

more projectors in well than in poorly performing schools. There was a statistically significant weak positive relationship ($p < .05$) between a principal's access to a projector and school performance, where the effect size ($r = .215$) was moderate. This implies that the access of a projector to principal played a role in influencing school performance, but to a small extent.

Access to ICT software

The software considered were word processing, spreadsheets, databases and PowerPoint.

Access to word processing (table 10)

The majority of principals 109 (58.0%) had access to word processing, while 79 (42.0%) did not. This was because, most computers purchased had word processing installed as a basic package. However, the values indicate that principals in poorly performing schools had less access 26(13.8%) than those in schools with good performance 56 (29.8%). There was a statistically significant strong positive relationship ($p < .05$) between a principal's access to word processing and school performance, where the statistical effect size ($r = .488$) was very big. This implies that a principal's access to word processing plays a significant role in influencing school performance. (Table 11)

Access to spreadsheets

Less than half of the principals 89 (47.3%) had access to

spreadsheets, while a slightly higher number 99 (52.7%) of principals had no access to spreadsheets. However, the proportion of access to spreadsheets varied with school performance index where 50 (26.6%) of principals in good performance schools had access to spreadsheets compared to only 13 (6.9%) in poor performance schools. There was a statistically significant very strong positive relationship ($p < .05$) between a principal's access to spreadsheets and school performance. The effect size ($r = .551$) was very big and this implies that a principal's access to spreadsheets plays a major role in influencing school performance. (Table 12)

Access to databases

Most principals 102 (54.3%) had access to databases for example student performance records, admission details and teachers details, school timetable, while 86 (45.7%) did not. However, the proportion varied with school performance and there was a statistically significant strong positive relationship ($p < .05$) between a principal's access to databases and school performance. The effect size ($r = .451$) was big and this implies that a principal's access to databases plays a big role in influencing school performance. (Table 13)

Access to PowerPoint

There were 84 (44.7%) principals who had access to

Table 12. Relationship between access to databases and school performance

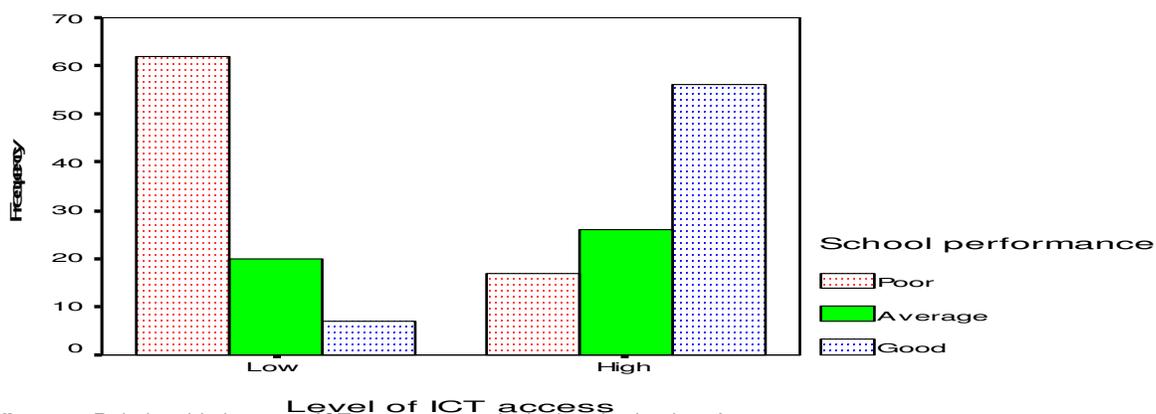
ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
Databases	No	N	54	22	10	86
		%	28.7%	11.7%	5.3%	45.7%
	Yes	N	25	24	53	102
		%	13.3%	12.8%	28.2%	54.3%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient ($r = .451, p = .000$)

Table 13. Relationship between access to PowerPoint and school performance

ICT hardware	Response	Frequency	School performance index			Total
			Poor	Average	Good	
PowerPoint	No	N	67	22	15	104
		%	35.6%	11.7%	8.0%	55.3%
	Yes	N	12	24	48	84
		%	6.4%	12.8%	25.5%	44.7%
Total		N	79	46	63	188
		%	42.0%	24.5%	33.5%	100.0%

Spearman's correlation co-efficient ($r = .123, p = .004$)

**figure 1.** Relationship between ICT access to a principal and school performance

PowerPoint, while 104 (55.3%) did not and the proportion varied according to school performance index. There was a statistically significant very weak positive relationship ($p < .05$) between a principal's access to PowerPoint and school performance. The effect size ($r = .123$) was very small and this implies that a principal's access to PowerPoint plays a very small role in influencing school performance.

DISCUSSION

The overall ICT access to a principal was determined by combining the responses for the access to ICT hardware and software. The values of the responses for ICT

access were converted to an index: Low = 1, High = 2 in order to determine the level of ICT access. The level of school performance was equivalent to the school performance index which was determined by a scale: Poor = 1, Average = 2, Good = 3. The conversion was done using the Statistical Package for Social Sciences (SPSS). In order to test the statistical relationship between ICT access of a principal and school performance, the null hypothesis H_{a0} was tested: *There is no statistically significant relationship between ICT access of a principal and school performance.* The statistical relationship between a principal's ICT access and school performance is shown using a bar graph as indicated in figure1.

Figure 1. indicates that when the level of ICT access was very low, the performance index was poor, when the ICT access was very high; the performance index was also high. The data was further tested to investigate the degree of the statistical relationship between the level of ICT access and school performance. This was done using Spearman's rho correlation co-efficient at 0.05 significance level and it yielded $r = .584$, $p = .000$. Thus there was a statistically significant strong positive relationship between ICT access of a principal and school performance in the Western province of Kenya. Using the significance level of ($p < .05$), the null hypothesis (H_{a0}) that there is no statistically significant relationship between ICT access to a principal and school performance was therefore rejected.

The statistical implication concurs with a study done in South England that the high levels of ICT access to school staff were proportional to institutional performance (Selwood *et al.*, 2003: 142). From the literature review, it therefore means the principals need ICT access in order to adjust to the world of technology change and embed ICT use in their teaching and administrative duties. In addition, school leadership plays a major role in ICT implementation at schools, especially in its integration into the curriculum and in determining to what extent computers can be integrated in school operations. Technology influences leadership quality and TQM as a concept concurs with the study findings that improving the quality of leadership influences organisational performance. In addition, study findings also concur with Kurt Lewin's force-field analysis in terms of managing change for improving quality in leadership and subsequently improving an organisation's output. The ANT also supports the idea that visionary leadership establishes institutional ideals and creates policy as a mission to respond to change and continuous improvement in the school environment.

CONCLUSION

The research findings in this study showed that a principal's access to ICT infrastructure has a positive influence on secondary school performance in the Western province of Kenya. The most available ICT hardware to principals consisted of Internet/e-mail connection, printer, electricity infrastructure and computer. The most available forms of ICT software were word processing and databases. Access to electricity infrastructure, computers, printers, copiers, word processing, spreadsheets and databases also played a significant role in improving school performance.

From the study it appeared that a relatively low percentage of principals (41.98 %) had access to ICT items in school. This means that the government and concerned stakeholders still have to go a long way in ensuring the availability of ICT to principals. The already

existing availability of ICT implies there is a that reasonable level of readiness for ICT integration in schools in the Western province of Kenya. On the basis of our research findings it can be concluded that the priority of concerned stakeholders should be to optimise the provision of electricity infrastructure, printers, copiers, and computers, the latter installed with word processing and spreadsheets. Following the cause-effect relationship as identified in our research, the improvement of such provision will lead to an improvement in school performance. Clearly, ICT access on its own is not sufficient for successful ICT integration in schools. Access should always be accompanied by training, and this is ever so true for a successful ICT dispensation in schools.

REFERENCES

- Besterfield DH, Besterfield CM, Besterfield, GH, Besterfield MS (2003). *Total Quality Management*. 3rd edition. New Jersey: Pearson Education.
- Bober MJ (2001). School information systems and their effects on school operations and culture. *J. Res. on Technology in Education*, 33(5): Summer. Available at <http://www.iste.org/jrte/33/5/bober.html>. Accessed on 9 May 2005.
- Cheung LS, Atjonen P (2006). ICT in Education in Finland and Hong Kong. An Overview of the Present State of the Educational System at Various Levels. *Informatics in Education* 5(2): 183-194.
- Collins J (2001). *Good to great: why some companies make the leap and others don't*. New York: Harper Collins.
- Cotton K (2001). Applying Total Quality Management principles to secondary education. *School Improvement Research Series*. Available at <http://www.nwrel.org/scpd/sirs/9/s035.html>. Accessed on 4 August 2008.
- Cresswell JW (2003). *Research design: Quantitative and mixed mode approaches*. 2nd ed.: Sage.
- Davies JE (2002). *Assessing and predicting information and communication technology literacy in education undergraduates*. PhD thesis. Canada: University of Alberta. Available at <http://proquest.umi.com/pqdweb?did=7264>. Accessed on 28 October 2006.
- Dawson C, Rakes GC (2003). The influence of principals' technology training on the integration of technology into schools. *J. Res. on Technology in Education*, 36, 29-49
- De-Feo AJ, Barnard JM (2005). *Juran Institute's Six Sigma. Breakthrough and beyond: quality performance breakthrough methods*. New Delhi: Tata McGraw-Hill.
- Johnson B, Christensen L (2004). *Educational research: Quantitative and qualitative approaches*. Boston: Allyn & Bacon.
- Kenya National Examinations Council (KNEC) (2007). *KSCE examination results*. Available at <http://mail.education.go.ke:8010/KCSE>. Accessed on 24 February 2007.
- Mahmud RM, Ismail MA (2008). *Factors influencing ICT integration in the classroom: Implications to teacher education*. EABR & TLC Conference proceedings: Salzburg, Austria. Available at <http://cluteinstitute.com.programs/salzburg>. Accessed on 13 March 2009.
- McMillan JH, Schumacher S (2001). *Research in education – a conceptual introduction*. Pretoria: Longman pp. 9-32
- Mitzberg H, Ahlstrand B, Lampel J (1998). *Strategy safari: the complete guide through the wilds of strategic management*. London: Prentice Hall.
- Mugenda AG, Mugenda OM (2003). *Research methods: quantitative and qualitative approaches*. Nairobi: ACTS Press.
- Mulkeen A (2003). "What Can Policy Makers Do to Encourage Integration of Information and Communications Technology?"

- Evidence from the Irish School System." *Technology, Pedagogy and Education* 12(2): 277–293.
- Pernia EE (2008). Strategy framework for promoting ICT literacy in the Asia-Pacific region. Publication of UNESCO Bangkok Communication and Information Unit. Bangkok: Asia and Pacific Regional Bureau for Education pp. 4-20
- Persaud B (2006). *School administrators' perspective on their leadership role in technology integration*. PhD thesis. Minnesota: Walden University. Available at <http://0proquest.umi.oasis.unisa.ac.za:80/pqdweb?diid=1127209711>. Accessed on 11 October 2006.
- Saunders M, Lewis P, Thornhill A (2007). *Research methods for business students*. 4th edition.: London: Prentice Hall.
- Selwood D, Fung A, O'Mahony C 2003. *Management of education in the information age*. Fifth working conference on Information Technology in Educational Management (ITEM 2002), Helsinki. IFIP conference proceedings, 248. London: Kluwer Academic Publishers.
- Smith KM (2008). *Kurt Lewin: Groups, experiential learning and action research*. The encyclopaedia of informal education. Available at <http://www.infed.org/thinkers/et-lewin.htm>. Accessed on 23 February 2009.
- Steyn GM (2000). Quality tools and techniques for improving learning in higher education. *Progressio*, 22(2)
- Tashakkorri A, Teddlie C (2003). *Handbook of mixed methods in social and behavioural research*. Thousand Oaks: Sage p. 12
- Teachers Service Commission (TSC) (2007). 10 key policies. *Teachers' Image: Quarterly Magazine*, (13)6: 9-11.
- Tondeur J, Keer H, Braak J 2008. ICT integration in the classroom: Challenging the potential of a school policy. *Computers & Education* 51(1): 212-223.
- Valle R (2007). *Discourses: From educational policy to leadership in practice*. Available at <http://www.uib.no/prp/plp/conent/Phd-projects.htm>. Accessed on 13 June 2009.
- Wango G (2009). *School administration and management: Quality assurance and standards in schools*. Nairobi: Jomo Kenyatta Foundation. Pp. 108-109.
- Waryzynski C (2006). *An actor network approach to leading technological change: Implementing a new technology at a prominent US research university* Amsterdam: Van Gorcum pp. 5-6
- Wilding B, Blackford A (2006). *How can a networked learning community promote and develop leadership?* Available at <http://www.ncsl.org.uk/media/7BO/BD/does-the-net-work>. Accessed on 15 November 2006.
- Zhao Y, Frank KA (2003). Factors affecting technology uses in schools: An ecological perspective. *American Educational Res. J.*, 40(4), 807–840.