

ICT INTEGRATION IN SECONDARY SCHOOLS IN NIGERIA



Kabiru Mohammed Badau, Ph.D

*National Business and Technical
Examinations Board (NABTEB),
P.M.B. 1747, Ikpoba Hill,
Benin City.*

Abstract

ICT integration in Secondary School in Sub-Saharan African countries like Nigeria is still at an early stage and already faces several set backs that may undermine the various initiatives undertaken by government. This paper provided requirements for [the successful integration of ICT in secondary schools in Nigeria. A review of some existing frameworks for ICT integration into secondary schools as well as the innovative pathways that should be taken to ensure the successful integration of ICT in schools were explored through literature review, revealing the trends, issues and challenges of ICT integration in schools. Recommendations for successful integration of ICT in secondary schools in Nigeria were offered.

The issue of computer in education started to become popular in educational policy-making in the early 1980s, when relatively cheap microcomputers became available for the consumer market. Stimulated by government policies and quite often led by the fear of losing the technology race, many countries started to build their own brand of microcomputers (BBC. Acorn, Tomson) and distributed these to schools. At the end of the 1980s, the term "computers" was replaced by 'IT' (Information Technology). IT came about in the 1970s to describe technologies that give the user direct access to a wide range of diverse information types (Tondcur, Valcke, & Van Break, 2007).

This signifies a shift of the focus from computing technology to the capacity to store and retrieve information. Nigeria was connected to internet in the early 1990's. This was followed by the introduction of the term 'ICT' (Information and Communication Technologies) around 1992, when e-mail started to become available to the general public. The term 'ICT' reflected the common understanding that a computer's potential is significantly enhanced by connection to a local network, and even more so by-connection to the internet (Fluck, 2003). With regard to the early introduction of microcomputers in education, there were high expectations that it would make education more effective and motivating. However, when many surveys had shown that computers were used mainly as a

supplement to the existing curriculum, and much less as tools that were fully integrated into the learning of traditional subject matter, the general feeling among many policy-makers was one of great disappointment.

Between 1992 and 1995, the investments in hardware, staff development and research programmes on ICT decreased (Pelgrum & Law, 2003). With the advent of the World Wide Web, the political interest in ICT was quickly boosted for a second time. Many have seen ICT as a formidable tool to close the gap between the developing world and the developed world-by skipping certain stage of industrial development and leapfrogging into the information Economy (Osterwalder, 2007).

The interest was accompanied by a commonly accepted rhetoric that education systems would need to prepare citizen for lifelong learning in an 'information society' (Pelgrum & Law, 2003). As a result, an information society was to be changed by ICT; citizen in these information societies would need new competencies that had not yet been sufficiently attained in the traditional education systems; educational innovations would need to be implemented- with the aid of ICT-to attain in these new skills. These related but semantically different interests have stirred up the way ICT in education is perceived in developing nations-preparing students for employment in a globally competitive environment predicated on the widespread use of ICT, or using ICT to improve educational outcomes.

What is ICT Integration into Schools

A useful definition of ICT is that which related to those technologies that are for accessing, gathering, manipulating and presenting or communicating information. The technologies could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the internet, local networking infrastructure, videoconferencing, etc). While the term ICT effectively refers to a broader domain, in developing nations, ICT still tends to mean computers and their peripheral devices.

These computers could refer to anything from high-speed connected state-of-the-art machines to something which is dated, stand-alone, or poorly maintained (Lloyd, 2005). ICT integration in schools could be simply viewed as the use of computers in the teaching and learning process. This view would clearly misjudge the complex nature of the integration procedure itself. By integrating, we understand combining parts together, so that they work together to make a whole. The parts to be combined include the school context in which integration is to take place, the technologies provided, the technical skills of teachers, the technical support provided for the installation, maintenance and upgrading of hardware and software, the pedagogical

preference and skills of teachers, the availability of appropriate electronic resources-and finally, the skills and motivation of students. (Ajayi & Ekundayo, 2009)

ICT integration could be seen as a whole configuration of events, activities, contents and interpersonal processes taking place in the context in which ICT is used. However, the right conditions need to be in place before the educational benefits of ICT can be fully harnessed, and a systematic approach is required when integrating ICTs into the education system. This fact is often overlooked, and in their eagerness to jump onto the technology bandwagon, many education systems end up with technologies that are either unsuitable for their needs or cannot be used optimally-due to the lack of adequately trained personnel (Ng, Miao, & Lee, 2009).

Requirements for a Successful ICT Integration in Schools

Several models and frameworks have been formulated to provide a better understanding of the ICT integration process, to evaluate the positive effects of technology on learning, or to investigate the kind of enhanced learning environment that technology provides in the classroom. Pelgrum & Law (2003) identified five key dimensions that should be addressed when considering ICT integration in education. These comprise the curriculum, the ICT infrastructure, the staff development and support, the organizational change and leadership, and the National educational policies and ICT implementation strategies.

The curriculum is seen as the content and processes of learning in schools, as well as the outcome of learning. Three roles are generally differentiated for ICT in the curriculum: "learning about ICT", which refers to ICT as a subject of learning in the school curriculum, such as computer(or ICT) literacy computer science and information literacy; Learning with ICT which refers to the learning of ICT including multimedia, the internet or web as a medium to enhance instruction, or as a replacement for other media without changing the benefits about the approaches to, and the methods of, teaching and learning; and Learning through ICT", which refers to the integration of ICT as an essential tool into course/curriculum, such that the teaching and learning of that course/curriculum is no longer possible without it.

ICT Infrastructure refers to the hardware, the software and network connectivity. Here, ICT is used not only to support "Learning with ICT" and learning through ICT as described in the previous section. Sub-dimension are identified in relation to ICT infrastructure in education, such as the standalone versus the distributed" dimension- if software is only locally available (CD-ROM) or accessible only from remote locations (Web-based); "the producer versus the consumer" dimension-if the digital materials are being made by the children and the teachers themselves, or if they are made by others and accessed b\ the children and the teachers; "the structured versus the learner-controlled" dimension-the degree to

which a pre-determined learning route is designed into materials (tutorials and some simulations) versus their being used as exploratory environments, or as hyperlinked encyclopedias of resources materials. (Mullar Sancho Gil & Hernandez, 2006).

Teachers play a crucial role in the adoption and implementation of ICT in education, since they are the key to making learning happen. The lack of ICT knowledge and skills from teachers is reported to be a major obstacle to implementation; and consequently, this requires the need for further training for teachers. The introduction of computers in schools is a complex innovation which poses considerable challenges to teachers in their daily work. Education reform should require teachers to adopt new roles, since more responsibilities for learning are given directly to the students. This change requires that teachers be proficient in advising and guiding students through more autonomous, self-directed learning processes, while at the same time monitoring the curriculum standard achieved by students preparing teachers for this new role is a major challenge for staff development. Also, while teachers are often the focus of staff-development provisions, they are not the only stakeholders that require staff development to cope with the introduction of ICT into schools.

The change brought in by introduction of ICT has to be aligned with other institutional priorities if it is to be successful. However, case studies of ICT implementation in schools in a number of countries have indicated that the version and goal of such implementation can be very different, even for schools that have been actively engaged in innovation of their traditional educational practices. (Pelgrum & Law, 2003). It might be expected that changes which do not involve challenges to the existing educational priorities or beliefs of the school would be relatively easily implemented.

However, to bring about curriculum change, drastic changes in teaching practices, school culture and organization management must be made. Schools need to become "learning organizations", i.e. institutions that anticipate new challenges and change, and orientate themselves toward continual renewal and improvement. In recent years, many governments throughout the world have adopted plans that have in varying degrees, addressed the issues relating to ICT integration in schools, (Pelgrum & Law, 2003). These plans are largely similar to their intentions in regards to the major direction of change, and are essentially plans for reforming education from a system which is mainly teacher-directed to one that encourage more student-centres learning. However, the nature and scope of the strategies for initiating, guiding and implementing these policy plans differ between countries partly as a consequence of varying socio-economic circumstance (UNESCO, 2007). This paper reviews the kinds of policy goals pursued by Nigeria, the implementation strategies that have been used at national level to promote the use of ICT in the curriculum, and the issue and challenges

that policy-makers need to consider when formulating their national ICT in education policies and strategies.

Framework for ICT Policy Formulation

Kozma (2008) suggested a classification of these components in a framework for policy formulation, into two categories, namely: strategic components and operational components. Strategic components, such as national policies, are needed to provide a rationale, a set of goals, and a vision for how education systems might look with the introduction of ICT, and how students, teachers, parents, and the general population might benefit from its use in schools.

Operational policies, on the other hand, are a means of turning the visions provided by strategic policies into reality. Operational policies-typically framed as action plans, programmes, or projects-often consist of the following components: content development; pedagogical and curricular change; technical support; teacher training and infrastructural development.

The Focus on ICT Integration into Schools: Moving Towards a Knowledge Society in Nigeria

According to the UNESCO, move toward "learning societies and organizations" are based on the need to acquire new knowledge throughout life. More and more opportunities for learning are currently being offered outside the formal education system, many of them supported by ICT development and tools (UNESCO, 2007). But as educational demand increases and supply diversifies, increasing disparities can be observed in respect of access, affordability and quality.

The nature of this ICT 'fake-up' in education goes beyond using information and communication system to improve education administration, to the large-scale adoption of digital technologies that impact on curricular and pedagogical structures. Some Sub-Saharan developing countries, like Nigeria generally characterized by low income, weak human resources and high economic vulnerability, are facing critical issues, some of which are outlined by the UN Millennium Development Goals (MDG) as: ending poverty and hunger, achieving universal primary education, promoting gender equality and empowering women, reducing child mortality, improving health, combating HIV/AIDS, malaria and other diseases, ensuring environmental sustainability. and developing a global partnership for development (United Nation). However, it is maintained that ICTs can be powerful enablers of such developmental goals (Hameed, 2006) because their unique characteristics can and do radically improve communication and the exchange of information to strengthen and create new economic and social networks.

All developing countries, even the poorest, are improving their access to, and their use of modern ICTs, some at a dramatic rate with a long-term view for improved education, health, job creation, governance and other services. But this is without a confluence of economic, social, and political challenges. On the one hand, there is pressure for governments to provide education to all members of the population—even in the face of scarce financial, physical, and human resources—as a precondition for economic and social development. At the same time, globalization and the shift to a knowledge-based economy' require that educational institutions develop in individuals the ability to transform information into knowledge, and to apply that knowledge in dynamic, cross-cultural contexts.

Justifying ICT Integration in Education in Nigeria

ICT integration in education should be seen as a support to "attain objectives that have not been attained effectively by educational systems, enhancing the quality of education, and preparing new and old generations for a technology-driven market place" (Jhurree, 2005). According to Jhurree (2005), integrating ICT in education could provide the following benefits to the community and the society.

- (a) An enhanced environment for learners: Technology provides a motivating learning environment, whereby learners are given the opportunity to be constructively engaged with instruction.
- (b) A powerful tool to supplement teacher's instruction in classroom: If properly used by teachers, technology can foster more interest in learning on the part of students, and teachers can use it in the instruction of their respective subjects.
An administrative tool for teachers and administrators: Apart from classroom instruction, teachers are also involved in class administrative duties, such as student's record keeping, lesson planning, preparing handout, tutorials and slides, preparing examination papers, marking papers and recording results, performing some type of statistical analyses on marks and so forth. Administrators are also involved in variety of work that requires technology, such as the computation of school performance for a certain year, the keeping of records of employees, and the preparation of the school budgets, among others.
- (d) Increase access to education and inclusive education in school: ICT has been recognized as providing a means of helping schools achieve the goal of promoting equal access to education. It also has potential to offer increased access to education to students with disabilities.
- (e) A communication platform: Through the internet and the networks, schools have an excellent opportunity to promote collaboration, to share ideas and experiences, and to communicate with the world. Students, teachers and

administrators can communicate, exchange knowledge and concerns, meet experts and peers, and share work in collaborative projects through ICT.

Major Issues and Challenges of ICT Integration in Nigeria

Several issues have been raised from literature pertaining to the adoption of ICT in schools in Nigeria. Well-known issues relate to financial constraints, whereby low-income developing countries, like Nigeria such as those in Sub-Saharan Africa, have obvious difficulties in escaping from the low-income, low technology equilibrium to enter into the ICT realm (Ogunsola & Aboyade, 2005) and lack of human capacity. Ogunsola & Aboyade, questionably states that "even if free computers and free internet access are available, they are useless to these individuals who are illiterate or lack the know-how. The application of ICT technology requires human capabilities to handle such technologies". Apart from these known issues, the use of ICTs in education in Nigeria is facing additional questions and challenges. These include.

1. **The rush to adopt the new technology in education:** Developing countries often find themselves in situations where there is pressure to acquire and adopt new technologies because of the claims of what these technologies could do to aid and leapfrog their development, without really understanding the potential and reach of the technologies, or without having analyzed their environment and contexts for appropriateness, applicability and impact (Swarts).
2. **The Focus on technology:** More often than not. computers are installed in school around the world without sufficient thought being given to how these computers will be used (Hawkins, 2002). Discussions and planning for ICTs in education are driven by a technological imperative with little thought being given to the wider educational context within which the technology is to be used. The appropriateness of the technology for the purpose is often overlooked in the rush to acquire this technology.
3. **Technology-generated learning:** This widespread notion may lead to a lot of wasted money; with technologies put into schools being either unused or poorly used (Swarts). For the new technologies to actually contribute to learning, much more thought needs to be put into the issues of pedagogy, curriculum, professional development of teachers, software, maintenance, scheduling and other issues. Moreover, as Pelgrum & Law (2003) suggests, a strongly ICT infrastructure-led development plan may lead to the wastage of valuable resources if the teachers and principals are not prepared, or if the understanding of the purpose is merely a technological one, such that the impact of the introduction of technology becomes rather limited.

4. Taking into account informal learning: Students, even in developing countries have considerable skill in the manipulation of new technologies, sometimes more so than their teachers (Swarts). Research findings seem to indicate that informal contact and communication is the most prevalent form of transferring ICT knowledge (Pelgrum & Law, 2003).
5. Technology not replacing traditional classrooms: Fear, anxiety, and concern that teachers have about change must be addressed. Using technology as a teaching and learning tool in the classroom does bring fear, anxiety and concern to a greater extent-since it involves both changes in classroom procedures and the use of the often-unfamiliar technologies (Bitner & Bitner, 2002).
6. Technology and content: Content development is a critical area that is too often overlooked. The lack of cultural appropriate education content, particularly for developing countries, like Nigeria poses challenges. Cultural differences affect learners' ability to fully understand and benefit from the lessons and their intended learning outcomes. It is, therefore, clear that content produced in one content cannot be adopted without some modification into another context (Tinio, 2003).

Common Factors Affecting ICT Integration in Schools

Kozma (2003) generally identified three levels of factors which may consequently influence the ICT use in education. The three levels are:

- a. A Macro-level refers to system factors, such as cultural norms, social context, educational policy, and curriculum standards, etc;
- b. A Meso-level refers to school factors, such as the IT infrastructure available, IT integration plans, school leadership, innovation history, parents, etc;
- c. A Micro-level refers to individual factors for teachers, such as pedagogical practice, innovation history, educational background, experience with technology, etc; and for pupils, such as experience with technology, social and cultural background, etc.

At the Meso-and Micro-levels several factors are known to enable or prevent ICT integration in schools. These factors could be identified as driving factors or opposing factors. Fisser (2001) identified several driving factors which affect the implementation of new forms of ICT in education.

Opposing factors or difficulties encountered in the process of ICT integration into schools are known as "barriers" (Schoepp, 2005). Pelgrum (2001) identified these barriers as pertaining to two kinds of conditions: material and non-material. The material conditions may have been the insufficient number of computers or copies of software. The non-material obstacles included teachers' insufficient ICT knowledge

and skills, the difficulty of integrating ICT into methods of instruction, and sufficient teacher time.

Webb (2007) in contrast, identified barriers at three levels: the teacher- usually to do with competence, motivation and training; the school: especially limited access to ICT and the absence of an ICT dimension in the overall school strategy; and the school system: rigidity of the school system, especially when linked with the wider educational framework.

1. The increasing capacity, flexing, and suitability of ICT to educational applications;
2. The continuing decrease in the cost of hardware'
3. The growth of knowledge with its attendant consequence of the obsolescence of much what was previously learned places an ever-increasing pressure on the conventional models of education:
4. The realization that the quality of the learning experience can be enhanced by applying ICT;
5. The demand from isolated learners for more equitable access and service;
6. The perception of many institutions that the application of ICT would enable them to increase their market share in an environment that is increasingly competitive;
7. The need to be seen to be keeping up with the competition;
8. The expectation of policy makers and administrators that the development of virtual delivery models would reduce costs, increase productivity, and enable expansion without cost increases

From a global perspective, the most commonly cited opposing barriers identified by Webb (2007) are as follows:

1. Accessing to hardware and software, as well as funding;
2. Time for planning, personal exploration, online access, and skill development;
3. Technical and administrative support and resources;
4. Training and expertise:
5. Resistance, passivity, school cultures, and the traditions of teaching;
6. Lack of vision and leadership;
7. Support for the integration of technologies into instruction and the curriculum;

Conceptual Framework for ICT Integration in Schools

Fluck (2003) distinguished "ICT integration" from "ICT effectiveness", as the first refers to the degree to which ICT vanishes into the background of the classroom learning activity; while the second refers to the degree in which ICT improves or

broadens learning outcomes and/or the rate of their achievement by students (Fluck, 2003). This suggests that the effective integration process is a transformation process that starts from a basic integration and ends at an effective use of ICT in the teaching and learning process in a school. And so, ICT development can be conceived as a continuum along which an educational system or an individual school can pinpoint the approach that relates to the growth of ICT in their particular context.

This model is referred to as a continuum of approaches to ICT development (UNESCO, 2002), and it identifies four broad approaches through which educational system and individual schools can proceed in their adoption and use of ICT. These four approaches, termed: emerging, applying, infusing, and transforming, represent a continuum:

Emerging ---- -> Applying ----> Infusing --- -> Transforming

The Emerging approach is demonstrated by those schools at the beginning stage of ICT development. School exemplifying the Applying approach is those in which a new understanding of the contribution of ICT to learning has already developed. The Infusing approach portrays schools involved in integrating or embedding ICT across the curriculum. The last stage of this continuum is the Transforming approach, and schools here use ICT to rethink and renew school organization in creative ways.

Another model proposed by Fluck (2003) could generally specify the stage of effective ICT integration. This model has the advantage of being sufficient general and simple. It accurately describes the integrating process in three stages: the introductory, the integrative and the transformative stages.

Introductory —> Integrative --> Transformative Introductory Stage corresponds to the period where the school system or participant has to do with computers in education, as a subject to be studied. The curriculum component at this stage merely enumerates a large number of facts and concepts about computers; ICT is taught as a separate subject, and one could say that at this stage, people "learn about ICT". ICT infrastructure remains a key issue and schools begin to purchase, or are donated some computing equipment and software. Such computers exist as stand-alone devices or in a single laboratory network.

The Integrative Stage describes contexts in which ICT is incorporated into the teaching of other subjects, and is included in teacher planning. The curriculum identifies key interrelated concepts and principles that organize the subject area and the curriculum also emphasizes deep understanding of these within and across the subject, as well as their application to solve complex real-world problems.

The Transformative Stage is the most complex of all the three stages, no assumption is made about the place or timing of learning, since this includes contexts where the topics studied embrace some of those which are not possible without ICT. The curriculum is flexible and responsive to student goals and local contexts; and furthermore, it emphasizes the development of collaboration, inquiry, information management, creativity, and critical-thinking skills learning occurs through ICT and can be tagged "learning how to learn".

Sub-Saharan Africa Countries ICT Readiness Measurement

To provide a quick and relative benchmark of the overall success of Nigeria in participating in and benefiting from ICT, the World Economic Forum, in its Global Information technology report (2009-2010), put in place the Net-worked Readiness Index (NRI). Nigeria continues to lag behind the rest of the world by a significant margin, among the 26 countries of the Sub-Saharan Africa listed in the 133 countries report. Nigeria is also ranked below the 100th mark (World Economic Forum, 2010). The network Readiness index classification supported the selection of countries in order to assess the level of ICT adoption in the schools in these countries. Countries from top, the middle and the bottom of the network readiness classification were compared, based on the status of the key components of the ICT development in the school framework.

Conclusion

ICT Integration in schools in Nigeria is at a static phase, despite encouraging initiatives all across nations and no progress made in the country. The country is widely known for its serious levels of poverty, hunger and under-development, low school enrolment, child mortality, and HIV/AIDS pandemic. Federal and State Governments in Nigeria are faced with the challenge of reducing the above concern; and they are generally reliant on global aid and funding from developed nations to implement the strategies. ICT has since been recognized as a catalyst, as it could aid in overturning the current trend and ensure a swift move towards an information society. However, lack of financial resources and poor and inadequate planning and the under-usage of available resources have resulted in the current status quo. The ICT integration in school in which the key component states are set in slow motion-from initiation to adoption.

Recommendations

Lesson learned from Nigeria by World Economic forum (2010) require recommending that addressing the following components in local context would certainly ensure the proper adoption of ICT in secondary schools.

1. With policies regarded as a compulsory guide for the integration process, principals and school decision makers should consider this as a first step towards the adoption of ICT into their respective schools.

2. Develop a vision of Where are we and where do we want to be? A vision for implementing technology across the school must first be established. This vision is important, as it defines the outcomes for learning and teaching, relationships and behaviors.
3. A performing ICT audit aimed at establishing the current status of ICT in a school should be carried out. It should reveal information regarding the access, use and opportunities provided by ICT within the school.
4. Developing the School ICT Policy through cross-curricular and discrete delivery model approaches when preparing ICT policies for secondary schools.
5. Some strategic targets and associated performance indicators should be set up by the school. These will start to make the vision a reality by providing a set of measurable achievements. This would also assist in assessing which projects and initiatives are more likely to contribute towards the overall success of the adopted plan.
6. The outcome of ICT in Education projects ultimately depends on those at the heart of education Teachers training (UNESCO, 2010). Quite a number of driving factors should be found in the schools with respect to teachers' professional development.
7. Schools need infrastructure to plan the development and management of their ICT infrastructure. ICT infrastructure planning should be driven by the broader strategic goals and needs of the school (Australia Department of Education, 2009). Plans that are developed should also be consistent with the policies and advice of the school system, or the sector to which the school belongs.
8. ICT costing is identified as an opposing factor, since most principals are ignorant of its exact cost. The cost of ICT in the schools visited was always associated with acquiring ICT equipment. Hardware. Software maintenance and support, connectivity, professional development, central development, facilities and renovations costs should be taken into account when planning ICT integration in secondary schools.
9. Funding for ICT development programmes has been a key issue in all secondary schools. The Federal Ministry of Education, realizing State Government's incapacity to provide funds for ICT development in schools, should publish a decree or act that allowed for schools to gather minimum funds through a compulsory ICT fee to be paid yearly by students.

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