ICT Adoption Readiness and ICT Policy Implementation in Secondary Schools in Mayuge District, Uganda

Gideon James Mukhula, Deborah Manyiraho, Dennis Zami Atibuni[*], David Kani Olema

Busitema University, Faculty of Science and Education, P.O. Box 236, Tororo, Uganda
*Corresponding author: zamidennis79@gmail.com

Abstract This study explored the levels of and relationship between ICT adoption readiness and ICT policy implementation in Secondary Schools in Mayuge District. The objectives included determining the level of ICT adoption readiness, establishing the level of ICT policy implementation and examining the relationship between ICT adoption readiness and ICT policy implementation. A cross-sectional survey research design employing both quantitative and qualitative approaches was used. A sample of 232 teachers was selected from both private and public secondary schools using simple random sampling technique to participate in the study. Three District Inspectors of Schools (DIS) selected purposively also participated in the study. A questionnaire containing closed ended questions was used to collect quantitative data from the teachers, while an interview guide was used to obtain qualitative responses from the DIS. The quantitative data were analyzed using descriptive statistics: frequencies, percentages, means and standard deviations, while the qualitative data were analyzed using thematic content analysis. The results revealed a moderate overall level of ICT adoption readiness ($M = 42.19$, $SD = 10.10$), a moderate overall level of ICT policy implementation ($M = 85.11$, $SD = 9.88$), and a significant moderate positive relationship ($r = .50$, $p < .01$) between ICT adoption readiness and ICT policy implementation. From the results it was concluded that secondary schools in Mayuge District were in the early stages of domestication of ICT and ICT policy implementation. It was recommended that concerted effort be directed towards improving schools' ICT adoption readiness in order to improve ICT policy implementation.

Keywords: *information, communication, technology, adoption, readiness, policy, implementation*

Cite This Article: Gideon James Mukhula, Deborah Manyiraho, Dennis Zami Atibuni, and David Kani Olema, "ICT Adoption Readiness and ICT Policy Implementation in Secondary Schools in Mayuge District, Uganda." *American Journal of Educational Research*, vol. 9, no. 8 (2021): 479-487. doi: 10.12691/education-9-8-3.

1. Introduction

Teaching may be considered one of the most challenging human endeavors, especially in the 21st century. This is because knowledge is ever expanding and so rapidly changing that modern day teaching demands the use of modern information and communication technologies (ICT) amidst challenges such as COVID-19 pandemic. The adoption of ICT for teaching and learning becomes inevitable in this regard. Therefore, academic faculties and teaching departments need to deploy newer, innovative, and future-oriented methods for effective teaching and learning in schools and higher education institutions [1]. Consequently, growing attention to ICT adoption readiness and policy implementation should be solicited from all directions such as the public, business, and education sectors.

According to Ochwo et al. [2], ICT refers to instruments that facilitate creation, processing, and transmission of information by electronic means. Ochwo and colleagues further assert that ICT embodies a full range of old and new technologies such as the radio, television, computers, internet and telephones, fax, scanners, printers, and the print media. ICT adoption in education is the gradual shift to automation of educational processes, administrative activities like students' admission, registration, evaluation, and delivering customized Learning Management Systems (LMS) as well as transferring all courses and the related content onto it [3]. For proper application of ICT in the teaching and learning process, there is need to ensure ICT readiness within the institutions. ICT readiness is conceptualized as having access and ability to utilize ICT to the benefit of an institution [4]. Efficient application of ICT also requires effective ICT policy frameworks which refer to a series of activities or decisions that are put in place by governments and other stakeholders to bring digital technology to individuals and communities so that they can access information [5,6]. ICT implementation then means putting to use ICT policies or plans to achieve the intended goals. Alimaghian et al. [5] opine that the process of implementation involves translation of the goals and objectives of a policy into an action.

The evolution of technology dates back to the Stone Age era when human beings used their intellect to improve their living [7]. Over the centuries, technology evolved from simple rudimentary tools to advanced

computer technologies, now within the fourth industrial revolution (4IR) characterized by internet of things and artificial intelligence [8]. Gutierrez [9] claims that ICT evolved from the invention of a simple mouse in the 1960s, to ARPANET, smart phones, and the instant text messaging of the 2000s. These developments have come with the need for institutions to adopt ICT in their operations. According to Osorio et al. [10], the shift has called upon world governments to develop suiting policies and frameworks, not only to deal with new challenges created by technology, but also set firm ground for a fast growing technology industry. So ICT readiness continues to improve almost everywhere in the world with clear upward trends across all regions. Osorio and colleagues further observe that there are noted high positive staggering trends of ICT readiness in the USA, Europe, and Australia depending on the cost of accessibility among other factors. Weber and Kauffman [11] reveal that the United Arab Emirates leads the Arab world in terms of Network readiness with greater connectivity.

Ewing et al. [12] note that ICT readiness and internet penetration in Africa is comparatively low due to limited exposure and prohibitive costs. This scenario largely accounts for the low level of implementation of ICT policies. Despite the low level of implementation, Ewing and colleagues observe that never before in the history of Africa has ICT adoption readiness been as concentrated as it is today, though it has made a slower progress. This view is also held by Lam [13] who asserts that there is a remarkable growth and development in the use of ICT in education in Sub-Saharan Africa.

The Government of Uganda, in a bid to enhance the development and utilization of ICT in the country, initiated several efforts. One such initiative is the integration of ICT in teaching and learning at secondary school. However, it is noted that very few schools are implementing the policy [14]. This prompted the Ugandan Ministry of Education and Sports (MoES) to formulate a sector policy to direct the implementation of ICT in primary and secondary schools and the other education institutions.

Thus, there was need to study the adoption readiness and implementation of the ICT policy. This study, underpinned by the Domestication of Information and Communication Technologies theory [15], was undertaken in this regard. According to the theory a high level of ICT adoption readiness is desirable for faster domestication of ICT which reciprocally quickens implementation of the policy.

1.1. Problem Statement

Harnessing emerging ICT in education helps to develop existing education practices more efficiently and effectively. However, despite the enormous advocacy for ICT based e-teaching and e-learning, investment in ICT, retooling of teachers, and provision of virtual content to schools, there is still ineffective and disappointing progress in ICT policy implementations in secondary schools [16]. Consequently, the number of schools still using traditional methods for pedagogical and administrative service delivery is still big [17].

Poor performance in the implementation of the ICT policy has been reflected in schools' failure to fully embrace e-learning [18]. Such failure to embrace technology may continue to disadvantage Mayuge District in attaining faster socioeconomic transformation as well as national and global competitiveness. The reasons for the failure could be many, including limited or no connectivity to the internet and lack of stable electricity among others. In secondary schools in Mayuge District, these reasons reflect a gap in the leadership, management and implementation of the ICT policy in education. This gap may result in poor pedagogical and administrative service delivery and poor implementation of the ICT policy. Therefore, this study explores the levels of ICT adoption readiness and policy implementation in secondary schools in Mayuge District, Uganda.

1.2. Objectives, Research Questions, and Hypothesis of the Study

The objectives, research questions, and hypothesis of the study included the following:

1.2.1. Objectives of the Study

1. To determine the level of ICT adoption readiness in secondary schools in Mayuge District.
2. To establish the level of ICT policy implementation in secondary schools in Mayuge District.
3. To examine the relationship between ICT adoption readiness and ICT policy implementation in Secondary Schools in Mayuge District.

1.2.2. Research Questions

1. What is the level of ICT adoption readiness in secondary schools in Mayuge District?
2. What is the level of ICT policy implementation in the secondary schools in Mayuge District?
3. What is the relationship between ICT adoption readiness and ICT policy implementation in the secondary schools in Mayuge District?

1.2.3. Hypothesis

H_0: There is no significant relationship between ICT adoption readiness and ICT policy implementation in secondary schools in Mayuge District.

1.3. Review of Related Literature

1.3.1. Conceptual and Theoretical Review

Several authors have explained the concepts of the study in different ways. According to Salaam and Obakhume [19], ICT means the techniques people use to share, distribute, and gather information to communicate through computers and computer networks. ICT can also be looked at as computers, hardware, electronic equipment and applications that help people to access, retrieve and process and, exchange information, at times referred to as e-business or e-government [20]. These two definitions basically look at ICT in terms of both the hardware and software. Similarly, this study considered ICT as sets of tools used to process, avail and access information and

communication products or services, which may include computers, telephones, televisions, internet, telefax, calculators, and projectors [2].

ICT adoption involves taking up ICT into the daily operations of an organization such as a school [21]. The UN International Telecommunications Union looks at ICT readiness through indicators such as the quality and availability of ICT infrastructure and personnel. ICT adoption readiness therefore refers to having access and ability to utilize ICT to the benefit of organizations [4]. This study thus conceptualized ICT adoption as the use of both the hardware and software in all processes in secondary schools in Mayuge District.

A policy, according to Anderson [6], is a guide to or purposive course of action, followed by guidelines in dealing with the matter of concern. This implies that the government needs to institute policies as a series or patterns of activities or decisions to give strategic direction in solving problems. Policies can only be effective if they are properly implemented, thus policy implementation involves translation of the goals and objectives of a policy into an action [5].

Several studies on ICT adoption and implementation have generally taken three possible approaches: diffusion of innovation, adoption of innovation, and a domestication of innovation [22]. However, this study adopted the domestication theory as a lens to understand how secondary schools integrate ICT in their curriculum, and how ICT adoption readiness correlates with ICT policy implementation. The domestication theory focuses on how technology becomes an integral part of everyday human activities [15,23]. This therefore suits it to explain the processes of ICT implementation. Moreover, Haddon [24] affirms that the theory supports case study findings that are descriptive in nature as this study.

1.3.2. ICT Adoption Readiness in Schools

ICT is fast becoming an essential component in preparing students for their roles in the future workplace [25]. However, most institutions, especially in the sub-Saharan Africa, are transiting to the adoption of ICT at a slow rate. According to Landon et al. [17], initial excitement over the prospect of acquiring computers and other new technologies in the classroom led to significant spending in the education sector in the 1980s and 1990s. Other scholars such as Cuban [26] predicted that computer use in schools would come with all the hype and expense. Cuban further stressed that computers would be incompatible with the requirements of teaching since they are slow, prone to technical faults, and difficult to operate and master. Adapting to ICT use in the classroom by both teachers and students would also require knowledge and comfort working with technology tools. However, as computers become more integrated with everyday life, the masses are forced to make a shift towards ICT adoption. Cuban's predictions can be used to assess areas where ICT is being used in the teaching and learning process so as to appreciate progress that has been made. These include public and private education institutions.

However, the adoption is still not progressing fast due to computer illiteracy among the work force. According to Cuban [26], the pressure of ICT integration falls on three components of the education system: the governmental Ministries overseeing education and technology, the schools and their administration, and the teachers who implement the integration. Thus for successful adoption, all the three components should be well equipped.

However, Buabeng-Andoh [25] notes that teachers in Uganda have little training in ICT skills. Teacher training programs for these skills have largely been unsuccessful for a variety of reasons including being overworked, poor attitude, and being overcommitted at their workplaces. Much as new computers have been distributed throughout the country to both urban and rural schools [27], a lot of effort from all the three components of the education system is required for successful adoption of ICT. This argument is supported by the findings of Taban et al. [28] in a survey in central Uganda where computers distributed to schools were used primarily by school administrators (Head Teacher, Director of Studies, Bursar) for nonacademic tasks and not for teaching and learning. In many of the schools, the computers were not available to students. In addition, the number of working computers was almost equal to the number of faulty ones, highlighting the challenge schools face in getting sufficient quality ICT resources.

Furthermore, the survey [28] showed that the pattern of teacher adoption of ICT indicated its use mainly for some type of administrative work, followed by personal entertainment. Only a small fraction of teachers used ICT for pedagogical engagements. This all suggests gaps in the adoption and implementation of the ICT policy in schools. On a positive note, coupled with the inclusion of Computer Studies at high school, a joint initiative by the Ministry of Education and Sports (MoES) and the Uganda Communication Commission (UCC) provided computers for secondary and tertiary institutions.

However, some educational technologists argue that computer laboratories have become obsolete and provide a disservice to education. For example, given the multitude of school and personally-owned devices (including laptops, tablets and mobile devices), laboratories would imply a separation between computing as a subject and the general curriculum. On the other hand, other technologists argue that the inclusion of a smaller number of computers and other devices in classrooms helps to build stronger links between ICT and curriculum, facilitating the development of 'higher-order' skills [29]. Thus, some better developed schools boost ICT further by deploying computers, interactive whiteboards and light-emitting diode (LED) projectors in classrooms, school libraries and other convenient locations around the school for both learners and teachers. This approach, however, turns out to be very expensive for schools in rural Districts including Mayuge where the stakeholders struggle to adopt ICT in their daily operations.

1.3.3. ICT Policy Implementation in Schools

Several strategies on curriculum and training of teachers in ICT skills and pedagogy are outlined in the East African ICT policies as basic to the implementation of ICT [30]. According to Mooij and Smeets [31], there are five phases of ICT implementation within schools, representing different levels of ICT transformation of the educational and learning processes. These stages include

incidental and isolated use of ICT by one or more teachers, increasing school awareness of ICT relevance for the school at all levels, emphasis on ICT coordination and hardware within school, emphasis on didactic innovation and ICT support, and the use of ICT integrated teaching and learning that is independent of time and place. In addition, Bodong [32] identifies three dimensions of change for the teacher using ICT in the classroom as the use of new hardware and software materials; the adoption of new activities, behaviors or practices; and changes in beliefs and understanding. This means that computers are but just a subset of ICT facilities needed in schools. Moreover, the computers have to be furnished with quality accessories, installed with appropriate software and linked to necessary networks to allow access to rich resources beyond the school, rather than serve as a resource for minor typesetting and other word processing activities.

Effective integration of ICT in schools would call for a whole institution to be networked, to ensure access to multimedia and learning-rich resources via the school's Intranet and the Internet, wherever students and teachers are, in or out of school. The ICT laboratories and classrooms need to be equipped sufficiently to allow ready access and utilization by students and staff. Despite the above desired situation, most education institutions in Africa face barriers to effective integration of ICT in the teaching and learning process, with limited infrastructure, in terms of satisfactory physical conditions of laboratories and the subsequent accessibility of the ICT resources to the learners [33].

Accessibility and integration of ICT enables students to explore the real world more thoroughly [34]. However, there are barriers associated with ICT integration and policy implementation, which fall within the physical realm, and are beyond the direct control of the teacher [35]. These barriers center on availability and accessibility of infrastructure, and decisions about purchasing and placement of computers in centralized laboratories versus classrooms. Such barriers affect the implementation of the ICT policy in schools, although integration and implementation of ICT in learning may increase over time as teachers and learners become more practical in using computers. The skills and attitudes of the learners and teachers determine the effectiveness of technology integration and ICT policy implementation in the curriculum [36].

1.3.4. Relationship between ICT Adoption Readiness and ICT Policy Implementation in Secondary Schools

Classroom teachers are the key implementers of the ICT policy; integrating ICT in their teaching and learning as well as facilitating learners to embrace ICT outside the classroom. Generally, integration of ICT in teaching and learning enhances the motivation of teachers through exposure to a wider curriculum, encouraging higher order intellectual skills, and improving teaching techniques [37]. Thus, both teachers and learners are exposed to meaningful and deep information. According to Carrasco and Torrecilla [38], utilization of ICT for teaching and learning is closely associated with school accomplishment and student attainment. This implies that implementation of the ICT policy in secondary schools would enhance students' achievement of educational goals. However, the integration of ICT in teaching and learning in schools is hampered by contextual factors such as availability of ICT resources [39,40]. In addition, Kolikant [37] notes that in cases where the resources are available, there is minimal utilization and therefore limited implementation of the ICT policy in schools.

Henessey et al. [30] postulate that teachers need to be supported to integrate ICT resources in their teaching for effective implementation of the ICT policy. The teachers should be given opportunity to attend ICT related training to enhance their competencies but also be supplied with ICT devices such as projectors, wireless internet, and computers [41]. This will enable the teachers not only to gain proficiency in using ICT tools, but also create technology-enhanced lessons which require a lot of time for preparation [37]. In this regard, some schools have been offered teacher training on ICT integration and access to ICT resources, thus improving the results of ICT integration practices [30].

2. Methodology

2.1. Research Design

This study employed a cross-sectional survey research design in which both qualitative and quantitative approaches were used. The design was suitable for data collection from the teachers at a specific point in time [42].

2.2. Study Population

This study was conducted in secondary schools in 12 Sub-Counties in Mayuge District in Uganda between May and June 2019. The study targeted secondary school teachers ($N = 594$) in both public and private secondary schools and the three District Inspectors of Schools in Mayuge District, totaling to 597. The District Inspectors of Schools were purposively selected to participate in the study because of their role in monitoring the implementation of the ICT policy by secondary schools in the District.

Table 1. Population, Sample size and Sampling method

Category	Population	Sample size	Sampling method
Teachers	594	232	Proportionate and simple random Sampling
Dist. Inspectors Schools	03	03	Purposive sampling
Total	597	235	

2.3. Sample Size and Sampling Techniques

According to Krejcie and Morgan's table of sample size determination [43], the population gave rise to a sample of 232 teachers who were selected using simple random sampling technique. All the District Inspectors of Schools (n = 3) were selected purposively to participate in the study. The sample was drawn from proportionate strata based on sub-counties, ownership, and funding.

2.4. Instruments for Data Collection

The teachers, as implementers of the ICT policy in their professional practice, filled a self-report questionnaire. While the District Inspectors of Schools responded to questions in an interview guide to generate qualitative data. The teachers' questionnaire was composed of three sections. Section A contained six items focused on demographic information of the participants and their schools. Section B had 13 closed ended items on ICT adoption readiness, while Section C had 33 closed ended items on ICT policy implementation. The closed ended items were scored on a 5-point Likert scale, 1 (*strongly disagree*) to 5 (*strongly agree*). Generally, higher scores denoted higher levels of ICT adoption readiness and policy implementation. The questionnaire was valid with an appreciable content validity index (CVI = .883). The Cronbach Alpha reliability coefficient was acceptable (Alpha = .70). Three interviews were conducted with the District Inspectors of Schools, to generate qualitative data.

2.5. Data Management and Analysis

Quantitative data from the fully filled-in questionnaires were sorted out, coded and entered in Statistical Package for Social Scientists (SPSS) version 25 for analysis. The scores of ICT Adoption Readiness (ICTAR) and ICT Policy Implementation (ICTPI) were categorized as shown in Table 2.

Table 2. Quantitative data score levels

Category	Low	Moderate	High
Level of ICTAR	16-37	38-58	59-80
Level of ICTPI	34-79	80-135	136-170

Qualitative data were transcribed and the information obtained was used in hermeneutic phenomenological approach to interpret the quantitative results. Data from the Inspectors of Schools were analyzed differently and triangulated with the findings from the teachers.

2.6. Ethical Considerations

Throughout the study, ethical considerations such as informed consent of the participants, privacy and confidentiality, anonymity and beneficence were observed. All sources of information used in the study were duly credited.

3. Results and Discussion

3.1. Demographic Information

The demographic characteristics of the participants are presented in Table 3. The number and percentage of participants in each category of demographic characteristics is indicated.

Table 3. Demographic Characteristics

Status	Respondent	n	Overall %	Govt (%)	Prvte (%)
Position	Teachers	232	98.3	43.0	57.0
	D.I.S	03	1.7		
Gender	Female	114	48.5	20.4	28.1
	Male	121	51.5	21.6	29.9
Age	Less 30 years	126	53.6	22.5	31.1
	31-35 years	68	28.9	12.1	16.8
	36-45 years	30	12.8	5.4	7.4
	46-55 years	9	3.8	1.6	2.2
	More than 55 years	2	.9	0.4	0.5
Level of education	Diploma	71	30.2	12.7	17.5
	Degree	128	54.5	22.9	31.6
	Masters	36	15.3	6.4	8.9
Teaching experience	Less than 1 year	19	8.1	3.4	4.7
	1-3 years	78	33.2	13.9	19.3
	4-7 years	67	28.5	12.0	16.5
	8-10 years	31	13.2	5.5	7.7
	More than 10 years	40	17.0	7.1	9.9
Subjects taught	Languages(English, Lusoga, Kiswahili)	38	16.2	6.8	9.4
	Arts and Humanities(History, Geog)	68	28.9	12.1	16.8
	Sciences(Biology, Physics, Chemistry)	77	32.8	13.8	19.0
	Vocational Studies(Woodwork, Metal work)	15	6.4	2.7	3.7
	Computers Studies	23	9.8	4.1	5.7
	Business studies(Entrepreneurship)	14	6.0	2.5	3.5
Total	Sub Total	235	100	42	58

SOURCE: PRIMARY DATA.

The demographic data indicates that the participants were drawn from a wide array of subject disciplines. Thus the sample served as a true catchment of participants for investigation of teachers' and schools' readiness to adopt and implement the ICT in education policy.

3.2. ICT Adoption Readiness

ICT adoption readiness (ICTAR) was measured in three sub-variables; infrastructure readiness, teachers' skills readiness, and funding readiness. The results are shown in Table 4.

Table 4. Level of ICT Adoption Readiness

ICTAR	Minimum	Maximum	M	SD	Level
Overall ICTAR	16.00	73.00	42.19	10.10	Moderate
Infrastructure readiness	11.00	52.00	27.67	7.86	Moderate
Teacher skills readiness	2.00	10.00	5.97	2.08	Moderate
Funding readiness	3.00	15.00	8.55	2.65	Moderate

SOURCE: PRIMARY DATA.

The findings (Table 4) showed that the overall readiness (M = 42.19, SD = 10.10) and the three dimensions: infrastructure readiness (M = 27.67, SD = 7.86); teacher skills readiness (M = 5.97, SD = 2.08); and funding readiness (M = 8.55, SD = 2.65) were all moderate. This means that the schools had the basic equipment required by teachers to implement the ICT policy, but were in their early stages of domestication of the technology, as suggested by Silverstone and Hirsch [15]. In agreement with this finding, a District Inspector of Schools **(Interview 3)** observed that

"… in terms of adoption readiness, the majority, if not all, secondary schools are not yet fully there…. This could be a result of the fact that secondary schools in the district have not yet developed strategies to address factors such as resistance to change or inadequate skilled personnel among other barriers…"

Similarly, another District Inspector of Schools **(Interview 2)** noted that "…factors related to infrastructure have the highest positive significance if schools are to be ready and so implement the education ICT policy…." The inspector further observed that "… ICT policy implementation in schools depends on schools' infrastructure, followed by say moderating factors like teacher attitude…."

The moderate level of infrastructure readiness is in line with the results of a study by Ouma et al. [44] which reveals that e-learning implementation requires physical infrastructure, yet less than 10 percent of secondary schools in Kenya had adequate ICT infrastructure. As noted by Aydin and Tasci [45], it is important for schools to attain readiness in the area of technological infrastructure in the pursuit of technological adoption. Similarly, Nachmias et al. [46] in their study of factors involved in the implementation of digital innovations using technology, established that most schools were having an incomplete infrastructure and the existing infrastructure did not support all developments such as distance learning. This lends lessons to the Ugandan ICT planners both at the local and national level to prioritize the presence and accessibility of functional ICT infrastructure, a view also held by the District Inspector of Schools in Interview 3.

The moderate teacher ICT skills readiness is in agreement with the results of a study by Boakye and Banini [47] which reveal that teachers' success in handling e-learning programs depends on their technical experience in information technology. The findings are also in line with the domestication process of objectification, where technology getting into the school sphere may not be immediately integrated in pedagogy. Therefore, ICT adoption readiness, as indicated by the teacher skills readiness in the secondary schools in Mayuge District, is still at the objectification stage of domestication of technology. It may be concluded that teachers are moderately ready for ICT policy implementation and may need to be acculturated into e-learning systems before they can attain the expected level of readiness for the implementation. This has implications to the effect that stakeholders both at the local and national level ought to champion the training and preparation of teachers in order to enhance a high level of ICT adoption and ICT policy implementation in secondary schools, a view echoed by one of the District Inspector of Schools **(Interview 1)**.

The study established a moderate level of funding readiness which is consistent with the observation by the District Inspector of Schools **(Interview 1)** that "… several barriers hamper school readiness and policy implementation...." However, the findings on co-ordination and management seem to contradict the perspectives of the District Inspector of Schools **(Interview 1)** who opined that there is less serious follow up on the achievement of the implementation of the ICT policy in education by the Directorate of Education Standards (DES) and the District Education Office.

3.3. Levels of ICT Policy Implementation

ICT policy implementation was categorized into three subscales; integration of ICT into the Curriculum, Co-ordination and management, and resource availability. Findings on the levels of the overall ICT policy implementation and the subscales is presented in Table 5.

Table 5. Levels of ICT policy implementation

	Minimum	Maximum	M	SD	Level
Overall ICTPI	34.00	152.00	85.11	2.54	Moderate
Integration in the Curriculum	14.00	66.00	34.35	9.88	Moderate
Coordination and management	12.00	59.00	29.57	9.01	High
Resource availability	8.00	40.00	21.19	6.33	Moderate

SOURCE: PRIMARY DATA.

The study established a moderate level of integration of ICT into the curriculum (*M* = 85.11, *SD* = 2.54). This finding corresponds with the findings of a study conducted in Nigeria by Chukwunyere and Ukagbu [36] which reveal that teachers' awareness of ICT policy does not readily translate into implementation in teaching due to lack of computer literacy and funds among other constraints. Such an implementation gap is a characteristic of ICT adoption readiness and ICT policy implementation in its infancy, as highlighted by Silverstone and Hirsch's [15] domestication theory stages of commodification, objectification and appropriation of technology innovation. This implies that in order to increase ICT integration in the curriculum to a high level and make the implementation of the ICT policy in the education sector feasible, schools and other stakeholders must set the right ground.

The moderate overall level of ICT policy implementation is also in agreement with Nachmias et al.'s [46] finding in their study of 10 cases of Israeli schools. The authors established that there is a consensus about the importance of ICT policy implementation in teaching, but that most schools ranked national policy implementation as being only mildly implemented. This finding is equally corroborated by results from a study by Landon et al. [17] which reveals that despite the effort by government, schools had not fully implemented the MoES ICT policy. Silverstone and Hirsch [15] domestication of technology innovation theory confirms the above findings that secondary schools in Mayuge District, could be at the first or second stage of ICT domestication.

Results from the study equally reveal that there was a high level of co-ordination and management in the implementation of ICT policy in the secondary schools in Mayuge District. This result appears to be unexpected since the District Inspector of Schools **(Interview 3)** revealed that, "...there was less monitoring of the performance of secondary schools as far as the implementation of the ICT policy was concerned...." by the education office, since the schools are far deep in rural Mayuge District.

3.4. Relationship between ICT Adoption Readiness and ICT Policy Implementation

To determine the relationship between ICT adoption readiness and ICT policy implementation, Pearson's Product Moment Correlation Coefficients were determined between the variables (Table 6).

Results in Table 6 indicate that there was a moderate positive significant correlation between ICT adoption readiness and ICT policy implementation (*r* = 0.5, *p* < .001). The null hypothesis that there is no significant relationship between ICT adoption readiness and ICT policy implementation was therefore rejected. This implies that as adoption readiness increases, the rate of ICT policy implementation reciprocally increases. Information from one of the District Inspector of Schools **(Interview 2)** agrees with this: "… if the factors relating to infrastructure, personnel skills, adequate funding, environmental issues, teacher perspectives and technical support were addressed, implementation of the ICT policy in secondary schools may increase…." These findings agree with those of a study of relationships between the use of ICT for instruction and availability of ICT resources in South Africa [39] which points out that easy availability of ICT resources for use in instruction and learning yields a positive meaningful achievement in education. The study however noted that information relating to the relationship between ICT and implementation of policies in Africa is still inconclusive.

The results also resonate well with the findings of a study by Hennessy et al. [30] which indicates that where some schools have been offered teacher training on ICT integration and access to ICT resources by way of adoption readiness, there are improved results in ICT integration practices and implementation of ICT policies. This is similar to the findings of Hogenbirk and Van de Braak [49] about the role of ICT to make teaching-learning effective in higher institutions of learning in Uganda, which concludes that the presence of all factors increases the probability of excellent integration of ICT in teaching-learning process. Similarly, as noted by Murithi et al. [50], ICT infrastructure, teacher competence and technical assistance significantly influence the integration of ICT in teaching and learning. Therefore, this study lends lessons to the effect that governments and other stakeholders ought to plan for transformation for ICT support, continuous professional development in school environments, investment in ICT consolidation, as well as motivate and reward teachers to use ICT among other areas of interest.

Table 6. Pearson Product Moment Correlation Coefficients (r) between ICTAR and ICTPI

		1	2	3	4	5	6	7	8
1. Overall ICTAR	r	1							
2. Infrastructure Readiness	r	.931**	1						
3. Teacher skills	r	.639**	.417**	1					
4. Funding Readiness	r	.545**	.253**	.413**	1				
5. Overall ICTPI	r	.500**	.395**	.410**	.410**	1			
6. Int. into Curriculum	r	.463**	.366**	.387**	.374**	.891**	1		
7. Coordination & Management	r	.446**	.336**	.398**	.390**	.914**	.681**	1	
8. Resource Availability	r	.422**	..356**	.291**	.323**	.869**	.643**	.767**	1

NOTE. **. CORRELATION IS SIGNIFICANT AT THE 0.001 LEVEL (2-TAILED).

4. Conclusions

The study findings indicate that secondary schools in Mayuge District had a moderate level of ICT adoption readiness. Reinforced by the views held by the inspectors of schools, it can be argued that ICT in education policies were being implemented to a moderate extent by ensuring that the three main pillars of ICT, namely; access to ICT infrastructure and equipment, teacher capacities, and monitoring were in place. It can therefore be concluded that secondary schools in Mayuge District strived to ready themselves for ICT adoption, but there was need for more effort to enhance the adoption readiness.

ICT policy implementation level in secondary schools in Mayuge District was moderate. This indicates that the responsible stakeholders undertook co-ordination and management of the policy fairly well. However, other factors including mentorship and continuous professional development should have been upped through strategic leadership and provision of ICT resources.

The study also found a significant positive correlation between the level of ICT adoption readiness and the level of ICT policy implementation. Despite such a finding not being indicative of a cause-effect relationship, it can be concluded that the level of implementation of the ICT policy is associated with the level of ICT adoption readiness. In this case, the obstacles to adoption readiness need to be overcome for effective implementation of the ICT policy.

5. Recommendations

Given the moderate ICT adoption readiness, the study therefore recommends that stakeholders should ensure that up-to-date and adequate technology is secured to increase the level of infrastructural readiness. In addition, schools and other stakeholders should step up teacher ICT skills' competency and training among pre-service and in-service teachers. This requires mobilization and availability of more funding both at national and local levels to schools in preparation for the ICT policy implementation.

The study also recommends strengthening of policy monitoring and evaluation by stakeholders. This would involve organizing workshops, seminars, and trainings for upskilling the stakeholders in feedback and feedforward strategies with regard to the ICT policy implementation. Workbooks and report forms detailing feedback guidelines need to be designed in order to strengthen the policy operationalization.

Statement of Competing Interests

The authors have no competing interests.

References

[1] Onovugghakpa, C. F., Yusuf, M. O., Andegbija, V. M., and Pouta, G. O., "On-line learning in higher education: Faculty readiness in Nigeria." *Malaysian Journal of Distance education. 16*(2), 199-223. 2011.

[2] Ochwo, D., Atibuni, D. Z., and Sekiwu, D., "Efficacy of information and communication technology in digitalized students' records management in universities in Eastern Uganda." *African Educational Research Journal, 6*(2), 99-106. 2018.

[3] Wael, S. B., Almandjani, A. J., and Almadani, F. M., "ICT adoption impact on students' academic performance: Evidence from Saudi Universities." *Education Research International,* 2018, article ID 1240197.

[4] Chanyagorn, P., and Kungwannaronkun, B., "ICT readiness assessment model for public and private organizations in developing countries." *International Journal of Information and Educational Technology, 1*(2). 2011.

[5] Alimaghian, R., Rahman, A. A., and Ibrahim, R. "Information and communication technology (ICT) policy: Significances, challenges, issues and future research frameworks." *Australian Journal of Basic and Applied Sciences, 5*(12), 963-969. 2011.

[6] Anderson, J. E., *Public policy making approaches: An introduction.* (7th Ed). Boston MA: Wordsworth. 2010.

[7] Fischer, R. B. "The evolution of technology: Early, middle and current stages." *The Washington Post.* 2017.

[8] Shuhua, M., and Quani, Y., *The evolution of information and communication technology in public administration.* 1717. 2015.

[9] Gutrierrez, D., "The birth of modern technology-50 years ago to now. A look at how far we have come." *Inside BIGDATA News Letter.* 2018.

[10] Osorio, B., and Pedro, F., "A conceptual framework for benchmarking the use of and assessing the impact of digital resources in school education." *OECD Centre for Educational Research and Innovation.* 2010.

[11] Weber, D., and Kauffman, R., "What drives global ICT adoption. Analysis and research directions." *Journal of Electronic Commerce Research and Application,* 10. 2011.

[12] Ewing, J., Chevrolier, N., Leenderste, M., Quigless, M., and Verghese, T., *ICT competitiveness in Africa.* Retrieved from: http/www.eTransform Africa.org. 2014.

[13] Lam, L. J., "ICT in teaching and learning and management of massification." In Atibuni, Z. D. (Ed.), *Postgraduate Research Engagement in Low Resource Settings* (16-31). IGI Global. 2019.

[14] Luyombya, D., *"Frameworks for effective public digital records management in Uganda."* Unpublished Doctoral Dissertation, University College London. 2010.

[15] Silverstone, R., and Hirsch, E. *Consuming technologies: Media and information in domestic spaces.* 1st Ed. Psychology Press, London. 1994.

[16] Mingaine, L., "Skill challenges in adoption of ICT in public secondary schools, Kenya." *International of Humanities and Social Sciences, 3*(13). 2013.

[17] Landon, S. N., Hite, J. S., Hite, J. S., and Mugimu, B. C., "Technology and education: ICT in Ugandan secondary schools." *Education and Information Technologies, 18*(3), 515-530. 2013.

[18] Mukelele, R., "Ten challenges facing implementation of ICT education in Ugandan schools." *ICT Teachers' Association of Uganda (ITAU).* 2018.

[19] Salaam, A., and Obakhume, A., "Assessment of school teachers' use of ICT in Oyo Metropolis of Nigeria." *Journal of Educational and Social Research, 1*(5). 2011.

[20] Wang, S. K., Hsu, H. Y., Revees, T. C., and Coster, D. C., "Professional development to enhance teachers' practices in using information and communication technologies (ICTs) as cognitive tools: Lessons learned from a design-based research study." *Computers & Education Journal.* 2014.

[21] Forth, J., and Mason, G., "Information and communication technology (ICT) adoption and utilization, skills constraints and firm level performance: Evidence from U.K surveys." *National Institute of Economic and Social Research, London.* NIESR Discussion Paper No. 234

[22] Pedersen, P., and Ling, R., "Modifying adoption for mobile internet service adoption: Cross disciplinary interactions." *Proceedings from the 36th Hawaii Conference on Systems sciences* (HISS03). 2003.

[23] Mofarreh, Y. I., *Implementation of ICT policies in secondary schools in Saudi Arabia.* University of Wollongong Thesis Collections 1995-2016. Australia. Retrieved from: http://www.m.uedu.au/theses/4718. 2016.

[24] Haddon, L., "Domestication analysis, objects of study and the centrality of technologies in everyday life." *Canadian Journal of Communication, 36*(2), 311-323. 2014.

[25] Buabeng-Andoh, C., "Factors influencing teachers' pedagogical use of ICT secondary schools: A case study of Ghana." *Contemporary Educational Technology, 19*(3), 272-288. 2019.

[26] Cuban, L., "The dubious promise of educational technologies: Historical patterns and future challenges." *E-learning and Digital Media, 12*(3), 425-439. SAGE Journals. 2015.

[27] Ishaken, R., *Aim to improve the education system in Uganda.* The Norwegian agency for International Cooperation and Quality Enhancement in Higher Education (DIKU). Science Norway. 2014.

[28] Taban, H., Mamun, A. A., and Chekun, C., "Difficulties faced by teachers in using ICT in teaching-learning at technical or higher educational institutions of Uganda." *International Journal of Engineering Research and Technology, 1*(7). 2012.

[29] Pedro, F., *Trusting the unkown: The effects of technology use in education.* In Soumitra, D., and Bilbao-Osorio (Eds.). The Global Information Technology Report 2012: Living in a Hyper Connected World. World Economic Forum and INSEAD. Geneva. 2012.

[30] Hennessy, S., Harrison, D., Onguko, B., Kiforo, E. A., Namalefe, S., Naseem, A., and Wamakote, L., "Developing the use of Information and communication technology to enhance teaching and learning in East African schools. Review of literature." *Research Report, 1.* Centre for Commonwealth Education & Agha Khan University Institute for Educational development. Eastern Africa. 2010.

[31] Mooij, T., and Smeets, G., "Modeling and supporting ICT implementation in secondary schools." *Computers and Education, 3*(6), 256-281. 2011.

[32] Bodong, C., "Exploring the digital divide: The use of digital technologies in Ontario public schools." *Canadian school of Learning and Technology, 41(*3). 2015.

[33] Schoolnet Africa., "Emerging trends in ICT and challenges to educational planning." Retrieved from: http://www.Schoolnetafrica.net/index.php?id=283. 2002.

[34] Ngololo, E. N., Howie, J. S., and Plomp, T., "An evaluation of the implementation of the national ICT policy for education in Namibia rural science classrooms." *African Journal of research in Mathematics, Science and Technology Education, 16*(1), 14-17. 2012.

[35] Waiti, J.M., "Factors influencing integration of ICT in learning and teaching public secondary schools: A case study of Trans-Nzoia west Sub-County, trans-Nzoia County, Kenya." *International Journal of Recent Innovations in Academic Research, 2*(7), 385-398. 2018.

[36] Chekwunyere, R. B. D., Singh, T. K., and Onwuagboke, T. N., "Perceived challenges to effective ICT integration in teacher education in South Eastern Nigeria." *Paper presented at the 3rd ELITA Conference.* University of Sains, Malaysia. 2014.

[37] Kolikant, Y. B. D., "Digital natives; better learners? Students' beliefs about how the internet influences their ability to learn." *Computers in Human Behavior Journal, 26.* 1384-1391. 2010.

[38] Carrasco, M. R, and Torrecilla, F. T. M., "Learning environments with technological resources: A look at their contributions to students' performance in Latin American elementary schools." *Educational technology Research Development, 60,* 1107-1128. 2012.

[39] Masango, M. M., *The relationship between the use of ICT for instruction and learning and the reliability of ICT resources.* (Unpublished Masters dissertation). University of Pretoria. 2014.

[40] Blignaut, S., Els, C., and Howie, S. J., "South Africa's readiness to integrate ICT into mathematics and science pedagogy in secondary schools." *Education and Information Technologies, 14*(4), 345-363. 2010.

[41] Salleh, S., "Examining the influence of teachers' beliefs towards technology integration in classrooms." *International Journal of Information and Learning Technology, 3,* 17-35. 2016.

[42] Creswell, J. W., *Research design: Quantitative and mixed methods approach,* 4th ed. Lincoln. Sage Publications, Inc. 2014.

[43] Krejcie, R. V., and Morgan, D. W., *Determining sample size for research activities.* Education and psychological Measurement, 30, 607-610. 1970.

[44] Ouma, G. O., Awuor, F. M., and Kyambo, B., "E-learning readiness in public secondary schools in Kenya." *European Journal of open, distance and e-learning, 16*(2), ISSN 1027-5207. 2013.

[45] Aydin, C. H., and Tasci, D., "Measuring readiness for e-learning: Reflections from an emerging country." *Educational Technology and Society, 8*(4), 244-257. 2015.

[46] Nachmias, R., Moduser, D., Cohen, A., Tubin, D., and Forkosh, A. B., "Factors involved in the implementation of pedagogical innovations using technology." *Education and information technologies, 9*(3), 291-308. 2014.

[47] Boakye, K. B., and Banini, D. A., "Teacher ICT readiness in Ghana." In Toure, K., Tchombe, T. M. S., and Karsenti, T. K. (Eds.). *ICT and Changing Mindsets in Education.* Bamanda, Cameroon. ERNWACA/ROCARE. 2014.

[48] Venezky, R., *ICT in innovative schools: Cases study of change and impact* (Unpublished Masters Dissertation). University of Delaware, USA. 2015.

[49] Hogenbirk, P., and Van de Braak., "Implementation of ICT in secondary schools." In Tatnall, A. (Eds.). *Encyclopedia of Education and Information Technologies.* Springer, Cham. 2012.

[50] Murithi, N., Gitonga, D., and Kimathi, P., "School ICT policy, a factor influencing implementation of computers studies curriculum in secondary schools." *Journal of education and Practice, 4*(23). 2015.