Information and Communication Technology Integration in the Nigerian Education System: Policy Considerations and Strategies

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ABSTRACT

The paper examines the Nigerian information technology policy and contends that the policy appears not to have sufficiently emphasized the integration of ICT in the nation's education system. It argues that the policy ignores critical elements of quality ICT application in education such as the need for integration into curricular and pedagogical structures, the need for quality professional development programs for teachers and the development of local content software. The paper advocates holistic policy considerations and strategies that reflect these critical elements.

INTRODUCTION

The global interest for the advancement of education in developed and developing countries of the world has been challenged by information and communication technology (ICT). The pervasiveness of ICT has brought about rapid technological, social, political, and economic transformation that has resulted in a network of society organized around ICT (Castells, 1996). In concrete terms, ICT can enhance teaching and learning through its dynamic, interactive, engaging content and can provide real opportunities for individualized instruction. Information and communication technology has the potential to accelerate, enrich, deepen skills and motivate and engage students in learning. It helps to relate school experiences to work practices, contributes to radical changes in school, strengthens teaching and provides opportunities for connection between the school and the world (Davis & Tearle, 1999). Information and communication technology can make the school more efficient and productive thereby engendering a variety of tools to enhance and facilitate teachers' professional activities (Kirschner & Woperies, 2003). In research ICT provides opportunities for schools to communicate with one another through email, mailing lists, chat rooms, and so on. It also provides quicker and easier access to more extensive and current information and can be used to do complex mathematical and statistical calculations. Furthermore, it provides researchers with a steady avenue for the dissemination of research reports and findings (Yusuf & Onasanya, 2004). Accordingly, the Nigerian national policy on education places emphasis on the provision and utilization of ICT as it stipulates that considering the prominent role of ICT in advancing knowledge and skills necessary for effective functioning in the modern world, there is the urgent need to integrate ICT in education (FRN, 2004)

Based on a review of 28 major reports on technology integration in American Schools, Culp, Honey and Mandinach (2003) advanced three major reasons for ICT in education. They suggested that technology is usually (a) a tool for addressing challenges in teaching and learning, (b) a change agent and (c) a central force in economic competitiveness. As a tool for addressing challenges in teaching and learning, technology has capabilities for delivery, management, support of effective teaching and learning. It is equally good

for geographically dispersed audiences and   helps students to collect and make sense of complex data. It also supports diverse and process-oriented forms of writing and communication, and broadens the scope and timeliness of information resources available in the classroom. As a change agent it catalyses various changes in the content, methods, quality of teaching and learning, thereby ensuring effective operation of constructivist inquiry-oriented classrooms.

The school plays a major role in developing an ICT culture of a country. The school must provide effective leadership in ICT integration through research, modelling of effective integration of ICT and provision of opportunities for professional development. In order to husband the potentials of ICT, most nations have evolved national information and communication technology policies to serve as a framework for ICT integration in all facets of society. African countries, particularly Nigeria, are not exceptions to this practice.

The digital divide between advanced and developing countries particularly in Africa is well established. Like most African countries Nigeria as a nation came late and slowly in the use of ICT in all sectors of the nation's life. Although Africa has 12 per cent of the total world population the continent has two per cent presence in ICT use (Jensen, 2002). In Africa there is low access to basic ICT equipment, low Internet connectivity, low participation in the development of ICT equipment, and even low involvement in software development. The seeming backwardness of the African continent in ICT necessitated a continent-wide initiative, the African Information Society Initiative (AISI). The AISI action plan framework called for the formation of National Information and Communication Infrastructure (NICI) plans and strategies. This was to be an on-going process through planning, implementation, regular evaluation of programs and pilot projects developed according to the needs and priorities of each country (African Development Forum, 1999). It should be noted that Nigeria did not achieve much on the NICI plan and strategies at the beginning of 1999. A significant progress was made in October 1999 when the Nigerian government issued a document on telecommunications development strategy and investment opportunities. Similarly, in October 1999 the National Policy on Telecommunication was approved. The document contained policy statements on objectives, structure, competition policy, satellite communication, management structure, finance and funding, manpower development and training, Internet, research and development, safety and security, international perspectives, and policy implementation and review (FRN, 2000). The national policy on telecommunication was a key step in the development of infrastructural base for ICT. In 2001 the Federal Government approved the Nigerian national policy for information technology and the establishment of the National Information Technology Development Agency (NITDA).

This article examines the adequacy of the Nigerian national policy for information technology in respect to the integration of ICT in the educational system. The present educational needs of the country is taken into consideration. In addition, it advocates holistic policy considerations and strategies that emphasize the integration of ICT in the nation`s education system.

CONCEPTUAL FRAMEWORK

The national policy on information technology (FGN, 2001) defines ICT as any equipment or interconnected system of equipment used in the automatic acquisition, storage, manipulation, management, control, and transmission of information. In a related view ICT is conceptualized as communication in whatever form used, accessed, relayed and transmitted (Olorundare, 2006). ICT comprises a range of technologies and their applications, including all aspects of the use of computers, micro-electronic devices, satellite and communication technology (Commonwealth Secretariat, 1991). Thus, ICT are tools that comprise electronic devices that are utilized for the information needs of institutions, organizations, and individuals. The electronic devices include information machines (for example computer, hard and soft wares), networking, telephones, video, multimedia and the internet (Ibara, 2010). ICT covers products of communication technology that stores, retrieves, manipulates, transmits or receives information electronically in a digital form. Thus, ICT can be seen as the various technological devices that enhance the creation, storage, processing, communication and transfer of information. In relation to education, ICT provides teachers and students with practical and functional knowledge of the computer, the Internet and other associated areas. The application of ICT in education is a challenging process that involves three levels namely, macro, meso and micro levels (Onuma, 2007). Onuma (2007) notes that the macro level determines the national policy on information technology and outlines the various ICT in education needs of society as well as the implementation procedures. The meso level specifically deals with the educational institutions translating ICT policy into practice and involves the provision of personnel and facilities needed for the implementation process. The micro level is the implementation procedure using the curriculum. Thus, a good policy formulation for ICT integration in education is expected to address these levels.

THE PRESENT STATE OF ICT IN NIGERIA

Nigeria had a late start in the use of computers but the growth in usage has been remarkable. For instance, computer installations are widely distributed in universities, government departments and agencies, banks, and industries. Table 1 depicts some enabling, and constraining features in ICT deployment in Nigeria.

Table 1: Enabling and Constraining Features in ICT Deployment in Nigeria

Factors	Enabling Features	Constraining Features	Risk Factors
ICT deployment	• Launching of NIGCOMSAT-1 in May 2007 and connection to the SAT-3 submarine cable to reduce telecommunication and Internet connection rates • Investment of the private mobile telephone companies in fiber optic networks to enhance the deployment of Internet services and facilities especially in urban areas • Tertiary institutions and other schools involved in widening access to computer technology and knowledge • Nigeria will be a net supplier of electric energy by 2008 • Agreements with Microsoft, CISCO, and other stakeholders to spread the knowledge and usage of ICT including the production of Nigerian language versions of Microsoft products • Computers and blended learning being used in the distance learning programs of some teacher- training institutions as well as NOUN	• The low percentage of teachers who have ICT skills and the challenge of the massive ICT education drive needed to correct and develop the huge human resources base at national and institutional levels in the faculty and student populations • The lack of requisite telecommunications infrastructure capable of transporting multimedia messaging • The absence of electric power grids in most parts of the country even in cases where there is adequate telecommunications coverage • Uneasy access to computer equipment and other accessories at institutional and personal levels due to locations of cyber cafés in commercially profitable communities to the detriment of semi-urban or rural communities	• Inadequate motivation of government authorities and school administrators to implement the ICT policy in relevant education sectors • Lack of financial resources at government level • Inability of government to extend ICT infrastructure due to financial and budgetary constraints • High levels of illiteracy among women and the northern populations hamper programs even in the ethnic languages
Technical and Vocational education (TVET)	Government and UNESCO reviewed and re-oriented TVET and have equipped several institutions to train teacher-trainers in 28 disciplines in seven staff development centers. Already 527 staff are trained in 34 training workshops.	Government budgets do not permit meaningful provision for these initiatives,	Future absence of international donor technical assistance may stall progress in the programs and defeat the purpose since less than 1% of post-secondary education is in TVET.
Gender equity	Government and society are involved in the campaign and programs for girls' education, especially in the northern and eastern states.	Traditional daily household demands still take priority over girls' education especially in the northern states.	The bridging of girls and boys enrolment ratios is a daunting task in light of current enrolment statistics.
ICT policy and implementation	The university and some institutions establish computer laboratories with support from external sources.	The absence of policy at the ministerial level has not helped co-ordinate ICT projects and programs being carried out separately by various agencies operating in the education sector, and will lead to resource wastage and duplication.	

Source: Agyeman (2007) Survey of information and communication technology in Africa: Nigeria country report

THE PRESENT RANKING OF NIGERIA IN
THE NETWORKED READINESS INDEX

The current ranking of Nigeria in the Networked Readiness Index is low. The Networked Readiness Index (NRI) published annually by the World Economic Forum measures the propensity for countries to exploit the opportunities provided by ICT. The NRI is composite of three elements; the environment for ICT offered by a given country or community; the readiness of the community`s stakeholders (individuals, business and governments) to use ICT, and the usage of ICT among these stakeholders. The table below shows the ranking of Nigeria among 133 and 138 countries that were included in the 2010/2011 and 2011/2012 of the index respectively.

Table 2: The Networked Readiness Index Rankings for Selected Countries

Country	2010/2011 Rankings	2011/2012 Rankings
Sweden	1	1
Singapore	2	2
Finland	3	3
United States	5	8
United Kingdom	15	9
South Africa	61	72
Ghana	99	97
Senegal	80	100
Nigeria	104	112
Uganda	107	110
Chad	133	138

Source: Adapted from World Economic Forum (2011& 2012) Global information Technology Report.

Table 2 indicates low position occupied by Nigeria among developed and developing nations (104th in 2011 and 112th in 2012). From the rankings in 2012, Nigeria drops a staggering eight places to 112th among 142 countries. The implication of the report is that the opportunities provided by ICT have not been fully exploited in Nigeria. According to the World Economic Forum Report (2012) Sub – Saharan Africa`s networked readiness continues to be disappointing, with the majority of the region lagging in the bottom half of the NRI rankings. It is obvious that many challenges need to be addressed in order to improve the state of ICT development in Nigeria. Corroborating this view Onuma (2007) notes this:

1. Telecommunication availability has improved in Nigeria, but communications quality is low and ICT penetration is still insufficient.
2. In Nigeria poverty is pervasive; hence ICT remains a stranger. Computing and telecommunication resources are unaffordable to the majority.
3. Software is at the heart of the global knowledge economy. Thus any nation that

values its sovereignty must take software development seriously. Software opportunities in Nigeria are not fully exploited.

4. Information security is an area of concern. Cybercrime, hacking, ATM fraud and general identity fraud theft are on the increase. Security of information is critical to building confidence in today`s network world.
   (p. 517)

A REVIEW OF THE NATIONAL POLICY ON INFORMATION TECHNOLOGY

As Hafkin (2002) notes ICT policy can be categorized into vertical, infrastructural, and horizontal policies. Vertical ICT policy addresses sectorial needs, such as education, health and tourism. The infrastructural aspect deals with the development of national infrastructure and closely linked with telecommunication. The horizontal aspect deals with the impact on broader aspects of society such as freedom of information, tariff and pricing, privacy and security. These three aspects are adequately addressed in the Nigerian IT policy. It is now important to examine the document as it affects education. In making this analysis the author as a guide proposed two questions.

- How adequate is the policy for the integration of ICT in the Nigerian education system?
- How can the policy be redefined to address the need of the Nigerian education system?

Answers to these questions are intended to provide a basis for redefining the Nigerian national policy on information technology. First, the policy document recognizes the need 'to use IT for education'. It is important to note that in as much as the mission, general objectives, and strategies in the policy recognizing the importance of ICT in education, the document has no sectorial (vertical) application to education. Issues relating to education are subsumed under sectorial application for human resources development. In other words, the policy document has no specific policy for ICT in education. The policy document under sectorial application for human resources provides the following objectives:

- to develop a pool of IT engineers, scientists, technicians, and software developers;
- to increase the availability of trained personnel;
- to provide attractive career opportunities; and
- to develop requisite skills in various aspects of IT.

In order to achieve the objectives for human resources development, the policy outlines nine major strategies. These strategies are targeted at the building of knowledge and skills in information technology. These include

- making the use of ICT mandatory at all levels of educational institutions;
- development of ICT curricular for primary, secondary, and tertiary institutions;
- use of ICT in distance education;
- ICT companies investment in education;
- study grant and scholarship on ICT;
- training the trainer scheme for National Youth Service Corp members
- ICT capacity development at zonal, state, and local levels;
- growth of private and public sector dedicated ICT primary, secondary, and tertiary educational institutions; and
- working with international and domestic initiatives for transfer of ICT knowledge.

In spite of these objectives and strategies that are focused on education the document is inadequate in addressing the needs of the nation's education system. Some of the inadequacies observed in the document are enumerated as follows.

- The policy has no specific application to education. While there are sectorial applications for health, agriculture, art, culture, tourism; and governance, education is subsumed under human resource development. African Development Forum (ADF) (1999) recommendation explicitly notes the need for sectorial allocation dedicated specifically to education.

- The objectives and strategies related to education as reflected in the sectorial application for human resource development are market driven. Students are only being prepared to acquire knowledge and skills for future jobs. This philosophy limits the potential of ICT in education to a major force in economic competitiveness. Its potentials as a tool for addressing challenges in teaching and learning and as change agent are ignored. Students need not learn about computers only, rather ICT should be integrated for the development, management of teaching and learning in Nigerian schools.

- Teachers are indispensable for successful learning of ICT. Computer education introduced into the Nigerian secondary school since 1988 has largely been unsuccessful as a result of teachers' incompetence (Yusuf, 1998). Empirical studies have established that teachers' ability and willingness to use ICT and integrate it into their teaching is largely dependent on the professional development they receive (Davis, 2003; Pearson, 2003). The Nigerian national IT policy is silent on teacher education and teachers' ICT professional development.

- Learning through ICT entails the development of nationally relevant content software for school use. The national policy does not recognize the need to create quality software. The available software in Nigerian schools is imported with no local content. The policy document does not address this issue.

- In addition the document has no specific direction on ICT or technology plan at institutional levels. Advanced countries have specific plans for ICT. For instance, in Britain the National Grid for learning initiatives and the strategy for Education Technology, specifically address ICT issues in United Kingdom and Northern Ireland respectively (Selinger & Austin, 2003). The Nigerian national policy does not give any guideline on school technology plans.

The implication of the above review is that the national policy appears not to address the need of the Nigerian education system. Its educational focus is limited to the market driven goal. The need for integration in teaching and learning, the need for quality professional development programs for pre-service and serving teachers, research, evaluation and development, and the development of local content software are ignored. These are major components of quality ICT application in education.

ICT POLICY DEVELOPMENT AREAS

Policies are usually seen as the strategic statements that provide a broader context for change and articulates a vision that motivates people to change and coordinate otherwise disparate efforts within the system and across sectors (Kozma, 2005). Policies involve action plans that provide the instrument in which the vision is to be realized.   In 2003, UNESCO Bangkok conducted a survey of the state of ICT use in education across Asia and the Pacific. Not surprisingly, the survey found a great deal of variation in the nature and extent of technology integration in the more than two-dozen countries surveyed. Specifically, countries were at different stages of both development and implementation in the areas of policy formulation, ICT infrastructure development and access to it, content development, program initiatives and the training provided for education personnel (Farrell & Wachholz, 2003). The differences stemmed not only from differences in the countries' financial and human resources, but also from differences in policymaking with regard to ICT in education. Farrell and Wachholz (2003) sum up these policy-related differences as follows:

> The countries are arrayed along a continuum of stages with regard to policies pertaining to the integration of ICT into their education systems. While all of them have stated that the development of ICT capacity is important to the future of their countries, fewer have grappled with the policy questions as they relate to ICT applications in education – and many of those countries lack the resources to implement their strategies.. This 'lack of resources' reflects, however weaknesses of existing policies and the need to improve them. (p. 267)

Indeed, weaknesses in policymaking often lead to the misallocation of resources, which in turn exacerbates the existing lack of resources. For example, there is a tendency to emphasize the installation of ICT over the seamless integration of ICT in teaching and learning – i.e. making ICT a part of the educational milieu and ensuring that it results in improved learning outcomes. This results in an incredible influx of financial support for equipment but only a meager trickle for network support or staff training (Monahan, 2004). In the Nigerian context the key areas proposed for policy development include:

1. The key considerations in selecting infrastructure and hardware are appropriateness, cost-effectiveness, and sustainability (Guttman 2003). Appropriateness refers to fitness for purpose and context, which implies that policymakers must resist the pressure to adopt the newest technologies simply because they are 'high-tech' and other countries are adopting them. As Guttman (2003) notes, some of the greatest educational problems are in the most remote areas, where electricity supplies may be irregular or non-existent, telephones scarce and lines difficult to maintain.

2. At the same time, in ensuring universal access to technologies, governments must keep in mind the need to ensure sustainability, which has technological, political, and social dimensions aside from the economic or financial dimensions. Techno-

logical sustainability has to do with choosing technology that will be effective over the long term, taking into account the rapid evolution of technologies and the availability of technical support. Political sustainability has to do with the policy environment and management of the change processes involved in technology integration in schools. Social sustainability comes from the involvement of all stakeholders, including those who will use the technology (teachers, learners), those who will be affected by its use, and others with a legitimate interest in education processes (such as parents, political leaders, and business and industry leaders (Tinio, 2003).

3. The financial cost of ICT acquisition in schools is usually a major focus of attention in policymaking and project planning. But the cost of acquisition is only one aspect, and policymakers and administrators need to budget for the recurring costs that form part of the Total Cost of Ownership (TCO). Maintenance and support account for about a third to half of the initial investment in computer hardware and software (Haddad, 2007). Thus, even if computers may be acquired for free, as in the case of donated computers, they require a substantial financial investment for maintenance and support.

4. The development of content for ICT-supported teaching and learning is another key policy area. According to Haddad (2007), introducing TVs, radios, computers, and connectivity into schools without sufficient curriculum-related ICT-enhanced content is like building roads but not making cars available, or having a CD player at home when you have no CDs. Development of content software that is integral to the teaching/learning process is a must. Policymakers will need to make a choice between acquiring or creating new ICT-enhanced educational content and software. Suitability (including curriculum relevance), availability, and cost are key considerations in making this choice. The selections of appropriate content and software have to be made not once but many times, since different learning contexts will have different requirements, for example in terms of age and learning abilities, subject-specific demands, culture and language.

5. The need for trained personnel who will implement technology integration in schools is also a key area that policymakers need to pay attention to, and they must do so from the outset. Technology by itself is not enough to transform education processes and improve educational outcomes. As Haddad (2007) notes appropriate and effective use of technologies involves competent and committed interventions by people. The required competence and commitment cannot be inserted into a project as an afterthought, but must be built into conception and designed with the participation of those concerned.

6. Access to the Internet and local networking resources deserves attention in ICT in education policies. This should address issues related to bandwidth and areas to be networked. Budget decisions should address not only the costs of the initial installation of networks but also the recurring costs of network services.

7. Technical support is another important component of ICT in education policies. It requires the provision of regular technical assistance. Teachers need this support not only in the early phases of ICT use, but also as educational applications become complex. Technical assistance is needed in order to integrate the use of ICT in curricular subjects.

The key components of ICT integration in education discussed will need to be integrated into a coherent plan with clearly specified targets, timelines, and costs. Moreover, the plan should first be implemented in pilot mode rather than full scale in order to determine whether the various elements work singly or in combination.

STRATEGIES FOR ICT INTEGRATION

The author proposes the following strategies for ICT integration in the Nigerian education system.

1. In planning for ICT integration in education policymakers in Nigeria would do well to begin by determining the educational purposes that technologies are to serve before they are brought on board. This means clarifying overall education policy as this should serve as the rationale and road map for technology integration. It is important to note that technology is only a tool and as such it cannot compensate for weaknesses in education policy (Haddad, 2007).

2. Once national education goals have been clarified, policy makers need to decide on what ICT integration approach to adopt. Farrell and Wachholz (2003) found three different strategies being used in Asia Pacific countries which can be beneficial to the Nigerian education system.
    (i)   teaching ICT as a subject in its own right, usually beginning at the upper secondary level, to develop a labor force with ICT skills;
    (ii) integrating ICTs across the curriculum to improve teaching and learning; and
    (iii) using ICTs to foster learning anywhere and anytime as part of the development of a knowledge society in which all citizens are ICT savvy. Each of these has different infrastructural, personnel, and management requirements among others.

3. Private sector-Public sector partnerships to either pilot or fast *track* ICT- based projects is a strategy that has gained currency among ministries of education in developing countries. These partnerships take many forms, including private sector grants with government counterpart contributions, donations of equipment by corporations to schools, and provision of technical support assistance for planning, management, and strengthening human resources at the grassroots level. However, the financial litmus test of ICT- based programs is survival after donor funds has run out. Many ICT–based education programs funded by aid agencies could not sustain because government failed to step in with the necessary funding. Thus, a two–fold strategy is imperative; government support and local community mobilization.

4. One of the greatest challenges in ICT use in education is balancing educational goals with economic realities. ICTs in education program require large capital investments; hence caution is required in making decisions about what models of ICT use will be introduced and the need to maintain economies of scale. Consequently, it is an issue of whether the value added ICT use offsets the cost relative to the cost of alternatives. In other words, is ICT–based learning the most effective strategy for achieving the desired goals, and if so what is the modality and scales of implementation that can be supported given existing financial, human and other resources. Tino (2003) suggests the following possible sources of funds and resources for ICT use programs: (1) grants, (2) public subsidies, (3) private donations and fund raising events, and (4) community support.

5. Teachers are critical to ICT-based learning and a good strategy for ICT integration in education should involve their professional development in five areas: (1) skills with particular application, (2) integration into existing curriculum, (3) curricular changes related to the use of IT (including changes in instructional design), (4) changes in teachers' role, and (5) underpinning educational theories (Tino, 2003). ICTs are rapidly evolving technologies and even the most proficient teacher need to continuously upgrade his or her skills in line with international best practices.

CHALLENGES TO EFFECTIVE INTEGRATION OF ICT IN EDUCATION
Some of the challenges to effective integration of ICT in the Nigerian education system include:

1. In Nigeria a good number of teachers and support staff in the school system are far from being computer literate. As Akubuilo and Ndubuizu (2007) rightly notes a high percentage of teachers and lecturers in science subjects in Nigeria are computer illiterate. From this standpoint, it is obvious such teaching staff will find it extremely difficult to deliver ICT compliant education and training.
2. Low teledensity constitutes a major challenge to ICT integration. For instance, access to telecommunication tools such as computer, Internet and telephones are still low. Adeyeye (2006) notes that Nigeria has the second largest telecommunication sector in Africa (second to South Africa) with a subscriber base of 20 million, but has a teledensity of less than 15% while Canada with a much smaller population has teledensity of l07%.
3. Power supply in Nigeria is epileptic. ICT facilities are power driven. In urban cities where there is power supply it is irregular and therefore interrupts the effective use of ICT facilities.
4. Low level funding has resulted in low level provision of ICT facilities in schools. Gbadamosi
    (2006) observes that education is grossly underfunded in Nigeria and has affected many areas such as the funding of ICT project, training and retraining of teachers, and development of software packages. The current level of funding education in Nigeria with decreasing budgetary allocation to the education sector is a major constraint to provision of ICT facilities in schools. For instance, the federal budgetary allocation to education in Nigeria for years running are far below the 26% education sector funding benchmark stipulated by the United Nations Educational

Scientific and Cultural Organization (UNESCO). The effect of poor funding is more pronounced in tertiary institutions where computers are needed for instruction and global information.

5. On a serious note, ICT has not been fully integrated into the curriculum of primary and secondary education in Nigeria. Not until the national policy on education is revised to fully integrate ICT in the curriculum the problem will still linger.

CONCLUSION AND RECOMMENDATIONS

Different countries will formulate different policies regarding how best to harness the power of ICTs to further their economic and social development goals through education. Even the process of developing policy could be different among countries. However, ICT in education policy considerations discussed comprise a basic set of elements that can guide the policy making process. As the Nigerian government embarks on large-scale adoption of ICTs in education, it is important to move away from techno centric planning and implementation approaches to models that focus on establishing sound policy and support strategies leading to integration of ICT in education. For this to happen, policymakers themselves need to develop systematic policy formulation and strategic planning for ICT integration. While they do not need to know the nuts and bolts of technology policy makers need to understand how technologies and education systems interact. They need to have a good grasp of the conditions necessary for ICTS to be effective in educational contexts. In the light of the discussion it is recommended that:

1. In view of the observed inadequacies in the present policy document there is the need to revise the document. Such revision should be undertaken to involve stakeholders in the area of education so that they can ensure that the policy cover issues related to learning about ICT and learning through ICT.

2. Furthermore, the objectives in sectorial application areas should address education specifically in order to broaden the market driven objectives. The integration of ICT into every aspect of teaching and learning should also be the key focus.

3. Although the issue of infrastructure is implicit in the present policy it should be reviewed in such a way that access policy is addressed in concrete terms, since this is important in ICT integration.

4. Given that teachers are important in ICT integration in education, the national policy on IT should address the issue of teachers' professional development. This should incorporate issues relating to teacher training institutions and ICT, pre-service teacher education, in–service teacher education, and standards for teacher competence and certification in ICT.

5. Also, research, evaluation, and assessment are critical for ICT usage in education. In this context, the national policy should identify a frame of reference in order to gauge success of ICT application in education, such a frame of reference will encourage refinement of school practices relating to ICT integration.

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