# Influence of ICT Capacity on Effective Utilization of ICT to Improve Organizational Performance of Learning Institutions: A Literature Review

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**Abstract**

Governments and ICT integration advocates tend to seek infrastructural investments as a panacea for the ICT needs for learning institutions, without proper plans on how they will be utilized and without clear understanding existing capacity deficits that will affect its successful implementation. The mere focus of most studies on availability of technology and what students learn through the technology has left a gap in understanding on the capacity requirements that will ensure effective utilization of the technology in order to improve the quality of educational processes in learning institutions. ICT capacity has been of particular focus by scholars in understanding the influence of teacher characteristics and capabilities on effective utilization of ICT to realize its full potential in improving efficiency and effectiveness of management, teaching and learning processes in learning institutions. This review summarizes the relevant research on the influence of ICT capacity on effective utilization of ICT to improve organizational performance of learning institutions. Specifically, the review summarizes the relevant research on teachers' characteristics and ICT capacity and its effect on organizational performance in learning institutions. The review also discusses gaps in the literature, directions for future studies to breach the gaps and the research implications on scholars and policy makers in educational technology.

**Introduction**

To improve productivity in learning institutions, there is need to enhance efficiency and effectiveness in the management, teaching and learning processes (Molenda & Pershing, 2008). Traditional methods of

teaching, learning and managing of schools are no longer effective in today's digital world and therefore governments and education stakeholders have been under pressure to invest more in technology in order to improve organizational performance in learning institutions where most of the operations and educational processes in the institutions are still manual and outdated. Instructional methods in the classrooms have also remained teacher-centered whereby the teacher asserts control over the material that students study and the ways in which they study it, therefore, offering students with fewer roles in the learning process. According to Livingstone (2012), twenty-first century teaching and learning skills call for a more efficient and effective teaching and learning process where the students take an active role in the learning process while the teachers act as facilitators.

The expansion of technology to educational institutions has come up with the main intention of enhancing the overall effectiveness of a school and the levels of academic performance (Al-Qahtani & Higgins, 2012). Introduction of ICT in delivery of educational processes and systems is expected to modernize the operations, teaching and learning processes in schools as step towards reducing physical, geographical and social barriers to education. ICT has the potential of improving the efficiency of the educational process through reduced time and cost required for such processes. Khan, Hasan & Clement (2012) asserts that adoption of ICT in schools has the potential to promote better access to information, student critical thinking and communication skills, sharing of educational resources, increased student motivation, improved teaching and learning process, increased efficiency and improved quality of services.

Consequently, education systems have been investing in ICT in the belief that, sooner or later, the technology would be adopted and benefit schools (OECD, 2009). Although most countries have been allocating huge budgets for making ICT infrastructure available in schools, it is argued that that availability of adequate ICT infrastructure, while necessary, is not in itself a sufficient requirement for successful implementation of ICT integration in learning institutions (Afshari, Bakar, Luan, Samah, & Fooi, 2014). Omariba, Ondigi & Ayot (2016) in a study to examine challenges facing teachers in integrating educational technology into Kiswahili teaching in selected secondary schools in Kisii County, Kenya, concluded that although teachers appreciated the role played by the use of instructional technologies in teaching and learning process, they hardly used most of these instructional technologies that were available in their schools. The research suggests that it is not appropriate to simply assume that availability of ICT will necessarily improve efficiency and effectiveness in school processes.

The literature shows that there is a gap between current use of ICT in learning institutions and its potential (Manduku, Kosgey & Sang, 2012; Tarus, Gichoya & Muumbo, 2015; Omariba, Ondigi & Ayot, 2016; Wambiri & Ndani, 2017). This signals ICT capacity's central role in ensuring effective utilization of ICT in educational processes in order to improve organizational performance of learning institutions. Successful integration of ICT into the educational system is a complex, multifaceted process that involves not just technology but also institutional capacity for change and ICT user capabilities.

**ICT Capacity in learning institutions**
According to Neely (2015), capacity can be defined as the combination of people, practices, technology and infrastructure of an organization that, collectively, represents the organization's ability to create value for its stakeholders through a different part of its operations. Newhouse (2013) defines ICT capacity as the ability to use ICT knowledge and skills to perform relevant tasks. The author argues that effective use of ICTs requires the establishment of user capability, necessary ICT infrastructure and an environment that is supportive of ICT use. ICT capacity in the education sector has been conceptualized differently by different scholars.
Balanskat, Blamire & Kefalla (2007) identified ICT capacity factors according to levels namely; teacher-level, school-level and system-level. Law, Pelgrum & Plomp (2008) while reviewing pedagogy and ICT use in schools around the world based on the findings from the SITES 2006 study came up with ICT capacity requirements necessary for successful ICT integration which included leadership, vision & policies, infrastructure, staff development and Support. Ng, Miao & Lee (2009) in a study to review capacity-building for ICT integration in education noted that before the educational benefits of ICT integration can be fully exploited, it requires a systematic approach to establish the right environment. The authors argue that ICT capacity requires establishment of conditions such as providing infrastructure, maintenance of ICT equipment and training of personnel for the integration of ICTs in school management teaching and learning processes.
In a conceptual framework on ICT use and educational performance, Heo & Kang (2010) concluded that ICT use and its effect on educational performance may be influenced by various factors such as the personal attributes of teachers students and other staff, curriculum and teaching practices at the micro level while school environment and its surrounding factors may affect the use of ICT in educational practice at the macro level. According to OECD (2009) ICT capacity includes the hardware, software, connections, digital content, policies ,training, knowledge and skills, support, values and attitudes among many other factors that enable efficient and effective running of schools' educational processes. The instructive

advantages from ICTs subsequently rely upon the schools' capacity to change their foundations in a way that ICT utilization can supplement their procedures.

Krug & Arntzen (2010) while investigating ecologies of learning recommended for a more holistic approach to educational technology research that will combine the interconnectedness of personal, instructional and organizational characteristics and their effect on ICT use and institutional performance. Sherry & Gibson (2002) claim that technological, individual and institutional factors should be considered when examining ICT capacity in organizations. Mboroki, Mulwa, Kyalo & Bowa (2012) while examining the relationship between human resource capacity and e-learning adoption in public secondary schools in Kitui District in Kenya established that there a relationship between institutional factors, human resource capacity and readiness to adopt e-learning. This paper reviews studies on the use of ICT by teachers and focuses on ICT capacity at teacher-level and school-level factors that influence ICT use in organizational performance of learning institutions.

**Teacher level Capacity**
*Teacher Characteristics*

Teachers are at the center of implementation of ICT use in learning institutions and therefore, their characteristics and abilities to respond to this change and innovation are essential factors for successful implementation of ICT in teaching and learning processes. With the advent of ICT in education, teachers form their own beliefs about the role of ICT as a teaching tool, the value of ICT for student learning outcomes and their own personal confidence and competency (Prestridge, 2007). Ertmer (2005) noted that teachers have a great responsibility of deciding when and how to use technologies for instruction. He further observes that few teachers integrate ICT into their teaching activities despite the increased availability of ICT hardware, school-related support for ICT integration, and a larger consciousness of teachers about the importance of educational ICT use. Teachers are, therefore, important agents who significantly influence the process of ICT implementation and educational change.

Scholars have theorized demographic factors as having the ability to determine the extent of use or non-use of ICT in organizations. Among the demographic factors that are often cited as having an influence on ICT use include gender, level of education and age (UNDP, 2011). Olatokun (2009) highlighted demographic factors such as level of education, age, and gender as the key individual differences that determine the freedoms , capabilities and performance's that relate to ICT use. Several studies have been conducted that addressed the relationships between selected demographic variables, educational levels and usage of computer however the findings are mixed.

Shapka & Ferrari (2003) in their research on computer-related attitudes and actions of teacher candidates noted that males were not only more interested in ICT use than females but had more positive attitudes about computers and consequently outperform females in ICT literacy. In a research conducted by Kay (2006) on addressing gender differences in computer ability, attitudes and use it was found out that male teachers also had relatively higher levels of computer attitude and ability before computer implementation, but there was no difference between males and females regarding computer attitude and ability after the implementation of the technology..

In study that examined the level of ICT readiness and the effects of demographic characteristics and educational background, Alazzam, Bakar, Hamzah & Asimiran (2012) established that there were no significant age and teaching experience effects on teachers' ICT readiness to adopt ICT in Malaysia. Similarly that there was no significant effect of teachers' educational background on teachers' overall readiness to integrate ICT in teaching. The study however confirmed that there were significant effects of teachers' demographic characteristics in terms of gender on teachers' ICT readiness. Mahdi & Al-Dera (2013) in a study to investigate the impact of teachers' age, experience and gender on ICT use in language teaching and learning, utilized a mixed-method approach of investigation to collect data from 46 in-service EFL teachers working at Najran University, Saudi Arabia. The results indicate that there is no significant difference in using ICT between the two groups of teachers according to their age and experience. However, the results indicate that there is a difference between male and female teachers in using ICT in language teaching. Female teachers reported less use of ICT in their instruction than male teachers. The study also established that there was no significant difference between experienced and less experienced teachers in using ICT. The study however did not evaluate the influence of teachers' educational, age and teaching experience on organizational performance.

In another study by Akinjide, Sunday & Adebayo (2015) which investigated the extent to which demographic variables predicted ICT use among science teachers in Federal Unity Schools (FUSs) in Nigeria established that demographic variables such educational qualification, ICT use experience, and teaching experience do predict the use of ICT by science teachers however they negatively correlated with ICT use. Educational qualification was found to be the leading demographic variables predicting ICT usage among the science teachers. Ogembo, Ayot & Ondigi (2015) investigated teachers' willingness to integrate ICT tools in classroom teaching among primary school teachers in Msambweni sub-county Kwale County in Kenya. The study sought to establish if demographic factors such as age, gender, and years of teaching experience and the teachers' area of

specialization influenced teachers' willingness to integrate ICT as well as the extent of the contribution of contextual factors such as teachers' level of education. The findings of the study revealed that while age had a negative relationship with teachers' willingness to integrate ICT, gender, teaching experience and teachers' area of specialization had a positive relationship however the relationship was not significant. Similarly, teacher's level of education was also found to predict their willingness to integrate ICT.

### *Human Resource ICT Capacity*
According to Khandekar & Sharma (2013), organizations with resilient human resource capabilities are assured of sustainable competitive advantage and thus superior performance. However, most ICT integration projects in learning institutions still have technology coming first rather than human resource capacity. This poses a major challenge whereby those involved in the implementation process lack the required ICT capacity that is necessary for proper utilization the new technologies. For effective utilization of ICT in helping teachers and students to perform more effectively, both teachers' ICT competencies and how they perceive the role of ICT in teaching and learning processes plays a key role. According to Shaheen, Naqvi & Khan (2013), institutions with skilled, talented, innovative, and creative employees achieve return on investment, which makes them assured of improved efficiency and organizational performance. In another study conducted by Jamal & Saif (2011) in knowledge intensive firms in Peshawar of Pakistan, which attempted to explain the relationship between management of human capital and organizational performance, it emerged that management of human capital is a source of competitive advantage.

According to Law, Pelgrum & Plomp (2008), the success of educational innovations depends largely on the skills and knowledge of teachers. Computer competence is defined as being able to handle a wide range of varying computer applications for various purposes (Tondeur, Valcke & Van Braak, 2008). In a qualitative multiple case-study research on primary school competence and confidence level regarding the use of ICT in teaching practice conducted in five European countries, Peralta & Costa (2007) found that technical competence influenced Italian teacher's use of ICT in teaching. However, the teachers cited pedagogical and didactic competences as significant factors if effective and efficient educational interventions are likely to be implemented.

Wambiri & Ndani (2017) investigated the preparedness of lower primary school teachers in implementation of teaching with ICT in Kenya and established that teacher beliefs, attitudes and computer competence had influence on ICT adoption by teachers. The authors concluded that that provision of computers and other ICT infrastructure in schools will not

necessarily guarantee that teachers will integrate ICT in schools and therefore recommended ICT training for the teachers. In another study, Manduku, Kosgey & Sang (2012) using a survey design investigated adoption and use of ICT in enhancing management of public secondary schools in Kenya. The research findings revealed that school management had not fully realized the full potential of ICT in performing management tasks. The authors recommended for training of all stakeholders in order to ensure that they acquired the necessary skills required for effective utilization of ICT while performing their tasks.

Teacher attitudes and beliefs have also been identified as a capacity determinant that influence the success of ICT integration in educational processes (Hew & Brush, 2007; Keengwe, Onchwari & Wachira, 2008). It is believed that if teachers perceived technology programs as neither fulfilling their needs nor their students' needs, it is likely that they will not integrate the technology into their teaching and learning. Tella, (2007) found that computer use was predicted by intentions to use and that perceived usefulness was also strongly linked to these intentions. If teachers' attitudes are positive toward the use of educational technology then they can easily provide useful insight about the adoption and integration of ICT into teaching and learning processes. Lumumba (2007) established that lack of ICT skills in schools and lack of positive attitude towards ICT were the main causes of unsuccessful implementation of ICT integration projects in public secondary schools in Kenya. In another study by Tezci (2011) on factors that influence pre-service teachers' ICT usage in education, it was revealed that teacher attitudes towards ICT differ based on the teachers' level of knowledge and teaching experience. Effective adoption and integration of ICT into teaching and learning in learning institutions depends also on the availability and accessibility of ICT resources such as hardware, software, etc. It is therefore obvious that if teachers cannot access ICT resources, then they will not use them. In a study by Kiptalam & Rodriguez (2010) on internet use in some secondary schools in Kenya reported that the use of internet as a means of communication and source of information was on the rise while its integration in school the teaching and learning process had also increased. The study also revealed that schools which had invested more on ICT had higher internet access rates. Wong, Bakar, Mohamed & Hamzah (2014) also in another study on ICT Integration in the Classroom in SMART schools in Malaysia with the aim of examining how teachers had integrated ICT in their classrooms established a relationship between access to internet, computers and ICT integration in teaching and learning processes.

Muñoz & Ortega (2014) while investigating the effect of ICT use on student performance in mathematics in Colombian schools represented a valuable contribution to the debate on the effective utilizations of ICT and

educational outcomes. The study revealed that integration of ICT in teaching and learning led to improved academic performance only if teachers received support from experts to help them change their teaching practices.  Mutisya & Mwania (2017) in a study using mixed method design to determine the extent to which ICT was being in the management of public secondary schools in Kenya established that ICT was used in school management once in a while. The study recommended that the government should introduce compulsory ICT training for all principals and teachers to equip them with necessary ICT skills.

**School Level Capacity**
*School ICT Infrastructure Capacity*
      Inadequate resources in learning institutions affect the adoption of ICTs in the teaching and learning process. Resources such as computer labs, internet connectivity and relevant educational software are key in ICT adoption and if not sufficient, it makes it difficult for teachers and learners to effectively prepare for their lessons (Korte & Husing, 2007). Effective adoption and integration of ICT into teaching in schools depends mainly on the availability and accessibility of ICT resources such as hardware, software. The challenges related to the accessibility of new technologies for teachers are widespread. Empirica's (2006) European study found that lack of access is the largest barrier and that different challenges to using ICT in teaching were reported by teachers. Similarly, Korte & Hüsing (2007) found that in European schools there are some infrastructure barriers such as broadband access not yet being available. They concluded that one third of European schools still lack broadband Internet access. Ngeera, Kibaara & Gichohi (2018) using mixed methods research design to investigate the influence of ICTs infrastructure on quality of distance teaching and learning in Kenyan universities established that utilization of ICT infrastructure influenced the quality of distance teaching and learning. The study recommended that the learning management systems that are developed should be capable of hosting various features to enhance adequate interactivity between the tutor and a distance learner.

      In study on technology integration by preservice teachers in Jordan, Al-Ruz & Khasawneh (2011) established that availability of technology positively influenced technology integration. Melor (2007) using Davis' Technology Acceptance Model (TAM) in a research to examine the factors that affect ICT use and the teachers' perception on their ICT skills in teaching established that majority of the teachers' attitude towards using ICT was positive and majority of them had access to computer at home. Many of teachers however indicated that there was inadequate access to ICT facilities while they were in school and that posed a challenge for them on the integration process. Majority of teachers also indicated that more training and

ICT support was required. Although the research looked the effect of ICT on the teacher and teaching process, it did not focus on other school processes which indirectly contribute to the running of a school which this study brings on board.

In other study by Wanjala, Khaemba & Mukwa (2011) to examine factors that influence secondary school teachers' efficacy in during in-service training on ICT use the classroom found out that most teachers used trial and error while integrating ICT into the teaching and learning process. The teachers were also found to be faced with various obstacles which included limited access to ICT facilities and support from the school leadership, inappropriate ICT knowledge and skills, negative attitudes towards using ICT. The researchers concluded with several suggestions that included in-service training on ICT integration, redesigning the school curriculum and increasing funding for ICT implementation. The study however did not give any indication on the level of adoption and if there is any effect on school performance as a result of ICT adoption hence a gap yet to be addressed.

Arinze & Okonkwo (2012) in a study on the use ICT in secondary schools using descriptive survey examined availability of ICT facilities, skills, competence of students and the effect of ICT use on student performance in social sciences. The research established that ICT facilities in schools was still inadequate while students' competence on using ICT for learning was still low. ICT use was found to have an influence students' interest in learning and their performance in social studies. The researchers concluded by recommending for equipment of schools with necessary ICT facilities for improvement on student performance not only in social sciences but other subjects. Although the research did bring out the role of ICT on student performance, other researchers argue that the direct effect of ICT on academic performance is insignificant. This study bridged the gap by evaluating the effect of ICT on school improvement which reflects organizational performance of a school.

Kamau (2014) in a study to evaluate technology adoption by mathematics teachers in secondary schools in Kenya, established that training on technology had a significant influence on technology adoption by mathematics teachers, compared to ICT facilities and teacher characteristics. The study also revealed that availability of ICT infrastructure for students, location of the school, teacher characteristics and time did not have any significant influence on technology adoption by teachers teaching mathematics. Similarly a study on computers and students learning using data from PISA, Fuchs & Woessman (2014) examined whether the availability and use of ICT influenced students' academic performance. The research established that access to computers had a negative correlation with student

performance while access and use of ICT facilities in school had no influence on student performance.

Without both good technical support in the classroom and whole-school resources, teachers cannot be expected to overcome the obstacles preventing them from using ICT. Korte & Hüsing (2007) argued that ICT support or maintenance contracts in schools help teachers to use ICT in teaching without losing time fixing software and hardware problems. In Saudi Arabia, science teachers would agree to introduce computers into teaching, except that they believe they will encounter problems such as technical service or hardware problems (Almohaissin, 2006). Yilmaz, (2011) in assessing the technology integration processes in the Turkish education system reported that in providing schools with hardware and internet connections, it is also crucial to provide the schools with technical support with regard to repair and maintenance for the continues use of ICT in schools.

In a study by Kiptalam & Rodriguez (2010) on internet use in some secondary schools in Kenya reported that the use of internet as a means of communication and source of information was on the rise while its integration in school the teaching and learning process had also increased. The study also revealed that schools which had invested more on ICT had higher internet access rates while some gender disparity was noted where male teachers were more proficient in ICT use as compared to their female counterparts. The research however did not address the influence of internet connectivity on organizational performance of the schools, an aspect that this study tried to examine.

Makhanu & Kamper (2012) in a study to examine the ICT literacy level among secondary school principals in western province in Kenya using a survey method sampled 188 secondary school principals and the study established that the level of ICT knowledge among school principals had a positive and significant influence on school performance. The study also revealed that although almost half of the respondents had fair access to internet facilities majority of them did not have required ICT knowledge and skills for integrating ICT in their leadership roles. The study recommended that education stakeholders to give priority to electricity supply, ICT infrastructure and involvement of school principals in matters to do with teachers' professional development and training. This study however, did not take into account the other ICT users within the school organization such as teachers, students and non-teaching staff. From the literature, many of the studies that examined the role of ICT infrastructure in learning institutions concentrated on its role on ICT adoption in the institutions with little focus on its effect on organizational performance

### *Institutional ICT Environment*

Successful ICT integration is related to actions taken at the institution level, such as the development of an ICT plan, ICT support, and ICT training (Tondeur & van Keer, 2008). The role of school leaders in building the capacity of the people to support and facilitate ICT integration in school processes is therefore very important. Vanderlinde & van Braak (2010) while examining the e-capacity of primary schools noted the need to empirically explore such relationships between school level conditions and the teachers' actual use of ICT in the classrooms.

As ICT continues to drive changes in present and future society, school policies need to define upfront their organizational vision and actions in view of planned change (Senge 2000). A number of studies (e.g. Barron et al. 2003; Tearle 2003) present evidence that an increase in classroom use of ICT can be linked to a favourable policy environment. School-level policy produces the desirability to build a coherent and sup-portive community of practice associated with effective, regular, and consistent ICT use (Hennessy, Ruthven & Brindley, 2005). Tondeur, Van Keer, Van Braak & Valcke (2008) examined ICT integration in the classroom. Using a sample of 53 primary school principals and 574 teachers from 53 primary schools. The study established that school-related policies, such as an ICT plan and mission statements correlated significantly with ICT use in the classroom. The outcome points out the need for schools to have in place proper policies and plans on ICT implementation for successful integration of ICT in schools. According to the researchers, such policies must echo the ideas and views of all stakeholders. Policymakers need to realize that teachers should not be excluded from school policy planning when considering future educational ICT use and therefore should be involved and be familiar with school-level policies.

According to Kirkland & Sutch (2009), school leadership is key in making sure that through ICT use, the teachers are innovative in their teaching practice. Kidombo, Gakuo & Kindachu (2010) in a research to find out whether the secondary school teachers in Kenya were using ICT effectively to deliver curriculum content concluded that integration of ICT in curriculum delivery in secondary schools depended on schools' leadership, professional training of the teachers in ICT, school manager's level of ICT skills competence and presence of school ICT policy. Hsiao & Chang (2011) argue that the style of leadership in any organization plays a crucial role in any innovational change such as integrating ICT in work practices by creating conditions that are favorable for effective utilization of technology.

Omwenga, Nyabero & Okioma (2015) investigated the principal's ICT competency as a characteristic that affected the teachers ICT integration in teaching science and established that there was a significant linear relationship

between the principal's competency in ICT and the teachers' ICT integration in the teaching of science. Tondeur, Krug, Bill, Smulders & Zhu (2015) in a study using Four-in-Balance (FIB) model to examine specific processes of technology integration within four secondary schools in Kenya, identified vision building, leadership, collaboration, expertise to use technology and access to adequate resources as ICT capacity requirements for successful technology integration in schools.

Tondeur, Krug, Bill, Smulders & Zhu (2015) in another study to examine the use of technology in four secondary schools in Kenya established that the objective of incorporating ICT across curriculum had been emulated in the actual use of ICT in schools however those involved in the ICT implementation lacked the capacity to develop school ICT policy plans and deciding the type of ICT infrastructure was best for their schools. The study concluded that while getting schools equipped with the appropriate infrastructure was a crucial step for ICT integration, other contextual conditions at the school need to be considered. In another study by Mwawasi (2014) which aimed at investigating how school leadership influenced capacity building for effective integration of ICT in pubic secondary schools in Kenya, established that through school principals there was increased access to ICT facilities and better support for teacher training on various ways of adopting ICT in the classroom. The school leadership had also put emphasis on the use of technology and came up with policies to promote ICT adoption in school processes.

**Influence of ICT Capacity on Organizational Performance of Learning Institutions**

Organizational performance is conceptualized and measured differently by different authors. According to Alam, Raza & Akram (2011) organizational performance is a construct that is multidimensional in nature. It includes elements of financial and market performance (such as profitability and market position), human resource performance (such as employee satisfaction), organizational efficiency and effectiveness and customer-focused performance (such as customer satisfaction or perceptions on products or services

Measuring organizational performance in terms of financial indicators alone has however come under increasing criticism because the information contained in them is not comprehensive to conclusively establish organizational performance. Mahdani, Mohammed, Ali & Ismael (2012) argue that measuring organizational performance in terms of non-financial measures such achievement of organizational goals and objectives is preferred since such measures are not affected by biasness. Kaplan & Norton (2005) tried to address these inadequacies of traditional financing measurement

system by introducing the non-financial measures of performance in the balanced scorecard (BSC) approach. Among the performance frameworks, Kaplan & Norton's (1996) balanced scorecard model is the most popular. The model categorizes and incorporates four key aspects in organizational performance measurement which include financial, customer, internal processes and innovation.

Alam, Raza & Akram (2011) on the other hand argues that in order to evaluate the organizational performance, one has to consider the nature of an organization and the reasons for which performance is being evaluated to appropriately select the dimension or element to apply in order to determine the performance of that organization. For a learning institution to be able to determine its overall performance consequently requires processes and collective measures that allow all stakeholders to determine the extent to which the institution met its expectations. According to OECD (2009), school organizational performance can be defined in different ways. From the learners' point of view, performance would mean students' outcomes. From teachers' perspective, performance would mean effective teaching practice and teachers' role in learners' outcome. For school managers, performance would relate to student discipline entrance rates and reputation ratings from stakeholders.

According Maslowski (2011) organizational performance in a school is indicated by the efficiency and effectiveness of the school management, teaching and learning process where effectiveness would mean the success of the school's objectives, while efficiency means the achievement of such objectives in a timely and costly manner. Rudd (2001) argues that measuring the effect of ICT on the overall performance of a school requires extensive consideration of all major factors that can effect performance of teachers, students and the school as a whole.

### *Effect on Student Outcome*

One of the benefits of use of ICT in teaching and learning is that it is expected to enhance the educational outcomes of students and therefore a number of previous studies have tried to examine whether the use of ICT in learning institutions actually resulted in improved student outcomes. Aristizabal, Caicedo & Escandón (2009) in a research to examine factors that influence performance using 2006 and 2009 PISA assessments in Colombia established that ICTs use both at home and in school positively influenced student outcome, with the former having more impact. However on the contrary, Spiezia (2010) while investigating the effect of ICTs on educational outcomes using the 2006 PISA data for all participating countries established that ICT use had a significant effect on student performance and the effect was greater in the case of ICT use at home, as opposed to ICT use at school in most

countries. The research findings thus put into question policies aimed at integrating ICT in schools. Fu (2013) while reviewing ICT in education noted that ICT use in classrooms not only enable students to access digital information efficiently but also improves their knowledge and skills which indirectly contribute to their academic outcome.

Basri, Alandejani & Almadani (2018) investigated the adoption of ICT by the universities and the impact it makes on the university students' academic performance. The authors established that there was a relationship between ICT adoption and academic performance in a conservative environment. Similarly, Ferraro (2018) in a study to establish whether ICT was satisfying educational needs in schools assessed the effect of ICT integration on mathematics based on the test scores of Italian students as measured by the PISA 2012 data. Using a new nonparametric methodology known as Bayesian Additive Regression Trees (BART) and while controlling for socioeconomic, demographic and school factors, the study revealed that the use of ICT at school had a positive and strong impact on mathematic test scores. Okorieocha (2016) while investigating the effect of ICT on students' achievement and interest in basic electricity in technical colleges in Rivers State established that ICT has significant effect on students' achievement and interest in basic electricity.

The research findings cited above show that ICT use had some form of positive effect on student outcome. However, there are other studies that reported contradictory results. For example, Goolsbee & Guryan (2006) while investigating the effects of a subsidy programme for internet use in schools in the state of California, in the United States established that although the programme had succeeded in expanding internet access in the classroom, there was no evidence that the expansion had any influence on student performance. In another research by Wittwer & Senkbeil (2008) using PISA survey data in Germany to examine the influence of students' computer use for games on their performance established that there was no relationship between ICT use and the students' performance. Cristia, Ibarrarán, Cueto, Santiago & Severín (2012) studied the impact of the "One Laptop per Child" programme in primary schools in the Peruvian countryside and found no evidence of effects on enrolment, dropout or repeat rates. Neither did they find effects on cognitive outcomes in language.

Sprietsma (2012) also in a study to assess the effect computers as pedagogical tools on students' academic performance in Brazil established that the use of computers as instructional tools had a negative effect on academic achievement. The researcher however noted that the negative outcome could be clarified by examining how the students used technology where it could be more of an entertainment rather than a learning tool. Similarly Witte & Rogge (2014) in a study to evaluate the effect of ICT use

on students' academic performance in Holland, found no statistically significant difference between the performance of students who had access to technology and made use of it and those who did not. Karamti (2016) while evaluating the influence of ICT on academic outcome using data from 377 college students and teachers in Tunisia established that there was a negative effect of ICT use on academic performance.

*Effect on teaching and learning process*

ICT provides the help and complementary support for both teachers and students where it involves effective learning with the help of the ICT to serve the purpose of learning aids (Jorge et al, 2003). The outcomes in teaching and learning are predominantly measured by the pupils' achievements in one or more subjects or by changes in the pupils' test scores (Shieh, 2012; Pilli & Aksu, 2013). The influence of ICT capacity on the effectiveness in teaching and learning has attracted the attention of ICT crusaders and scholars. Several studies have examined the impact of ICT in in teaching and learning. One hand, some researchers have reported a positive impact of ICT on teaching effectiveness and pupil learning. They argue that ICT use in teaching and learning process not only enhances the educational outcomes but also provides flexibility and autonomy for pupils in their learning with better learning attitudes and experiences (Witte & Rogge, 2014).

While ICT can be motivating and engage pupils in learning more effectively, sustained impact depends on the ability of the teacher to integrate or embed ICT into the learning experience of pupils in such a way that the potential of the technology is fully realized (Becta, 2007). Teachers have to be confident in their own ICT capacity to be able to understand the potential benefits of using ICT in a planned and pedagogically sound way. Hussain & Suleman (2017) investigated the effects of ICT on the students' academic achievement and retention in chemistry at secondary level. 50 students of 9th grade were selected randomly from two public schools. The findings not only revealed that ICT positively affected students' academic achievement but also found more compelling, effective and valuable in teaching of chemistry when contrasted with conventional techniques of teaching.

Garcia & Pacheco (2013) also in a study on constructivist computational platform to support mathematics education in elementary school which aimed at analyzing how computational tool affects student motivation, collaboration and discussion established that he integration of computational tools into conventional method courses provides elements to improve student motivation, collaboration and discussion based on their own exploratory experiences. Seo & Bryant (2009) in a study to conduct a meta-study of computer-assisted instruction (CAI) studies in mathematics for students with learning disabilities (LD) focused on examining the effects of

CAI on the mathematics performance of students with LD. The study revealed that that those CAI studies did not show conclusive effectiveness with relatively large effect sizes.

Gachinu (2014) in a study to examine the effect of ICT integration on student performance in mathematics in public secondary schools in Embu County in Kenya using experimental research design sampled 218 form four students from ten different schools. The students were grouped into two where one group of 104 students from five different schools were taught using the traditional methods of teaching while the other group of 114 students were taught the same concepts using ICT. The students were then subjected to a standardized assessment test from which the results indicated that students from schools where ICT had been integrated in teaching mathematics, the learners performed much better than similar groups taught using the traditional methods. Although the study tried to link ICT use and student performance, literature shows that the role of ICT use on student performance is not only difficult to isolate from other determinants of academic performance but it is also argued that academic performance alone does not reflect the overall school performance.

Thomas (2014) in another research to explore the influence of ICT use on student performance in social studies at secondary school level, divided the study into three sections of ninth-grade in rural public high schools for four weeks. A pre-test was done to understand the students' background on using ICT in the classroom. Data was collected through analysis of grades earned on assessments and completion of journal writing by students. A post-test was then completed the students to quantify their ICT acceptance in the classroom. The study revealed that students were reluctant to use ICT in the classroom. The students however accepted the use of cell-phones for communicating with their teachers and were inconsistent with their acceptance of using computers to complete the coursework. The results also showed that some students gained from using ICT while others preferred traditional methods of learning. The study concluded that the use of ICT may improve student achievement, but the benefits of ICT need further research.

On the other hand, there are some disbelievers of influence of ICT improving effectiveness in teaching and learning. They are of contra opinion that the impact of ICT in education may very well be negative with the use of ICT-tools in the classroom being more a distraction to pupils or teachers and/or pupils not having the necessary skills to use computers most effectively in their teaching and learning. For instance, Barrera-Osorio & Linden (2009) studied the effect of computer use in schools in Colombia using experimental design and established that the integration of ICT in schools had no effect on learning outcomes. The researchers attributed the research findings to the ineffective use of the technology in schools which was as a result of resistance

to change by the teachers who were reluctant to apply new teaching techniques using ICT in the classroom despite the fact that they had been trained and were being provided with technical support.

### *Effect on school management*

School administration is a key determinant for the realization of desired outcomes and success in schools and therefore it is viewed as critical by all education stakeholders. As a result most learning institutions have adopted ICT to support the administrative tasks with the aim of improving operational efficiency. According to Ghavifekr, Afshari, Siraj & Seger (2013), ICT plays an important role in enhancing the quality of education. Administration and management applications of ICT are currently popular in schools due to its capabilities in facilitating administration activities from data storage to knowledge management and decision making.

Previous studies show some evidence that the use of ICT in administration allows schools to become better in management functions such as procurement, finance, personnel, transport and other school management areas. Brooks-Young (2006) asserted that the use of ICT in school management can better assist school managers in accomplishing administrative tasks. In a study on the influence of educational innovations on school performance using nonparametric conditional efficiency model to study secondary school efficiency in the Netherlands. The study established that that innovations are positively influenced school efficiency.

Aristovnik (2012) in a study using non-parametric analysis examined the efficiency and effect of ICT use on educational performance at country level from a sample 27 European Union countries and some OECD countries. Non-parametric tests do not rely on any distribution and hence does not need to meet the assumption of normal distribution of data. The study concluded that there was a significant variance on efficiency of ICT use across the countries and despite the assertions on ICT capacity to transform educational systems, there was little effect on educational outcome. In another study, Manduku, Kosgey & Sang (2012) using a survey design investigated adoption and use of ICT in enhancing management of public secondary schools in Kenya. The research findings revealed that school management had not fully realized the full potential of ICT in performing management tasks.

### *Effect on Educational Processes*

Potential applications of ICT in educational processes reported by studies include preparation of lesson plans, lesson presentations, collection and analysis of pupil test scores, the reporting of the pupils' school outcomes to the parents, the sharing of information among the teaching staff, the development of tests and assignments, and the monitoring of progress in

pupils' scholastic achievements (Becta, 2007; PriceWaterhouseCooper, 2004). Makewa, Role & Nyamboga (2011) in a study on ICT in secondary school administration in rural southern Kenya noted that ICT can now be used not only in formulation and implementation of schemes of work, but also in coordinating staff for effective teaching and learning processes. Rabah (2015) in a research on benefits and challenges of ICT integration in English schools which concluded that ICT was being used in educational process to improve school management and teachers' lessons. The belief is that ICT has benefited the efficiency and the effectiveness of educational processes in learning institutions.

**Discussion and Conclusion**

The reviewed literature brings out the assertions on the role of ICT in enhancing organizational performance of learning institutions however, there is neither a strong and well developed theoretical case nor enough empirical evidence to support the assertions on the benefits of ICT integration in the education sector. A school being a form of organization whose core business involves management, teaching and learning processes, it is clear that the efficiency and effectiveness of these processes form the background for measuring organizational performance of learning institutions. Majority of the studies that tried to measure the effect of ICT use on performance in learning institutions generally concentrated on availability of technology and its effect on learner's attainment.

Secondly, while some studies reported some positive influence of ICT-based instruction on student performance other studies provided diverse outcome and hence no conclusive empirical evidence to support assertions of ICT use to improve performance in learning institutions. Lastly, there is noticeably less research that focused on the direct causal impact of ICT capacity on overall performance of learning institutions. Given the huge investments on capacity building for ICT integration in learning institutions, there is need for accountability and justification for such investments through research on the effect of ICT capacity on organizational capacity of learning institutions.

Research in this area will go a long in broadening the researchers understanding on the role of ICT capacity in the education sector. Governments and policy makers will find the results such studies intriguing as a source of information on the influence of ICT capacity on organisational performance in learning institutions and the necessary strategies that need to be adopted in building the necessary capacity required for successful implementation of ICT projects. ICT practitioners and school administrators need insights and practical implications of capacity building on ICT integration and the importance of human resource ICT capacity, school ICT

infrastructure and institutional ICT environment as drivers of organisational performance in in learning institutions. Research in this area will definitely contribute to the existing theoretical knowledge on ICT capacity and organizational performance of learning institutions.

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