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Visionary Educational Administration and Technology Integration: Implications for Economic Development

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Abstract
The use of technology in general life has achieved globalized status. Technology is now accepted as a mechanism that reduces constraints associated with more productive work. With regards to the school system, national government and world institutions agree that technology integration drives quality, removes inequality and open up educational world to limitless learning opportunities. This research focuses on a key aspect of technology integration – school administrators. It evaluates the significance of educational administration to technology integration which in turn impacts on economic development. The research made use of descriptive techniques and focused on reviews of the literature relating to school administrators' role and support of technology integration into the learning environment. The study showed that the current state of skilled technology in Nigeria is not sufficient for effective technological integration and outlines a number of recommendations for effective technological leadership in Nigerian schools.
Keywords: *Technology Integration, Development, economy, Administration, progress, TPACK*

Introduction

Technology has permeated every aspect of life changing the way and manner in which people communicate, work and live. From the development of climate and disease resistant crops in agriculture to neonatal, maternal health and prevention and treatment of disease in health care to reliable and sustainable power supply, quality but low cost housing, efficient transportation system to efficient administration of election and justice systems. Think for instance on any activity of human endeavor in today's world that involves communication, work, relaxation and you will find it difficult to come up with one that does not involve the use of technology (Izumi, Fathers & Clemens, 2013). Technology such as the mobile phone has aided various forms of social and economic progress; it has improved access to information, capital base, overcome geographical constraints and expands access to markets and learning. According to Gulati (2008) technological innovations is a sure way for countries especially those of developing status to foster growth and ultimately development, address issues of inequality and enhance all forms of training and education.

Given the important implications of technology in today's world, it is now a necessity that cannot be sidelined in the course of its potential impact including the field of education. Valdez (2004) stated that technology is required in education for three major reasons – the need to prepare students for tomorrow internet and information-based society, the need to prepare students as competent staff of tomorrow work environment and the need to make education effective and efficient to meet up tomorrow's demands. The educational system now more than ever has the responsibility to educate individuals who have technological capabilities.

Schools are turning their attention from the 'general' form of learning to a learning system that is geared to prepare students in readiness for the 21st century (Warschauer & Matuchniak, 2010). National government have gone ahead to beef up their spending patterns and budgets, commit more personnel, research and resources to actualizing this objective. A case in point is in 2003 and 2004 school year where school administrators in the United States spent $8 million USD towards computer integration which saw a reduction in student-per-instructional computer and student-per-internet-connected ratios drop to 3:8:1 and 4:1:1 respectively (Education Week, 2005). Following in this

step, the Nigerian government in 2006, committed venture funding towards educational technology also called EduTech or EdTech amounting to ₦1.89 billion naira which is expected to hit $2 billion in 2017. As at 2016, the National Information Technology Development Agency (NITDA) Director Dr. Isa Ali detailed that despite the economic situation in the country the Nigerian government expended $2.6 billion USD on importation of infrastructure related to technology and this is forecasted to rise to $147 billion USD by the year 2020 (Okonji, 2016).

Notwithstanding the millions of naira spenton technology equipment, the use of technical tools such as personal computer still remains a 'step child' in many schools. The Nigerian education system is still such that a professional from the 18th century may be transported to 2017 and still find it comfortable to teach in our modern day school environment as we still educate our children much the same way as yester years; to most, it is accepted as an enhancement tool, but only in spare time or after the 'real' learning has been done (Williams &Adesope, 2016). Teachers have witnessed several educational tools and technology come and go without any real impact (Hamidi, Ghorbandordinejad, Rezaee & Jafari, 2011) supporting the notion that the mere introduction of technology to the school system will not bring about any sustainable change.

Furthermore, though the classroom teacher is essential in integrating technology in classroom learning, the school administrator is 'crucial' for technology integration in the overall school culture. The 21st century system demands that school administrators not only manage and administrate personnel and information and instructional practice but also become forerunners or leaders.

Even though the concept of visionary or quality educational administration is beginning to permeate educational literature, the concept as it applies to Nigerian school administrators and the success of technology integration has not been explored ineptly. Thus, the question becomes, what are the roles of school administrators in technology integration? How can the Nigerian school administrator become a technology leader? What are the challenges school administrator faces in the quest to becoming digital savvy? Based on this, the research significance lies in bringing more awareness to the huge role that school administrators need to play in technology integration as this connects with changes in teaching and learning environment and further public's understanding of the components that makes for successful management and leadership towards seamless integration of technology into schools. Ideally, it would aid schools administrators, the Ministry of Education and policy makers develop educational reforms and programs that integrate the best practices described in this research as part of school reform efforts. Thus the paper's objectives are as follows:

Determine state of technology integration in Nigerian secondary school.

1. Determine the role of technology integration on educational development.
2. Determine the technology integration role of school administrators in Nigeria.
3. Determine the methods and strategies required for effective technology integration by school administrators.

Schumpeter theory of growth

The framework for technology-development relationship is hinged on the Schumpeter theory of growth. This theory is ascribed to the work of Joseph Alois Schumpeter (1883-1950) an economist and political scientist of Austrian-American descent. The author observed that the only determinant of economic progress or growth is technological innovation or advancement. Schumpeter (1942) made a clear distinction between the innovation itself

and the processes of invention. According to the author, only a few future-oriented individuals grasp the potential of a new invention and exploit it for their personal gain which then translate to the 'economy's gain'. Thus the real source of economic growth is not in the invention, but the activities of the innovative individual which he called entrepreneurs.

Schumpeter model of economic growth revolves around three ideas – (1) long-run growth is a consequent of innovations (2) these innovations are a product of entrepreneurial investments (3) old innovations are constantly been replaced by new ones (Aghion, Akcigit & Howitt, 2015). The process of production depicts the combination of productive inputs which he referred to as 'production forces'. These forces according to Schumpeter (1942) are made of two groupings – material and immaterial factors. The materials factors are land, labour and capital while the non-material resources consist of technical facts. The production function is depicted mathematically thus:

$$Y = f(L, K, N, S, U)$$

Where: Y = Output of the economy, K = means of production, L = Labour, N = natural resources and S= technological changes and U = social set up or organizations.

The highpoint of this analysis is that, it is not just innovation of technology that drives economic growth but 'technological progress", thus, if technology or innovation becomes constant, growth advancement becomes stunted. Schumpeter (1942) stated the three basic stages required to complete the cycle of technology integration in the marketplace which is fondly referred to as the processes of technological change – invention, innovation and diffusion. Invention relates to the initial development of a technology product or service. Innovation stage is when this product or service becomes available in the market. Diffusion is when it moves from the marketplace to the hands of economic agents to be used in economic activities.

Technology and Technology Integration Defined

Technology has been described in a number of phrases such as "applied science", "technical means of achieving practical purpose" (Webster's New College Dictionary, 2017). Technology Integration refers to the subsuming this technical means of achieving practical purpose into a process in this case educational process. Technology integration does not connote the substitution of 30 minutes of reading skills for 30 minutes of technology skill acquisition but rather using technology to teach the 30 minutes of reading. It is not eliminating the 'traditional' medium of pedagogy but making use of technical tools for learning purposes;it is the practice of fitting technology to content area curriculum. According to Cakir, (2012): technology integration is using computers effectively and efficiently in general content areas that allows effective learning in meaningful ways.

It is the ability to use modern day software compatible with modern day business and work environment such as computers, mobile devices, digital cameras, projectors, social media and network platforms, software applications and the internet in the school environment purposeful and creatively. It is having the school curriculum drive technology and not technology driving the school curriculum; hence, curriculum drives technology and not vice versa (Dockstader, 2008). Technology is fully integrated when the end user in this case students stop perceiving technology as a tool but second nature as depicted in the last level of Technology Integration by Mary Beth Hertz known as "Seamless" (Izumi, Fathers & Clemens, 2013). The seamless stage connotes that students are able to apply a variety of technology tools daily in the classroom showing a deep understanding of the subject in question.

According to the National Educational Technology Standards for Students International Society for Technology Integration (2009):

> *"Effective integration of technology is achieved when students are able to select technology tools to help them obtain information in a timely manner, analyze and synthesize the information, and present it professionally. The technology should become an integral part of how the classroom functions -- as accessible as all other classroom tools."*

Technology integration relates to coordinating and organizing school curriculum and technology in pari par su to achieve a harmonious relationship. A review of the Technological Pedagogical Content Knowledge (TPACK) (Fig. 1) a model attributed to the seminal works of Mishra & Koehler (2006) seminal workdepicted to identify the nature of knowledge required for effective technology integration in school indicates that technology integration is the interplay of the three basic forms of knowledge acquisition (Koehler & Mishra, 2009) – Content (CK) (knowledge relating to the subject matter that is to be learned or taught), Pedagogy (PK) (knowledge that relates to the processes and practices of teaching and learning) and Technology (TK) (knowledge about innovative thinking and working with certain tools and resources). Technology integration goes beyond these three knowledge framework in isolation. That is, technology integration in the school system is not content knowledge alone, pedagogical knowledge alone nor technological knowledge alone, neither is it a combination of technological pedagogical knowledge or technological content knowledge or pedagogical content knowledge but an integration of the three to make Technological Pedagogical Knowledge. To Koehler & Mishra (2009) Technological Pedagogical Content Knowledge (TPACK) is:

"TPACK is the basis of effective teaching with technology, requiring an understanding of the representation of concepts using technologies; pedagogical techniques that use technologies in constructive ways to teach content; knowledge of what makes concepts difficult or easy to learn and how technology can help redress some of the problems that students face"

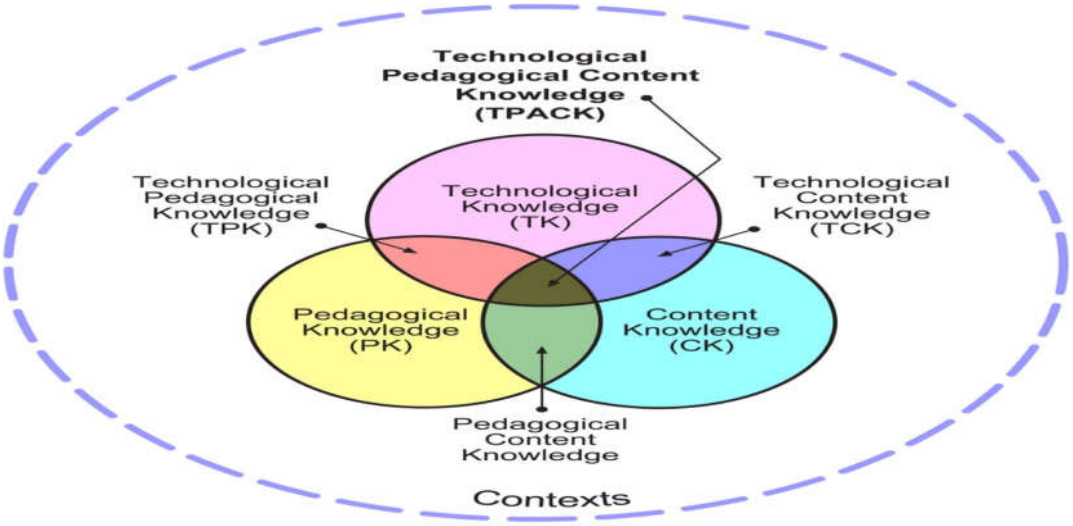

Fig 1: The TPACK Model of Technological Integration (www.tpack.org)

In K-12 classrooms in an advanced economy like the UnitedStates of America, administrators try to drive both cognitive and non-cognitive skills of the students using lots of technology platforms. For instance, students have virtual field trip experiences of going too far off places such as Machu Picchu, the Great BarrierReef, and other historical sites without leaving the classroom. Educators access this program using technology platform like the

Google Expedition Pioneer Program for school lessons controlled from a program on a tablet. Another example is the 'zSpace' learning platform where students are able to work with variety of images, from the earth crust to human physiology, engage in construction such as building a battery or automobile using 3-D glasses and a stylus (United States Department of Education, 2017). These examples clearly show that learning become less constrained within classroom and that technology can enhance learning experiences.

Technology Integration and Economic Development

The role of technological progress has been recognized by most theories and principles to development; the question however is what exactly that role is? Specifically, what part does it play in economic transformations? Before now, for majority of underdeveloped economies especially those of Sub-Saharan African origin, the quality of life deteriorated to unacceptable world standards despite several years of search towards development indicated by severe stagnation in economic growth with GDP per capital which is insignificant when compared with advanced economies with culminating increases in population growth, poor health with associated spread of terminal illnesses, high levels of poverty and hunger and low literacy rates widening the economic divide between the 'rich' an 'poor' economies (Aghion, Akcigit & Howitt, 2015).

Fortunately, emergence of several globalized tools such as technology are changing the global balance by impacting on access to markets, information, products, services and trade given developing economies the leverage to overcome the hurdles to development and speed up the growth process. For the Nigerian economy, a report by AllAfrica.com (www.allafrica.com) stated that in 2014 ICT sector was responsible for the creation of ₦500 billion creating about 2.5 million jobs within a decade as well as attracted direct foreign investment to the tune of $30 billion USD between 2003 and 2014 (The Guardian, 2017). GDP recorded a contribution from ICT services in the first two quarters of 2016 as follows: ₦1, 935,952.68 and ₦2, 214,081.36 respectively (NBS, 2016).

Many experts in the field of development ascribe a transformative role of technology, regarding the ability to use Technology as critical for human capital development vis-a-vis economic development. For instance, Caliskan (2015) estimated that technological change accounted for 2/3rd of the growth of the U.S. There is no doubt that technology – both in its process and quality dimension – when infused into human capital development – contributes meaningfully to growth. According to Caliskan (2015) the use of new technologies aids in the production of new and cheaper commodities, capital accumulation, quality of institutional researchers and aids international competitiveness while contributing to cultural and political development of participating societies. In the area of financial market, many institutions such as banks and financial intermediaries adapt their systems to technological advancement aiding developments such as online and mobile banking services thereby enabling the provision of 24-7 services.

Sepehrdoust & Khodaee (2013) carried out a study to investigate the extent to which technology has improved the employment situation of developing economies focusing on the Organization of Islamic Conference (OIC) countries. The authors used a panel analytical technique for 10 years 2000-2009. The findings of the analysis revealed that technology integration has led to major structural changes in the OIC countries boosting the level of employment.To benefit from technology waves that has swept the globe, Fodje (2015) stated that what Africa requires is a substantial reform in its educational system that can coincide side by side with technology revolution

and keep pace with technology hangs. To be effective, interventions into the school system must begin at a young age. Studies indicates that to build world-class ICT tools and products require 10,000 hours (416.67 days) to master skills which can amount to anywhere between 5-8 years for a lot of people. African students do not really differ from those in advanced countries who build world-class ICT products at a tender age, the difference only reside with the access to technology facilities at an early start (Cakir, 2012; Demski, 2012; Izumi, Fathers& Clemens, 2013).

Status of Technology and Technology Integration in Nigeria Educational System

The Nigerian school system is not devoid of some levels of technology. Besides communications platforms like MTN, Airtel, Multilink, STARCOMMS, and GLO which make internet services available to Nigerian audience, the Federal Government came up with the scheme of one-laptop-per-child. Unfortunately, the project did not really take off beyond the installation of personal computers (Adomi, 2010). To address this issue of unsustainability, the Federal Government of Nigerian in 2001, came up with a policy on Information Technology (Mobile Internet Unit) which birthed the National Information Technology Department Agency (NITDA). This also could not be sustained, as the document could not explicitly detailed the process of technology integration into Nigerian educational sector (Oyelekan, 2015). A critical perusal of the document revealed that issuesof technology integration were "vaguely presented". Compared to other sectors like Governance, Agriculture, Health,Tourism etc. which received detailed sectoral treatment of technology integration, there were no clear cut policy statements to guide stakeholders as per educational sector. The document only listed nine (9) strategies for the application of ICT for human resource development which included funding and infrastructure. The document was devoid of specifics relating to learning, training such as development of indigenous educational software or incorporation of ICT tools into tutor training, instruction and evaluation. Thus, one can safely conclude that there were no national policies on Technology Integration in the school system.

To correct this flaw, the government in 2004, came up with the "ministerial initiative on e-education for Nigerian educational system" via the federal ministry of education. The document stipulated the objectives of e-education in Nigeria, appraised the status of e-education globally and makes a justification for why e-education should be part of the Nigerian school system as well as strategies for its implementation. The document states the role of government to provide ICT infrastructure at training at the primary school level while making ICT a pre-vocational elective course at the junior secondary school level. This also gave birth to programs such as the SchoolNet Nigeria (www.snng.org), the National Open University of Nigeria and the Virtual Library Project Federal Republic of Nigeria, 2010).

The Nigerian government in 2004, also partnered with Microsoft Corporation in a program tagged PiL, Microsoft Nigeria's Partners in Learning as $215 million project. The programme is targeted at training 225 secondary school teachers across the federation by the National Teachers Institute (NTI) and the Universal Basic Education Commission (UBEC). With the strategy of 'train the trainer 'the targeted teachers are expected to return to their schools and pass on their skills to ten (10) of their colleagues and forty (40) of their students. Furthermore, in partnership with Microsoft, NTI is to aid draft an ICT integrated curriculum for Nigerian schools. The government also succeeded in registering the country in cyberspace via the establishment of the Nigerian Internet Registration Association (NIRA) in 2006.

Although all these efforts have been put in place by the government to make technology available, these efforts are unsustainable with the level of diffusion slow and more importantly without much impact for the simple reason which forms the main reason of why this research was undertaken "poor integration pathway". The major findings of most studies (Adomi, Okiy and Ruteyan, 2003; Okwudishu, 2005, Adomi & Kpangban, 2010) indicates that the typical African school environment does not provide opportunity for training in the use of technology as most of the respondents (teachers and in some cases students) have limited or no expertise in the use of technology.

Educational Administration and Technology Integration

Educational advancements in education are advancing worldwide at a rapid pace with new and more advanced that are also beneficial and highly productive. Among these developments are blogs, Wikis, RSS which are referred to as Web 2.0 technologies. The rapid spread of a new technology does not automatically imply rapid social and economic change. Other factors such as economic, social and educational policies, agreements between various stakeholders, institutions, norms and beliefs. Additionally, experts have ascertained that the problem does not lie with the technology but the process and rate of its integration and for technology to be infused in today's school environment, the role of the school administrator need to move beyond that of a manager to a 'technology leader'(Russell and Babell, 2004, Webb, 2011).

To be truly effective, it has become imperative that the 21st century school administrator become not only a school manager (seeing to the day to day running of the school system) but also a leader; while a leader create a vision that permits progress and change, the duty of a manager is the implementation of that change. Consequently, in today's learning environment a different kind of administrator is required. Thus, as an instructional leader – the principal is been asked to move beyond the role of management to play a significant role in technology integration. This role is imperative to aid classroom teachers create modern ideal learning environment for student.

Mehlinger and Powers (2001) stated that in today's world, it is almost impossible for a school administrator to be considered 'good school leaders' and be naïve above technology. Larkin (2012) observedthat the principal of Burlington High School, Burlington who initiated the "1t0-1 IPAD initiative" averred that any school reform, whether it is those relating to curriculum, teacher professionalism and efficiency, instruction or pedagogy or assessment would record success in schools with 'strong leadership'.

In the words of Wilmore and Betz (2000):

"Information technology will only be successfully implemented in schools if the principal actively supports it, learns as well, provides adequate professional development and supports his/her staff in the process of change"

Farrace (2015) stated categorically that the role of school administration especially school principal is "one of facilitation and modelling behavior". The author stated that a principal who want to be effective in inspiring innovation in their school is one who models behavior than the one who demand usage. Larkin (2012) emphasized that they should model to the extent that they become recognized as 'digital principals'. Digital principals according to the National Centre for Education Statistics (2000) are in a better position to understand how well technology can be used to support instruction and assessment and provide the needed guidance to classroom teachers.

A study by Oznacar and Dericioglu (2017) to determine the 'role of school administrators in the use of technology' sought to obtain the perception of high school administrators as to the obstacles they are exposed to in

the attempt to integrate technology. Using snow ball sampling technique the research was carried out in North Cyprus using 2015-2016 academic year using a sample size of 14 school administrators' the study conclusion was "that school administrators were not anxious concerning the use of technology at school as such they fail to integrate technology into their school system". Another study by Ertner, Ottenbreit-Leftwich, Sadik, Sendurur & Sendurur (2012) indicated that teachers reported that besides their attitude towards technology support by school administrators played a significant role in shaping their practices.

To effectively integrate technology into classroom practices, there is need for change both at the level of practices and learning environment and this demands new style of leadership which aids teachers cope with technological and pedagogical change. By modelling behavioral use of technology, school administrators reduce constraints associated with technology use such as insufficient time, access to technology and lack of technical support (Kincaid, 2002). A report developed by TSSA (2010) to examine the responses of various school administrators on the issue of Technology integrationfound out that visionary administrators indicated the issue of 'incorporating 21st century skills into classroom instruction' as what would likely wake them up in the night. Visionary administrators according to TSSA (2010) are those who do not just discuss the issue of technology, they are often twice to use it as much as their peers.

The reports continued by stating that the benefit of technology integration is lost when school administrators begin to rely on intermediaries to do their e-mails, manipulate sensitive and critical data or handle other key technology task for them. When schools have visionary technology administrators who make every stakeholder understand the crucial importance of technical competence, their subordinate are far more likely to pay attention on how technology can improve schools operations. According to Chambeline (2015): "teachers who are on the fence – or think they do not have time to get involved with technology – give it another though when they perceive a positive attitude on the part of the administration"

These administrators believed that to be complete, a 21st century well-equipped school should boast of the following – "digital equipment for creating multi-media projects, interactive whiteboards in every classroom, online databases for research, online tools to streamline communications between teachers, parents and students"(Jhurree, 2005). This would take care of most of the challenges listed as constraints to effective ICT adoption in Nigerian schools: limited information infrastructure, poor power infrastructure, non-integration into the school curriculum, poor policy implementation strategy, inadequate ICT manpower, limited school budget, lack of ICT skills among teachers, inadequate education software, poor management on the part of school administrators, lack of maintenance culture and lack of ICT application (Oznacar & Dericioglu, 2017).

A detailed analysis of literature, reports and document outline that the effective school administrator should be a hands-on technology user who must carry out the following roles:

1. Establish a clear vision and goals for technology integration in schools – the administrator must sit down and develop a strategic plan outlining the goals they wish to achieve with technology integration (Gusby, 2009) including the opinions of school stakeholders – parents and community members.
2. Model the use of technology in his/her everyday school activities.
3. Support the use of technology in school – professional curriculum should be developed with a long term goals in mind. The administrator can with the support or clearance from the Ministry of Education and Department of ICT

benchmark several programs targeted at education and training in ICT from international organizations. These programs include world Program, the British standards in ICT for learning education and training and international society for Technology and Education Standard (www.iste.org/standards.aspx).

4. Engage in professional development activities that focus on teaching instruction and learning activities
5. Provide professional development opportunities for staff and teachers – technology life skill should be constantly being taught from the time teachers enter a school to begin teaching until they retire from teaching (Kervin, 2010).
6. Secure resources that support technology use
7. Supportive of national technology standards and promotes attainment and use of technology.

Conclusion

Agreeably, the integration of technology in school system has benefits both for human development and economic development. Despite this role, schools in Nigeria especially at the early years (primary and secondary) have yet to adopt it extensively for instruction and learning. Efforts geared towards integration of technology have not had much impact due to challenges such as poor policy and implementation strategies. To ensure that technology becomes fully integrated (i.e. move from the basic stage to the seamless stage) even with what is currently available and make administrators technology leaders we recommend the following:

1. School heads should make use of existing ICTfacilities by adapting when and where applicable .the inset must shift from whether technology is beneficial to learning to how to improve all aspect of content and instruction through the use of technology.
2. School administrators should organize professional ICT training at school level using peer learning and sharing activities.
3. Should encourage their teachers to take advantage of online teacher learning communities. Teachers should be encouraged by their administrators to move from the use of technology in passive ways to more active creative ways.
4. Allocate time for teachers to reflect about new ICT practices inspired by ICT based teaching, 'a get-together to know what's happening' and learning with a view to inculcate them into mainstream teaching.
5. In terms of policy, the Nigerian government should set up a plan specific to primary and secondary school system tagged such as "Early School Education Technology Plan (ESETP) –a specific vision for learning through technology.
6. Finally, Nigerian school administrators can look up to the National Educational Technology Standards for Administrators developed by the International Society for Technology in Education (2009) which is a comprehensive and recent professional and peer reviewed guide about what school administrators and leaders should know about educational technology.

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