IOSR Journal of Computer Engineering (IOSR-JCE)
e-ISSN: 2278-0661,p-ISSN: 2278-8727, Volume 21, Issue 2, Ser. III (Mar - Apr 2019), PP 23-33
www.iosrjournals.org

Integrated Cloud Computing Environment Model (ICCEM) Towards Affordable ICT Integration in Education

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***Abstract**: Cloud computing is one of the universal Information Communication Technology(ICT) development and its implementation in education can contribute towards solving the existing problems and also contribute to meeting ofeducational goals at an affordable cost. The application of Cloud Computing in education will not only ease educational institutions from the obligation of managing complex Information Technology infrastructure and maintenance activities, but will also lead to substantial cost savings. This paper assesses the technologies being used in education in primary schools, analyzes the human capacity that manage ICT integration in primary schools and develops an Integrated Cloud Computing Environment Model towards Affordable ICT Integration in primary schools. The study employedresearch science design approach. It was used to perform a background research, collect data inform of requirements and design the model.Questionnaires, guided interviews and observation checklist were used to collect data from the respondents. Validity was achieved by use of experts while reliability of the instrument was achieved by pretesting and piloting the instrument ofstudy. The study established that hardware, software and their subsequent maintenance costs when dealing with a wide range of hardware, and basic ICT skills are required for successful Integration of ICT in education. When ICT integration in education is made affordable to governments, schools and stakeholders through careful planning, it can be successfully incorporated in education.*

***Keywords:** Cloud Computing; ICT Integration; Affordability*

Date of Submission: 27-03-2019 Date of acceptance: 12-04-2019

I. Introduction

Advancements in Technology most often have had an important impact on industry development of a country. This has resulted in affecting even the most traditional systems such as education. Cloud technology is one of the global trends in ICT development and its implementation in education can be an effective way to solve existing problems at low cost [1]. Institutions/organizations that have innovative ideas for new application services do not have to spent more on hardware and software infrastructures [2]. The application of Cloud Computing in education will not only ease educational institutions from the obligation of managing complex IT infrastructure and their subsequent maintenance activities, but also leads to substantial cost savings [3].The education sector would greatly benefit by applying Cloud Computing Technology. Cloud Computing is Internet-based computing in which shared pool of resources, software and information are delivered as a service and accessed through computers or mobile devices on demand via the web. This technology, promises to deliver affordable, reliable, flexible computing solutions as in [3]. Governments and other educational stakeholders in attempting to provide quality education to its citizens today are faced with challenge of lack of infrastructure and maintenance costs that are associated with a wide range of hardware and software. The successful use of these technologies require ongoing investment and also professional support skills [4].There is need for careful planning for ICT Integration in education and this requires a model that can guide the integration process while focusing on the cost of hardware, software and subsequent maintenance as well as ensuring that teachers have adequate skills and knowledge to manage the technologies in the long run [7].

II. Statement of the Problem

Governments today are experiencing challenges in providing education to its citizens using ICT. The incorporation of ICT in education can be used by governments to drive progressive and effective education in schools. To actualize ICT integration into primary education, the Government undertook the initiative aiming at providing one laptop per child (OLPC) to all standard one pupils in primary schools in Kenya in the year 2016. However, Integrating ICT in education requires development of infrastructural facilities, acquisition of hardware and software technologies, periodic configuration, updating of hardware and software, management of the technologies and provision of professional support services during their usage. Procuring and maintaining a wide range of hardware and software is a major challenge in ICT integration ineducation as technology is ever changing. This requires large initial and ongoing capital investment as well as professional support to achieve successful ICT integration in education. Cloud promises to deliver affordable, reliable and flexible computing solutions to the education sector. The application of Cloud Computing in education can not only ease educational institutions from the obligation of handling and managing complex IT infrastructure as well as the accompanying maintenance activities, but can also lead to substantial cost savings. The purpose of the study was to develop a Cloud Computing Environment Model towards affordable ICT integration in education in primary schools.

III. Methodology

The study adopted research science design. Design science approach was used to perform a background research on the available technologies being used in schools and the human capacity for managing the technologies. The data collected inform of requirements that are then used to develop the model. Figure 1: summarizes the steps followed in design science research design [5].

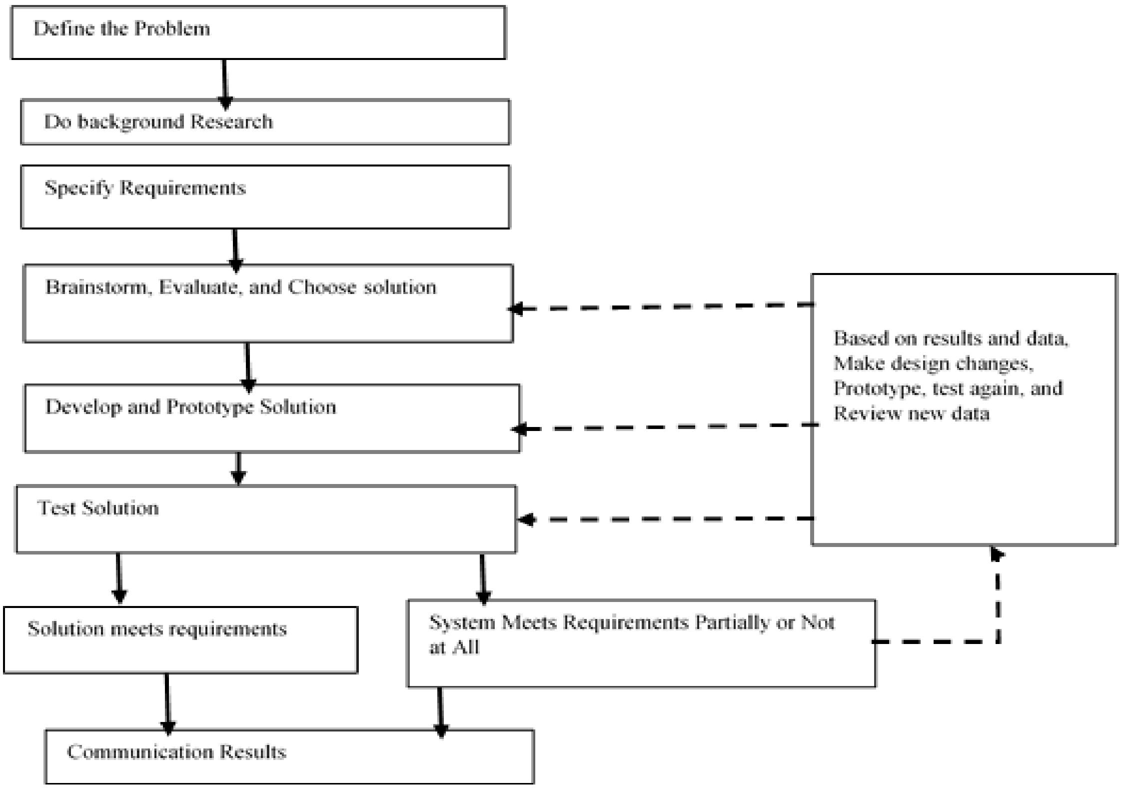

Figure 1: The Design science design model (Adapted from [5])

The population for this study was 425 primary schools in one of the County's in the Western region of Kenya. This Countywas a representation of the other Counties for this study because the laptop project was being rolled out in all Counties in the entire Country and also the types of equipment supplied to public primary schools were of the same specifications. Teachers were also subjected to same level of training across the Counties. The accessible population included only primary schools which had ICT equipment totaling to 100 schools at the time of which data was collected. Purposive sampling technique was used in selecting the sample. Purposive sampling is a non-probability sampling procedure which does not afford any basis for estimating the probability that each item in the population has a chance of being included in the sample as in[9]. This technique was used to select schools that had ICT infrastructure and teachers who had trained in ICT. The study focused purposively on those schools that had ICT equipment and on those teachers that had been trained on the use of ICT in education. The study sampled 30% of the schools (100), which had ICT equipment, representing 30 schools. Ref [8], suggests that at least 30% of the total population is representative enough for the study.Questionnaires, guided interviews and observation checklist were used to collect data from the respondents. Quality control of the instruments of study was done to establish both validity and reliability. Content and face validity was done by a team of experts and average value of judgement calculated which was

.783. Reliability of the instruments was established through pretesting and piloting where the Cronbach's alpha of .762 value calculated for 17 items. The tool was hence deemed reliable for use in the study [6].

IV. Results

The study collected and analyzeddata about technologies available in primary schools. The study targeted only primary schools that had ICT equipment at the time of study.

Technologies in the primary schools

The study targeted technologies that are being used in education in the primary schools which were found to be as summarized in Table 1.

Table 1: Hardware Technologies

Technology	**Frequency**	**Percent (%)**
Desktop computer	18	5.70
Laptops	90	28.48
Tablets	86	27.24
Printers	32	10.10
Projectors	88	27.85
Smartboards	2	0.63
Total		**100.00**

Table 1 reveals that there are a variety of hardware technologies in use in primary schools. These are: desktop computers (5.7%), laptops (28.48%), tablets (27.24%), printers (10.1%), projectors (27.85%) and smartboards (0.63%). Basing on observation of the findings in Table 1, laptops, tablets and projectors were the most dominant hardware technologies being used in the primary schools.

Data Storage devices

Data was collected and analyzed to investigate the type of storage devices in use in the schools. Table 2gives a summary of the findings.

Table 2: Data storage devices

		Frequency	**Percent (%)**
Valid	CDs	6	6.67
	Hard disk drive	20	22.22
	Flash disk	32	35.56
	Google drive	8	8.89
	More than two devices	20	22.22
	None	1	1.11
Missing	System	3	3.33
Total		**90**	**100.0**

Table 2 reveals that data storage devices were being used in the schools. These included: CDs (6.67%), Hard disk drive (22.22%), Flash disks (35.56%), Google drive (8.89%), those who were using more than one storage device (22.22%) and those who were not using any storage device (1.11%). Basing on observations in Table 2, only 8.89% of the respondents were using cloud for data storage.

Cloud technologies

Cloud technologies areInternet-based computing in which shared pool of resources, software and information are usually delivered as a service and accessed through computers or mobile devices on demand via the web. Data was collected and analyzed to investigate the cloud technologies being used in the schools. These included: e-mail services, internet and devices used to connect to the internet.

Email services

Data was collected from the respondents and analyzed to find out the use of cloud technology by teachers. Table 3 gives a summary of the findings on e-mail account and usage by teachers.

Table 3: Email account and access rate

Count					
		How often do you access your e-mail?			**Total**
		Non	**Less frequently**	**Frequently**	
Do you have a personal e-mail account?	Yes	58	22	4	84
Total		**58**	**22**	**4**	**84**

Table 3, reveals that 26 respondentshad e-mail accounts while 58 respondents did not have e-mail accounts. Further, 22 respondents who had e-mail accounts were using them less frequently while 4 of the respondents were using them frequently. Thus basing on observation,the majority of respondents who had e-mail accounts (22), were not using them frequently.

Internet connectivity in the schools

Cloud technologies areInternet-based and shared pool of resources, software and information are usually delivered as a service and accessed through computers or mobile devices on demand via the web. Data was collected and analyzed to investigate the level of Internet connectivity in the primary schools.
Table 4 provides a summary of the findings.

Table 4: Internet Connectivity

Is school connected to Internet?		**Frequency**	**Percent (%)**
	Yes	30	33.3
	No	60	66.7
	Total	**90**	**100.0**

Table 4 reveals that 33.3% had internet connection while 66.7% did not have internet connection in their schools. This implies that most of the primary schools (66.7%)are not connected to the Internet.

Devices used to access the Internet in the schools

Data was collected and analyzed to find out the devices used by teachers to connect to the Internet. Table 5 gives a summary of the findings.

Table 5: Devices used to access Internet

		Frequency	**Percent (%)**
Valid	smart phone	56	62.2
	Tablet	14	15.6
	Laptop	8	8.9
	Desktop	2	2.2
	I don't have any device	6	6.7
Missing	System	4	4.4
Total		**90**	**100.0**

Table 5 reveals that 62.2% of the teachers use smart phones, 15.6% use tablets, 8.9% use laptops, 2.2% use desktop computers to connect to the Internet while 6.7% did not have any device to help them connect to the Internet.

This implies that majority of the respondents (62.2%) use smart phones to connect to the Internet, which are also personal devices. This justifies further the presence of low level Internet connectivity in primary schools.

Human capacity for managing ICT Technologies

ICT human capacity development focuses mainly on equipping teachers with the relevant skills and knowledge in ICT to enable them to use and also manage the equipment so that they can last and serve the purpose they are meant for. This can be achieved through training and retraining teachers so they are informed and also remain relevant in this era of ever changing technology. Training is therefore a core component towardsan effective and competent teacher who is confident enough managing ICT integration in the schools.

Staff competency

The study focused mainly on the ability or competency level of the teachers in the use of ICT technologies. The parameters of interest were based on relevant practical skills required to use the ICT equipment. These were: Setting up a new computer, understanding software licensing requirements, checking network connection, changing monitor display mode and extending the screen, testing printers and printing documents, setting up projectors and troubleshooting a computer system. The study rated the observation on a scale of 1-4: not very competent, moderate level competency, Competent and expert as summarized in Table 6.

Table 6:ICT Staff competency level

		Frequency	Percent (%)
Valid	Expert	6	6.7
	Competent	26	28.9
	Moderate Level competency	30	33.3
	Not very competent	28	31.1
	Total	**90**	**100.0**

Table 6 reveals that 33.3% of the teachers are at moderate level of competence, 28.9% are competent, and 31.1% are not very competent while 6.7% are at expert level of competency. This implies majority of the teachers are at moderate level of competency.

Training

Human capacity development is achieved through well planned training programs to be able to realize the desired skills and knowledge in teachers. Time must be set aside for training of staff in an organization before roll out of new technology(s) for its success. Training of teachers in ICT integration in education is one the ways of ensuring that there is effective and quality delivery of education using ICT technologies. Data was collected and analyzed to investigate teacher training and length of training as summarized in the findings in Table 7.

Table 7: Length of ICT Training

		Have you been trained in the use ICT	Total
		Yes	
How long was the training?	1-5 Days	82	82
	Missing	8	8
Total		**90**	**90**

The table 7reveals 82 out of 90 teachers sampled were trained in ICT, which is 91.11% and that the training took only one week or less as in the Table 1. This implies that training time (one week or less) to equip teachers with knowledge and skills to manage and use ICT equipment in education was too short. This was inadequate for teachers to have acquired the relevant skills and knowledge and practiced on their integration in education.

The study also sought to collect and analyze data to establish the areas of ICT on which teachers were trained on as in the Crosstabulation of the findings in Table 8.

Table 8: Area trained and use ICT.

		Have you been trained on the use ICT	Total	Percent (%)
		Yes		
Which area were you trained on?	Basic networking	10	10	11.11
	Software upgrade	2	2	2.22
	Computer basics	70	70	77.70
	Missing	8	8	8.88
Total		**90**	**90**	**100**

Table 8 reveals that most teachers were trained on the ICT, 11.11% on basic networking, 2.22% on software upgrades and 77.70% on computer basics. Basing on the findings in Table 7 and Table 8, most of the teachers were trained on computer basics. The training had a wide coverage on computer basics than the other areas indicated in the Table 8 as it was touching directly integration of ICT in education.

Further analysis was done to find out whether the respondents had follow up activities on training after the initial one to support them in case of difficulties. The results were summarized on Figure 2: Follow up training.

Figure 2: Follow up Training

Figure 2 reveals that majority of the teachers (97.78%) had no follow up training sessions after the initial one. A follow up training would have formed a platform for the teachers to ask questions about areas they had not understood during the training. The trainers would have also used this forum to find out any problems they were encountering in the process of ICT integration in education.

Availability and adequacy of resources are critical in integration of ICT in education. The research investigated the extent of availability of time, training and support offered to the teachers towards ICT integration in education in primary schools. The findings were as in Table 9

Table 9: Time to develop ICT Skills and Knowledge

Had enough time to develop skills and knowledge		**Frequency**	**Percent (%)**
Valid	Strongly agree	6	6.7
	Agree	14	15.6
	I don't know	2	2.2
	Disagree	28	31.1
	Strongly disagree	40	44.4
	Total	**90**	**100.0**

Time is a core resource of training. Its availability to trainees can boost the grasp of knowledge and skills. Table 9 reveals that 75.6% of the teachers did not have enough time to train and acquire the relevant skills and knowledge required for ICT integration in education. The training took a shorter period (a week) and hence was not sufficient to enable teachers acquire skills, knowledge to enable apply in ICT integration in education smoothly.

A further analysis was done to find out whether the respondents had sufficient support to acquire ICT skills and knowledge as summarized in the findings in Table 10.

Table 10: Adequate Support

Had adequate Support		**Frequency**	**Percent (%)**
Valid	Strongly agree	6	6.7
	Agree	12	13.3
	I don't know	8	8.9
	Disagree	44	48.9
	Strongly disagree	20	22.2
	Total	**90**	**100.0**

Professional support is usually handy whenever one falls short of technical knowledge or skills in the course of application. Table 10 reveals that majority of teachers (71.1%) did not receive any support to enable them apply the skills and knowledge in ICT integration in education. They therefore lacked the confidence of using the ICT equipment for fear of getting stack in the process of usage.

ICT Health and safety Issues

The research sought to investigate the ICT health and safety practices in schools to establish how prepared the teachers are to ensure a safe environment for the learners and the surrounding community during ICT integration in education. This arose from the fact that schools are and would be consuming both hardware and software resources which are bound to become defective, obsolete or reach their end-of-life with time hence rendering them useless.

The study looked at human capacity training on: use of anti-glares, care of hardware and software, use of protective keyboard covers, disposal of equipment and effect of e-waste to the environment as in Table 11.

Table 11: ICT Health and Safety Issues

		Frequency	Percent (%)
Use of Anti-Glare Screens	Strongly agree	6	6.7
	Agree	10	11.1
	Not sure	4	4.4
	Disagree	20	22.2
	Strongly disagree	50	55.6
	Total	**90**	**100.0**
Care of Hardware and Software	Strongly agree	6	6.7
	Agree	18	20.0
	Not sure	4	4.4
	Disagree	18	20.0
	Strongly disagree	44	48.9
	Total	**90**	**100.0**
Use of protective keyboard covers	Strongly agree	6	6.7
	Agree	18	20.0
	Not sure	4	4.4
	Disagree	18	20.0
	Strongly disagree	44	48.9
	Total	**90**	**100.0**
Safe disposal of ICT equipment	Strongly agree	6	6.7
	Agree	14	15.6
	Not sure	16	17.8
	Disagree	18	20.0
	Strongly disagree	36	40.0
	Total	90	100.0
Effect of e-waste on the environment	Strongly agree	8	8.9
	Agree	8	8.9
	Not sure	12	13.3
	Disagree	20	22.2
	Strongly disagree	42	46.7
	Total	90	100.0

Table 11 reveals that 77.8% of the teachers did not train on the use of anti-glare screens, 68.9% did not train on the care of hardware and software, 68.9% did not train on the use of protective key board covers, 60% did not train on the safe disposal of ICT equipment and 68.9% did not train on the effect of e-waste management. It's clear from the figures that over 60% of the teachers did not train on the ICT health and safety issues and this would make it hard for them to properly manage the ICT equipment. Inadequate skills for proper management can lead to many equipment breaking down and in the process making them expensive in maintenance. Those equipment that cannot be maintained need to be disposed properly and this calls for teachers to have knowledge on the disposal and also effect of e-waste management to keep the environment friendly for the children and the community at large. Spillage of harmful materials from defective or obsolete equipment that has not been properly disposed is dangerous to the environment.

V. Discussion

The analysis in Table 1 reveals that the most dominant computing devices in schools are laptops (28.48%), projectors (27.85%) and tablet at 27.24%. These devices are portable and conducive hardware technologies that can be used for ICT integration in education. The analysis in Table 2 revealed that most the most commonly used data storage device in schools is flash disk (35.56 %) with a few of the respondents (8.89%) storing data on google drive.This implies that most respondents do not use google drive as a data storage device. To use this storage device requires Internet connection in the schools. Lack of Internet connection in schools is the main contributor to low usage of this service which is usually housed in the cloud. Comparing storage capacity and cost of flash disk with the use of google drive, the latter has more storage capacity and has is less expensive since it is offered as a service and payable only on demand. Users are also more privileged to access their data and information anywhere as need and is easy to recover data in case of an accident. The user does not also have to incur additional costs on maintaining the software during usage but only needs Internet connection to access and use the storage space.

On the usage of cloud technologies in schools, across tabulation of those who had personal e-mail account and how they often access their e-mails was done. Table 3 reveals that 58 respondents have personal email account but do not use their account, 22 have personal email account but they use them less frequently while 4 have e-mail account and also frequently use it. This implies that majority of the respondent who have e-mail accounts do not frequently use these accounts as in Table 3. Lack of internet connection could be a contributory factor the low usage of e-mail accounts in the schools.

Investigations into the extend of Internet connectivity in the schools reveals that 66.7% of the schools are not connected to the Internet as in Table 4. This justifies the observation made in Table 3, where there is low usage of e-mail accounts by teachers. The analysis in Table 5, reveals further that 62.2% of the teachers who access the Internet use smart phones. These are personal devices and so only those teachers who have smart phones can access the Internet and even e-mail and cloud storage. The usage of e-mail and cloud requires knowledge on the same respectively. The Table 6 reveals majority of teachers are at moderate level of competency. They were trained on ICT integration in education as in Table 7, though the length of training was short (1-5 days). This however, was not sufficient to enable them acquire knowledge and skills to operate e-mail accounts among other things.Table 8 revealed that 70 of the respondents trained on computer basics, 10 on basic networking and 2 on software upgrades. This further justifies that in the 1-5-day training, most of the training was carried out on computer basics. This implies that the training is still below the threshold of enabling the teachers to fully integrate and sustain ICT in education in primary schools in Kenya. Further, Table 9 revealed that, 44.4% strongly disagreed that they had enough time to develop skills and knowledge in ICT Integration in education. This implies that majority of the respondents did not have enough time to train and develop skills and knowledge in ICT.

Data was collected and analyzed to find out the use of anti-glare screens on monitors to guard against eye strain to computer and tablet users. The findings in Table 11 revealed that majority of the teachers (77.8%) did not have any training on the use of anti-glare screens which is a health and safety issue when using ICT equipment. This implies that there is need to train teacher on the use of anti-glare to protect their eyes and those of learners against damage due to long exposure on the screen. On the care of ICT equipment (Hardware, software and peripherals), Table 11 revealed that, over 68.9% did not train on the care of hardware and software to prolong the lifespan of the equipment. This implies that there is need for training teachers on the care of hardware and software measure as this determine the lifetime of hardware and software. Key board covers protect keyboards against dust, moisture and spillage of liquids that might interfere with the electrical circuit hence the operation of the device. Table 11 revealed further that 68.9% of the teachers did not train on the use of protective keyboard covers, a component that enables users to interact with the computer. Hardware equipment with time of use, may become defective due to failures, obsolete due to changes in technology or reach their end-of-life after long usage. In such cases it may become necessary for them to be removed and be disposed-off safely. Data was collected to establish the level of training on the disposal of such equipment in primary schools. Table 6 revealed that majority of the teachers (68.9%) were not aware of the effect of e-waste on the environment. The lack of awareness implies that they were not trained on and do not know how to keep the environment friendly during the period of use of ICT equipment.

Integrated Cloud Computing Environment Model (ICCEM)

Basing on the findings of the study, Factor analysis was used to identify the factors that were relevant to the development of the model. Principal component analysis was done to find how the factors load on the components as in Table 12.

Table 12: Principal Component Analysis

Component Matrix[a]										
	Component									
	1	2	3	4	5	6	7	8	9	10
Levels of competency			-.678							
Set up a new computer										
Check set up of existing computer system	.575									
Set up projector for use	.711									
Trouble shoot a computer	.539									
Has had enough time to develop ICT skills and knowledge			.707							
Has had enough training			.709							
Trained on use of anti-glare glass on monitors	.714									
Trained on care of hardware, software	.800									
Trained on use of protective Keyboard covers	.828									
Trained on safe disposal of equipment	.835									
Trained on the best practices when using ICT equipment	.790									
Trained on safe and responsible use of electronic communication e.g. email	.730									
Trained on effect of e-waste on the environment	.795									
Desktop computers				.616						
Laptops							.570			
Tablets							.599			
PDAs								.557		
Printers										
Projector										.739
Do your learners access any learning material through the internet while in class?									.573	

Are the learners able to access learning material used in class while at home?									.609	
Which search engine would you recommend for the learners to use while on the internet?										
How can you categorize Processors	-.617									
How can you categorize Networks		.731								
How can you categorize Storage space	-.583	.565								
How can you categorize Database, spreadsheets, power point		.703								
How can you categorize Microsoft Office 2013		.681								
How can you categorize Learning management system					.621					
How can you categorize Windows/Linus OS		.542			.541					
How can you categorize Google search engine		.538								
Extraction Method: Principal Component Analysis.										
a. 10 components extracted.										

Table 12 reveals that after principal component analysis, 10 components were generated and the variables that load together onthe subsequent component are shown under each component including their weights.

After establishing the variables that load on the components, Factor rotation was done to reduce the number of factors in which the variables under the study have higher loadings. This was done to identify the variables and make the interpretation easier as in Table 13.

Table 13: Rotated Factor Loadings

Rotated Component Matrix[a]										
	Component									
	1	2	3	4	5	6	7	8	9	10
Set up a new computer			.812							
Check set up of existing computer system			.791							
Has had enough time to develop ICT skills and knowledge					.940					
Has had enough training					.902					
Trained on use of anti-glare glass on monitors	.869									
Trained on care of hardware, software	.834									
Trained on use of protective Keyboard covers	.880									
Trained on safe disposal of equipment	.787									
Trained on the best practices when using ICT equipment	.752									
Trained on effect of e-waste on the environment	.856									
Laptops							.751			
Projector										.824
Are the learners able to access learning material used in class while at home?									.751	
How can you categorize Processors		.769								
How can you categorize Storage space		.760								
How can you categorize Learning management system						.824				
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.										
a. Rotation converged in 14 iterations.										

The variables: Trained on use of anti-glare glass on monitors with a factor loading of (.869), care of hardware and software (.834), use of protective Keyboard covers (.880), safe disposal of equipment (.787), and best practices when using ICT equipment (.752) and trained on effect of e-waste on the environment (.856) load together to form component 1. All these variables had a common shared element of green computing and were renamed Green Computing.The variables: Set up a new computer with a factor loading of (.812) and check set up of existing computer system (.791) load together to form component 3. It was observed that these variables had a common shared element of hardware skills and were therefore renamed as Basic Hardware skills.The variables: Had enough time to develop ICT skills and knowledge with a factor loading of (.940) and had enough training (.902) load together form component 5. It was observed that these variables had a common shared element of technical training skills and were renamed Technical Training skills.The variables: Laptop computers (.751) and Projector (.824) have a common shared element of hardware and were renamed Hardware (ICT technologies).The variable: How can you categorize learning management system with a factor loading of (.824) has a key element of the platform as a service and was as such renamed Platform as a Service.The variables:How can you categorize Processors with a loading of (.769) and how can you categorize Storage space (.760) load together form component 2. It is observed that these variables have a common shared element of computing power and were therefore renamed as Computing Power. The variable: Are the learners able to access learning material used in class while at home, with a factor loading of (.751) loads to form component 9. It is observed that this variable has a key Internet of Interment and was therefore renamed Internet.The integrated Cloud Computing Environment Model developed is as in Figure 3.

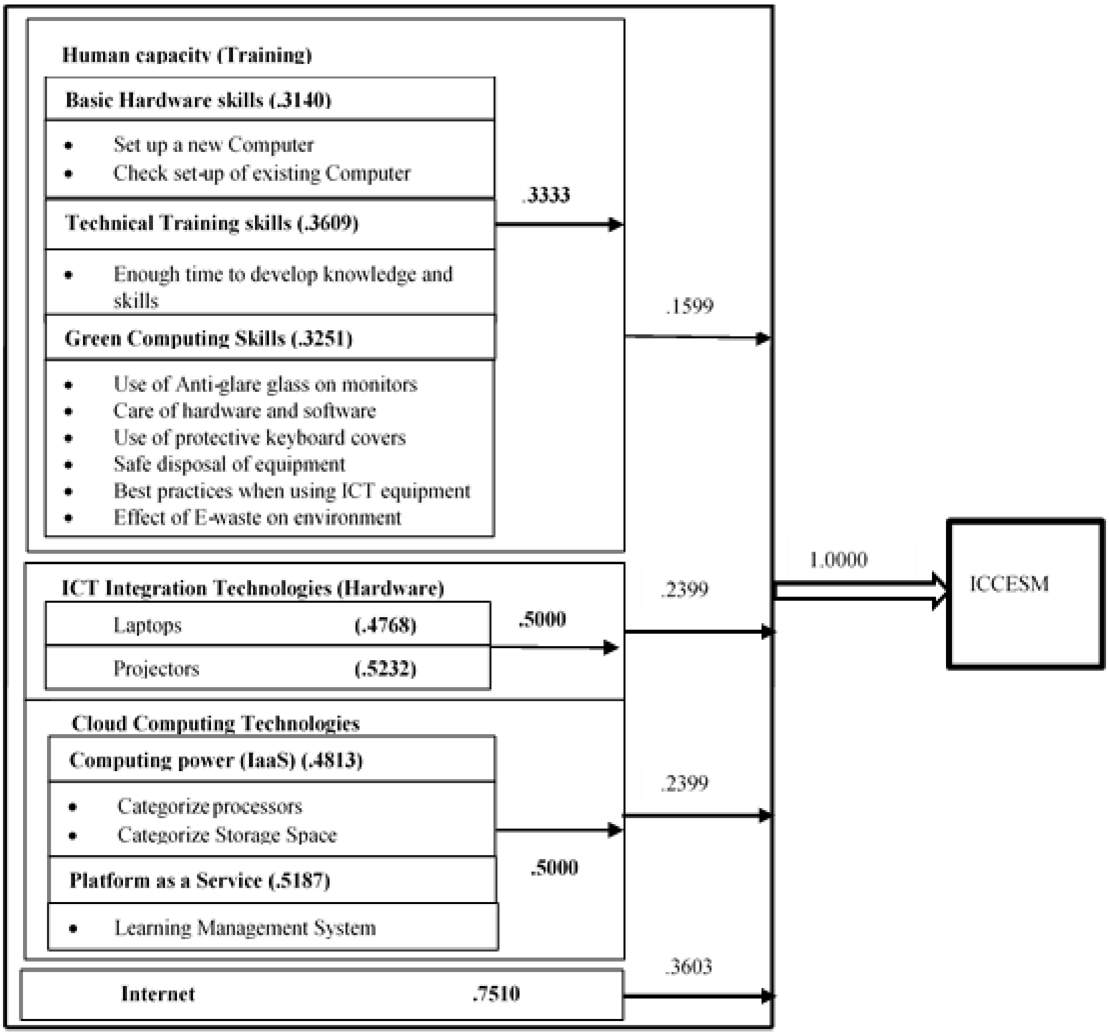

Figure 3: ICCEM Model

The contribution of the sub-constructs to the ICCEM model were calculated and fed into the model. These were: Human capacity training (.1599), ICT Integration Technologies (.2399), Cloud Computing Technologies (.2399) while the Internet contributed (.3603) towards model development.

Basing on the findings of the study, affordable ICT Integration can begin with Internet connectivity in the schools (high speed Internet access) as revealed by the high weighting of the variable (.3603), that depicts its importance on facilitation of communication and access to shared pool of resources. The next step would be to purchase some hardware devices for use in class such as laptops and projectors. These devices are portable and easy to move with from one point to another. The next step would be to move servers, operating systems, learning managing systems, which are normally very expensive in terms of cost, maintenance and support to the cloud. Cloud enables the hardware's and software's to be provisioned as services (Infrastructure as a Service, Software as a Service and Platform as a Service) that can be accessed anywhere, anytime via the web. With this strategy, Governments can be relieved of the agony of incurring huge expenditure on purchasing powerful hardware and software and also their associated maintenance and support costs thusmoving closer to affordable ICT Integration in education in schools.With the Internet and ICT Integration and Cloud technologies in place, human capacity development (Training) can be launched. Teachers can then be trained on basic hardware skills to use the technologies, the technical training skills to enable them acquire relevant knowledge provide professional support which would otherwise attract a cost in the absence of a well trained workforce. Training teachers on ICT health and safety issues will empower teacher on the care and management of ICT resources to ensure the safety of the children and also environmental sustainability.

VI. Conclusion

Incorporation of ICT in education can be successful if the acquisition of hardware, software and overall maintenance costs are affordable in the long run. Environmental friendliness should also be considered in the process of planning for ICT Integration in education. Clear guidelines should therefore be followed in order to successful integration if ICT in education that is financially and environmentally affordable. The Integrated Cloud Computing Environment Model (ICCEM)developed as in Figure 3, can be used to direct and control ICT Integration in Education. The model incorporates cloud technologies which reduces on the cost of hardware, software and dealing with a wide range of technologies which also come with other ongoing operational costs. It also curbs on accumulation of e-waste in the environment that may arise from defective, obsolete and equipment that reach their end of time by properly training teacher on good management and disposal skills and knowledge. To achieve affordable ICT Integration in schools, there is need for major infrastructure development like high speed Internet connectionto facilitate the use of cloud services via the web on demand thus reducing on the cost of investing in powerful hardware like stand-alone servers for each school and software for each device, some of which is very expensive to buy and maintain and thus making ICT Integration un affordable for the government and schools. With an integrated cloud environment, the resources can be pooled at a central point to facilitate sharing and easy management by many schools within a region or at national level. This model will therefore greatly lower the cost of ongoinginvestment and professional support required to operationalize the hardware and software and also ensure environmental friendliness in the long run.

Acknowledgment

We highly acknowledge the National Research Fund-Kenya for funding this study to make it a success.

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IOSR Journal of Computer Engineering (IOSR-JCE) is UGC approved Journal with Sl. No. 5019, Journal no. 49102.

Yonah Etene. "Integrated Cloud Computing Environment Model (ICCEM) Towards Affordable ICT Integration in Education" IOSR Journal of Computer Engineering (IOSR-JCE) 21.2 (2019): 23-33.