Analyzing ICT Policy in K-12 Education in Sudan (1990-2016)

Adam Tairab[1] & Huang Ronghuai[1,2,*]

[1]School of Educational Technology, Beijing Normal University, 19 Xinjiekouwai Street, Haidian District, Beijing 100875, China

[2]Smart Learning Institute, Beijing Normal University, 19 Xinjiekouwai Street, Haidian District, Beijing 100875, China

*Correspondence: School of Educational Technology, Beijing Normal University, 19 Xinjiekouwai Street, Haidian District, Beijing 100875, China. E-mail: huangrh@bnu.edu.cn

Abstract

The aim of this study of ICT policy in K-12 education in Sudan is to investigate the status of planning for technology in education and then determine how the advantage of ICT can best serve the educational system and improve educational outcomes. The study examined two plans for ICT in education, addition to an interview with the educational planning manager, and information center of federal ministry of general education, and other documents from the ministry of education, as well as recommendations of previous studies which emphasized the need for policy to be compatible with other countries may face semi conditions of Sudan, and importance of compatible with UNESCO declarations (Incheon& Qingdao, 2015). The results of this study showed the need for policy emphasis on using technology in education, K-12 education in Sudan requires better technology equipment, inclusive ICT policy includes primary and secondary education need to formulate. The study also suggests that evaluation and assessment are required in order to get more effective solutions and cope with the international educational progress of ICT in K-12 education.

Keywords*: ICT; Policy; Analysis; K-12 education; Sudan*

1. Introduction

Information and communication technologies (ICT) is playing an increasing role in education. There is a need for innovative uses of ICT in education to support active learner participation in school and later in life (OECD, 2016) Improving educational technological abilities requires significant educational planning for technology. Hadad and Draxler (2002) argued that technological, economic, and social forces are important factors which contribute to educational development. These forces also exist worldwide, and deeply affect multiple domains, including government policies. This reflects the importance of policy for ICT to be implemented in school and promotes the role of ICT in the educational system, then shift to contribute economic and social development. The needs for ICT policy implementation are one of the main issues that deserve study requiring the attention of researchers. Policy issues are also one of the main challenges facing educational institutions in adopting ICT(Khanna & Goyal, 2016).

(Wilson, Scalise, & Gochyyev, 2015) believe that ICT plays a considerable role in preparing people for their careers and whole lives, especially through education. Moreover, ICT plays a powerful role as a sustainable development tool that can help develop learner skills in the classroom and workplace skills later in the workplace(Gorghiu, Gorghiu, Brezeanu, Suduc, & Bîzoi, 2012). In the same context, Kozma believes that ICT gets international attention because of the role that it can play in economic and social development beside educational development(R. B. Kozma, 2008). Applying ICT in the education system requires a policy to enable implementation processes at schools. On the other hand, how can the educational use of ICT evolve? Answering that question has policy implications. The importance of a policy can be derived from a global perspective. The potential of ICT in education and the status of Sudan as a developing country looking for sustainable educational development will be viewed from a global perspective. Furthermore, ICT policy expected to be an essential part to draw approaches of how to do what, and enable further solutions for education (Lee, 2016; Mominó & Carrere, 2016a; Tilya, 2008).

The literature reviewed (A. Ahmed, 2015; A. A. Alamin & shaoqing, 2014; H. A. A. Alamin & Elgabar; Elemam,

2016; Elsunni, 2014; Hamdy, 2007; Nour, 2015; Osman, 2013; Saeed & Fadlallah, 2015; Stubbé et al., 2016; Suliman, Raman, & Hamid, 2007; Tairab, Huang, Chang, & Zheng, 2016) shows that it is necessary to provide a framework or strategic view for ICT policy implementation to help the educational system to improve teaching and learning process. Addition to assisting learners and educators to access the learning resources. Continuously, support the development and delivery of the curricula, and insuring that national policies and programs can be important tools for the realization of ICT's promise in education. In line with this point, the national policy and strategic plan play an important role in promoting digital literacy, encouraging diverse efforts, and achieving the educational goals of the country(R. B. Kozma, 2008). Furthermore, the national policy and strategic plan play an integrated role in motivating and coordinating diverse efforts needed to achieve the educational goals of the country (R. Kozma, 2010). According to the world bank view, ICT play a crucial role in help countries support educational reforms ((ESCWA), 2013). Moreover, ICT policy can enable implementation processes and guidelines(Peeraer & Van Petegem, 2015).

This paper seeks to analyze ICT policy plans in K-12 education in Sudan based on official documents from federal ministry of general education (FMGE). These documents include educational policies and plans between 1990 and 2016. The purpose is to discover the international context of the ICT policy and determine what can be advantageous for Sudan to follow. The study also investigates whether this strategic and national policies include goals and a vision for ICT, plans for ICT integration in K-12 education, and infrastructure development plans. As part of the documents and studies, the study analyzing the recommendations of educational conferences held in 1990 and 2012, ICT policies plans -first five years' plan (2007-2012), and second five years' plan (2012-2016), as well as recommendations of previous studies (Tairab et al., 2016).

2. Materials and Method

2.1 K-12 Education in Sudan

The term K-12 refers to the educational stage from the kindergarten (the 'K') through high school (12th grade in many countries; see http://whatis.techtarget.com/definition/K-12). Some countries call it K-12, others call it public education, and some others call it general education because it includes primary and secondary schools. It also refers to the beginning of the educational journey of the learners which start from kindergarten. As known this kind of education seeks to provide kids with the fundamental knowledge and skills to enable them to join the upper educational levels in higher education (see http://www.ask.com/education/k-12-education-757e4270aff830d3). In Sudan, the term K-12 is not used widely, although it is usable among the researchers, teachers, and scholars. Popular usage in Sudan for K-12 is general education which consists of kindergarten where kids study two years before joining primary or basic education where students study eight years, and then secondary school where students study three years. In the year 2012, the Seventh National Educational Conference recommended changing the academic years from eleven to twelve years. (Sudan, 2012). The debate was held about the situation of the 12th year in which stage it should be added, however, majority of the experts of committees which formed to make the final decision believe that it should be added to the secondary stage to be four years instead of three (journal of educational documentation, 2013).

Moreover, the educational system in Sudan consists of three educational stages Pre-school, basic(primary) education, and secondary education. In the pre-school stage, there is khalawi and kindergartens. The role of the khalawi is to teach Holi Quran for kids. The children are between 4 and 5 years old. By the end of this stage, kids can join the basic education stage; this basic or primary school consists of eight years from the age of six to thirteen. When the students finish this basic schools they have to take an exam for a basic school certificate which gives them eligibility to join the secondary education. Secondary education consists of two sectors of education: an academic sector, and a technical/vocational sector. Students age from fourteen to sixteen years old, by the end of secondary school student have to take a secondary school certificate to join higher education which consists of three to five years for a diploma and a bachelor degree (EDUCATION, 2012; Elmagboul, 2014; E. Planning, 2008; UNESCO, 2010).

2.2 Definition of the Policy

Policy is defined as: "a definite course or method of action selected from among alternatives and in light of given conditions to guide and determine present and future decisions" (Merriam-Webster Online Dictionary). Statements of an educational policy refer to educational pointers, cross-state comparisons, enrollment patterns, expenditures of the state on education, in addition to other aspects of education including international dimensions in curricula, the effectiveness and outcomes of schools(Rhoads, Torres, & Brewster, 2005). "Any course of action adopted as advantageous or expedient" (Malone, 1999).

2.3 Influencing Factors for ICT Policy

In line with this framework there are factors affect ICT in education which are ICT policy, infrastructure, educational resources, , teacher professional development, as well as curriculum and assessment (Tay, Lim, & Lim, 2015). In the same context, Tairab, et al, demonstrated that ICT policy is one of the main factors that can drive the educational progress in K-12 education in Sudan (Tairab et al., 2016). In addition, in their study for e-learning policy- (Kong, Chan, Huang, & Cheah, 2014) identified five dimensions or factors to examine the status of the policy: (a) infrastructure, (b) curriculum integration, (c) student learning, (d) teacher professional development and leadership, and (e) capacity building. Before that, UNESCO identified an approach to IT policy and boosts that, this approach consists of "policy -curriculum, assessment resources, professional development, beside the fund generation"(Tilya, 2008). From above mentioned, we noted that ICT Policy almost plays the first position in these studies which means that it is a cornerstone in an educational development. Accordingly, ICT policy in Sudan should be examined to Shed light on the progress of the country in promoting ICT in K-12 education.

2.4 Global Rationales for ICT Policy

ICT has the potentials to enable changes in education, especially in developing countries to promote educational development. This development needs continual efforts and a future outlook (Price, 2015), However, developing countries, particularly sub-Saharan countries, face diversity in the implementation of infrastructure, curricula, capacity building, and usage of ICT in schools(Mominó & Carrere, 2016b; Tilya, 2008; Twining et al., 2015).

There is a need to enable schools to have ICT tools. Nevertheless, these tools cannot be launched without obvious policies and master plans to show the steps of the implementation process. This study looks closely at ICT policy plans in Sudan to determine to what extent these policies keep up with international trends of ICT in education, and regard the orientations of an educational body like UNESCO.   Below the authors discuss the experiences of ICT policy in the countries around the world. Sudan along with many developing countries in Sub-Saharan Africa and the Middle East, needs reforms involving ICT in education (Ibrahim, 2008). To do so, this study looks at the global efforts of ICT in education. The global education reforms have seen great development since Jomtien Conference 1990, where the world declared the policy of Education for All. In this conference, about 150 nations promised to make the year 2000 as a date of basic education available for all people (child's, youth and adults).

The efforts and initiatives continued in Dakar, where countries which taken place in this conference reconfirmed undertake to achieve their accomplishment of Dakar- Jomtien goals of education for all (EFA). These countries also adopted A framework which called Dakar framework for action of EFA. ((UNESCO), 2000). To what extent did Sudan pledge to implement these declarations? This study shows that through the policies progress and formulations.

The countries like USA, Europe, Asia (Korea, China,) Africa and middle east (Tanzania, Kenya, and Egypt) has developed diverse policies and plans include ambitious frameworks and models, as well as following UNESCO declarations and goals to apply ICT in their education (Tairab et al., 2016). This reflects the importance of the policy to driving applications of ICT in education and make the educational reforms base technology and cope with the advance educational progress, as well as make the desirable educational reforms in term of e-learning as a whole. UNESCO introduces view for ICT policy can be applicable in the education and calls upon countries to develop this policy to support implement of ICT. Through the declarations, UNESCO has been working to provide countries with new suggestions, ideas, and encourage using ICT to promote education and lead the goals of sustainable educational development. Hence, implementation ICT in the educational system is a base step toward using technology in school and classroom level, addition to the role of ICT in student learning and practice.

2.4.1 ICT Policy in the US

The country planned policies to transform American education as in national education technology plan 2010, plan of future ready for learning 2016, as well as plans of (2010, 2015, 2016). These Plans reflects the advanced application of technology in education, from a plan for technology to empowering learning through technology (Office Of Education Technology, 2015; Office of Educational Technology, 2016). The US launched online and blended environments and digital content for the student of K-12schools, in addition to standards for assessing the quality of digital content and sharing it. Schools were also provided with resources to share develop and evaluate this digital content (Powell, 2016). They also introduced digital divide as an indicator of access to technology among students in school and at home, addition to work for how to evolving this digital divide, and make more progress in kid's education.

The country compatible with UNESCO declarations, they provide an overview to lifelong learning, education for all, and well sharing for the community in school through increasing family engagement in school programs to support student success. In term of connectivity, they achieved 100 Mbps and are planning to launch 1 Gbps per 1000 students

by the year 2018 (Office of Educational Technology, 2016). The US has been reached a high level of ICT in K-12 education as it planned to do. This also confirms the good development of factors affects promoting ICT in education.

2.4.2 ICT Policy in Europe

European countries focused on how to make ICT-enabled innovation by the year 2020. How a school can make effective strategic to help the student be more effective learners, provide them with good learning resources, internet connectivity, and portable computing devices. "Students in 19 European countries were equipped with a portable computing device in the school. Addition to regarding students' needs to adapt in the pedagogy, as well as learning space to achieve diversity and flexibility. Planning toward the innovations based learning, creativity support the strategies and learning style of the Students" (Holmes, 2013; Wastiau et al., 2013).

2.4.3 ICT Policy in Asia

Asian countries, for instance, Korea developed a pilot scheme to find suitable models to support developing an effective solution for e-learning. As well as effective way to reduce student dropout rate through the transition from school to university. Korea also working to find a way for introducing knowledge for young learners. Enable student to easy access and use of technology, addition to taking advantage of mobile devices, and the social networks, these are the main ideas behind design digital textbook content in Korea, as well as provide students with reactive and authentic experiences for learning as contribution to raising the ICT enable innovation 2020(Punie, Law, & Kampylis, 2013).

China established ICT in education two decades ago when they declared the importance of IT for the economic development of the country(Zhao, 2010). In 2001 china followed five years' strategy for ICT (2001-2005,2006-2010,2011-2015)(Kong et al., 2014). In addition to enhancing teachers' competencies, school infrastructure, learning resources, China is using OER, and looking forward. The country also designed strategy (2006-2020) with nine aspects, with focusing of advance ICT in education(Atkinson, 2014). Recently, China launched the level of innovation in education through applying instructional innovation practice (Zhang, Meng, & Jing, 2016). According to (Miao, 2008), China made a framework for ICT in school, teacher training, ICT curriculum, and national standards. These strategies compatible with declarations of UNESCO, in term of education for all (EFA), lifelong learning (LLL) and high-quality education (HQE). Notable, these frameworks mentioned in Asian experiences also provide the same factors used in Europe and US to promote ICT in K-12 education.

2.4.4 ICT Policy in Africa and the Middle East

Tanzania formulated universal strategic for the ICT policy as part of state development vision 2025. The country also regarded standards to be in line with the transforming of technology in term of ICT policy which identified in 2014. Additionally, to easy access of learning materials for teachers, students, and the administrators in the all part of state, with the availability of ICT maintenance resources, ICT pedagogical tools, and the developing local educational content to contribute the development of national goals (Steve, 2012).

The Kenyan planner was believed as an importance role of ICT policy to lead economic, social and political development to towards goals of vision 2030. The e-platforms was used an important tool in educational sector state to develop school infrastructure, and trained teachers on ICT skills as well as curricula and content improvement. Computers have been used in all subjects to aided teaching, research, and communication, to accelerate the using of e-mail in the school as telecommunication technologies. On the hand, the electric board, video, audio cassette, and instructional radio and TV were also used to support the educational process. Kenya seeks to transform the curricula from text to digital format to facilitate the integration of ICT and deliver the educational curricula(Mingaine, 2013).

To reform of the education in Egypt, the ministry of education (MOE) used "standards-based content" to integrate and assess ICT. Five years as strategic planning was applied to develop the technology applications as tools to word digital citizenship, increase economic and social development. These targets were identified in the strategy of ICT 2012-2017 (Pouezevara, Mekhael, & Darcy, 2014). The country established ICT for educational reform include cloud computing and tablet computer. For tablet initiative, the (MOE) pointed to use Arabic digital content, the mobility of learning, and building industry for a tablet computer to provide schools with 20 million tablet devices. The advantage of the regional experiences has been used to establish Egyptian framework for tablet industry, and to encourage the national companies to design their goals, policies, and plans to promote the local and the regional projects. In addition to emboldening software production, educational games, and other applications like service-oriented architecture (SOA) (Communications & Egypt, 2012).

Regarding a cloud computing for the educational process, the initiative seeks to build human capacity based on the international experiences to be as a framework for cloud computing industries. Beside this, implement and enable application of e-learning system, requires the development and management of e-learning package, track, students'

knowledge and needs. Creating virtual community by using cloud computing as a social network to enable the communication and enhance the knowledge transmission to enrich the experience of Arabic content. Enhance the learning management system at schools, provide 2Gb internet to enable simulation software and application in the schools to improve the learning experience and their achievement, make adaptivity and personalize student learning techniques as well as empower teaching skills. Moreover, there is a project for open resources, and other projects for learning management system based on automating process "Educational Institutions Automation Project" and also a project for 21st century skills development (Communications & Egypt, 2012).

3. Historical Development of Educational Policy in Sudan (1990-2016)

In the year 1990, the government of Sudan was held a universal conference to reform the education called (National educational conference, 2012). This conference identified important and comprehensive changes included Philosophy and goals, educational system, a generalization of education, curricula, teacher development, teaching language(Sudan, 2012).Below   the study shows these changes.

3.1 Philosophy and Goals

Based on the changes which facing Sudan and the world around, and according to the views of the government of Sudan- since 1989-till now (2016)- it is importance to adopt goals for education reflect the Sudanese educational philosophy. This philosophy should be the guide for the Sudanese foundations in their message for the youth. Accordingly, the goals included

3.1.1 The consolidation of religious belief among young people, help them to construct their behavior on the values of religion, including helping to create community, social, economic and political values based on these religion instructions.

3.1.2 Strengthening the unity soul among young people, the sense of loyalty to the homeland development, reconstruction of consciousness and love and work for its progress.

3.1.3 Building self-help society, work on infuse spiritual and potentials in the country and promote the ambitions to restore the cultural role for Sudanese as civilization nation have their own message.

3.1.4 Developing the individual abilities, skills, and offering modern technical traineeship opportunities for the peoples and optimum use of their potential to serve the overall development.

3.1.5 Developing the sense of environment among young people, insight into the environment as components of the grace of ALLAH. This goal must be preserved to support development and preservation of drought, desertification and other environmental disasters.

3.2 Generalization of Education

To make the equity of education available for all citizens, to upbringing future generation according to Sudanese educational goals, the commitment to international instruments and elimination of illiteracy the conference recommended the items below:

3.2.1 Generalizing the basic education for all the children in the school age including children with disabilities according to plan which assume implement within 1991-1994.

3.2.2 Political statement issues of the country affirming its commitment to circulate basic education according to the suggested plan as the first step in the comprehensive development strategic.

3.2.3. Establishing a national foundation to implement goals of this plan, and working to attract financial support from regional and international funding agencies and organizations.

3.2.4 To implement this plan, it possible to consider different educational patterns according to circumstances of each area like khalawi of Holi Quran, two Cycle schools, and blended schools.

3.2.5 State should oblige to free education in all general educational stages and involve the rich people to contribute children education.

3.3 Educational System

The above recommendations of the national educational conference included goals of Sudanese nation to be achieve these goals represent in prepare young people to contribute the economic, social and political life, extend the useful life of the citizen, graduate students more mature, narrow the gap between the work and the study age, complete the stages of primary education age, as well as reduce the cost of public education. Addition to above goals the

conference (2012) also recommends the following points:

3.3.1 Dividing the general education to two stages: Stage of primary education include eight years joined by starting at the age of six. Secondary stage with multi majors (academy, technical and vocational, Islamic studies), this stage composes of three years.

3.3.2 Sudanese secondary certificate considered as a standard to evaluate the other certificates, and it should be integrated evaluation for the student by the end of general education stage. Regarding stage of Preschool education as below:

3.3.3 Work on expanding in foundations of pre -school education, with establishing new patterns and low cost to distribute in the countryside to be a major tributary of the education system.

3.3.4 The supervision of these schools should be by a coordination council, while the curricula should design by the ministry of education. The children can join these schools by starting at the age of four.

3.4 Curricula

According to the national conference recommendations (2012), the current curricula is not satisfying for Sudanese nation and not matching the country national goals. As a result, it is importance to design the educational curricula to match the educational goals of Sudanese nation. Reconsideration the approach of separate subjects, and design curricula based on the integrated knowledge like activity approach or multi-Axes approach. Establishing a council for curricula development, and employ best educational expert with better job and conditions to cope with higher education, and national research centers. Curricula should be planned based on the national instructions to apply in the countryside, with considering the Arabic as the teaching language. The topic of the courses should address the cultural and religious diversity in a positive way and support the national unity. Using Arabic language programs and develop styles of teaching and increase care it in the overlapping areas of language. Care with teaching other foreigner languages. Curricula content must build on knowledge rooting and integration.

The content of curricula should plan for each educational stage to raise qualify of the graduate students. This step could enable students to cope with life requirements and interact with the community. The curricula should enable the learners to love the work and earn related values. The academic programs and educational activities need to consider the privacy of girl's education and prepare them as wife's, mothers have their effective contribution in the comprehensive development of the country. The academic programs also have to care learner contribution in the class to positively support educational activities. The educational plan supposed to give enough time for educational activities particularly military training, participating in different activities related to the local environment, and consider these activities as a core part of the curricula in the school's evaluation. Addition to above mentioned, the recommendations include formulating the preschool curricula based on the religion values and behaviors with taking advantage of the high abilities of children in learning, simulation, memorizing, and orientation individual and group playing (Sudan, 2012).

3.5 ICT Policies

The policies related ICT in K-12 education in Sudan represented in two plans, the study shows them below:

3.5.1 Five-Years Plan 2007-2011

The main features of this policy plan are represented in increase the number of the student's enrollment at schools, and the number of preschools, enhance the environment of the school, capacity buildings, curricula development., school nourishment, projects for nomads, and other for girls to increase their number at school, program for educational database, and education evaluation program as well as activities for students. This plan expected to supported by the state ministry of general education and NGOs. Notable, the cost of these projects was detected (five-years plan 2007-2011).

3.5.2 Five- Years Plan 2012-2016

This plan includes some policies and priorities to the ministry of education to implement. These priorities include Creating an educational community connected to the sources of technical information with the adoption of e-government concepts. Reduction the technical illiteracy of employees in the educational field. Contribute to the continuous improvement of quality and excellence of education, keep up with the performance and outputs of the educational work and raise educational efficient appliances. The establishment of an integrated information system while providing networking vicinity of public education. Increase distribution of computer to educational institutions. As well as attention curricula, strength technical and research abilities of learners and researchers. Support documentation of educational information in all areas. Application of standards and standards issued by the

competent authorities. About the goal of achieving global connectivity. Addition to these policies, there are twenty priorities based on this plan.

4. Method

The Study has followed a couple of methods. First of all, the study followed the qualitative content analysis method which authors consider as "a flexible method for analyzing text data" (Hsieh & Shannon, 2005). It also described as "[a way] to analysis of documents and texts that seek to quantify content in terms of predetermined categories" (Bryman & Bell, 2015). Authors, in other words, has carefully read the document concerning status of ICT in k-12 education in Sudan before reflecting upon the statements included in the document, the researcher has also carefully reviewed the related literature. The analysis of both the policy. In other meaning, the study uses content analysis and comparative global context of ICT policies.

4.1 Data Analysis and Interpretation

The perspective of the educational philosophy of the country focus on making the characteristic of learners based on religion rules to contribute in the other part of the life, besides strength the behavior of young people to be productive community members and work for country development. Continuously, make the community depend on self-potentials that could help to be more progress and raise bright future with summon historical and cultural role of Sudanese nation. The encouraging sense of environmental care among people with focusing on the youth to consider that in their future message and adapt their life to participate in the country development based on potentials of the environment. Under the goal of generalization of education, which includes all children under school age and those with special needs, this goal was implemented somehow. However, there is a big number of children still out of school and other weren't finish their primary stage and other weren't complete their secondary school.(Stubbé et al., 2016). All these categories will not contribute positively to the country development because they still illiterate and may not be half- skills worker to be provided to the labor market and that is one of the obstacles to country development.

Another important issue, is political status of the country, which also consider as the first obstacle not just for education but also for the community life. This problem faces Sudan for a long time, where the war with southern Side since 1983 as one of the longest war in the world as general and in Africa and the Middle East in particular. The comprehensive peace agreement (CPA) which declared in 2005 gave the right of self-determination in 2011(E. Ahmed, 2009). Though, the result of that self-determination led to the separation of Sudan into two parts, the new part called the country of South Sudan as newest country in the world which has born in 2011 (Young, 2013). According to the separation of Sudan, the mother country (Sudan) faced unsustainable financial status for missing Oil as an important economic resource which the country spent a lot of efforts to achieve it. This status reflected negatively on the whole status of the country economically, socially as well as educationally. Funding resource obstacle, this point is facing not just Sudan but many other countries in developing world, however, many countries over the world reached a high level of educational funding where educational foundations provide free education, and in school services like food, and loan for secondary students(Tilak, 2015).

Connecting with discussed above, the goal of making education free is to achieve this goal, some statistics from ministry of education (2014) shown increased number of schools, students and teachers, there is no studies and official data from the MOE shows the free of education. However, Sudan still needs time to accomplish this goal with working on make schools available in all part of the country particularly western sides which affected by the war more than other parts. As shown in figure 1, the educational system in Sudan divided to two stages primary and secondary, the primary education composes from eight-years. Though, there is a missing year to complete the system to K-12 as an international system. As recommended in the educational conference of 2012 to make the primary education consists of nine years. As responding to these recommendations, in this year 2016 the ministry of education stated that they will apply a system of twelve-years by adding one year to complete the primary stage to nine-years and be K-12 with secondary stages starting from 2017. Regarding pre-education stage, this stage considered as the entrance of education and that make it need attention of the government to enable Child's basic of literacy and educational skills. Ministry of education did considerable work through the statistics to show the status of this stage. Statistics shows that numbers and ratio of children where highest ratio of child's enrolment was 70.3% and less ratio was 42.3% these statistics does not include one state off the country-western Kurdufan- (planning-, 2014)
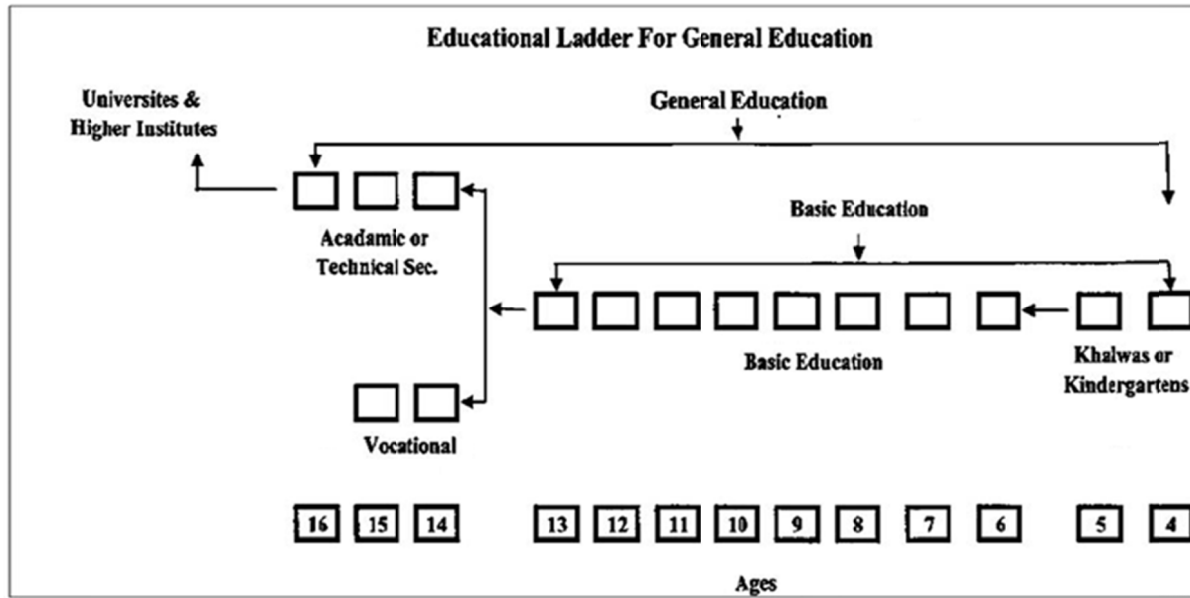
Figure 1. K-12 Education in Sudan

Source: Baseline survey on basic education in the northern states of Sudan(2008)

The first five years' plan of ICT (2007- 2011), as introduced above, encompass a vision for "constructing knowledge society that embodies values of work, scientific research and investment of IT for developing the human capabilities, and quality of works.". To infuse this, the vision the federal ministry of general education (FMGE) has done considerable efforts to enhance the environment of school, increase student enrollment, and educational database (Managers, 2014). These projects somehow achieved where a number of schools have been connected to the internet, provided with computer devices. However, these efforts still not up to the required level where there are a large number of Children out of school, this number is more than two million according to the estimation of UNICEF(Stubbé et al., 2016). Addition the estimations above, some more obstacles still prevent implementation of this plan at schools, as instance the big number of school still not connected to the electricity, computer, as well as internet, addition to digital literacy among majority of students. Moreover, schools need more computing power to increase student digital skills (R. Kozma, 2010; Tairab et al., 2016). Teachers also not yet skilled digitally and still have to professionally develop to cope with the implementation of ICT in teaching and learning process (Elemam, 2016). To do so, FMGE could seek to professional development for teachers by investigate their technical needs and determine which training they should train on, how they can benefit from digital educational resources, how they should use it effectively in the teaching and learning the process, etc. (R. Kozma, 2010). As a result, the author argues that FMGE and schools should work to offer educational resources and enable teachers and students to access. In the same time teachers have to take advantages of digital educational resources to develop their skills.

The second five-years plan (2012-2016), designed after separation of the country in 2011, accordingly, it expects to develop efficient solutions for education. The priorities of represented plan in erase technical illiteracy of workers to contribute to the continuous improvement of quality and excellence, keep up with the performance and outputs of the educational work and raise of educational efficient appliances. The priorities also include applications of computer in educational system, attention curricula, and scientific research. Continuously, the priorities include documentation of educational information, standards to achieve global connectivity, creating knowledge community connected to the sources of technical information with adoption of e-government concepts. Addition to these policies, there are twenty priorities based on this plan. The federal ministry of general education (FMGE) works to link her plan to the e-government initiative. One of the main goals of e-government is to change Sudan to the digital nation and change the lifestyle for people to cope with international communities' progress (S. N. C. f. S. Planning, 2012). To word this goals government work to promote ICT through cooperation with national telecommunication companies (There are four companies competitive to provide telecommunication services in Sudan). Addition to above goal of e-government also maximizing the effectiveness and efficiency, quality and excellence in performance, skills development, national capacities economically, institutionally and administratively.

For the plan of FMGE, there is a progress in term of providing schools with computer and the internet to make a base

for ICT infrastructure. About attention curricula, FMGE worded this goal partially through the designing of the electronic book and uploaded it to the website of FMGE in 2016 (http://www.moe.gov.sd/Curriculum.html). These books could be useful for secondary education in spite of some schools equipped with computer and internet, but also large number of schools still have no desktop computer, database, website. Students also have no computer laptops or tablets, etc., to receive these books, and also majority of the school's face lack of computer and internet to enable student access these books. As a result, this step still needs more work to make infrastructure equity in the schools. However, this goal facing real challenges to implement in primary education, in other meaning there is no clear a way to achieve this goal, the literature review showed that ICT implementation focused on secondary education in isolation of primary education (A. Ahmed, 2015; A. A. Alamin & shaoqing, 2014; Elemam, 2016; Elsunni, 2014; Tairab et al., 2016).

Documentation of educational information in all areas; regarding this goal FMGE could launch some strategic or mechanism for the school in the countryside to make the integrated database. This database may enable either FMGE or school administrator to provide required information toward the school base information. It is necessary for FMGE to identify the information that could be in top priority. This step may assist to enable easy use and application of educational process according to the position, action and time. This behavior might be enable the decision making based on data database as an approach to making more progress in an educational environment (Vlasova, & Kirilova, 2016). This progress may support FMGE to discover beyond and achieve the goals in a few times; in addition to linking and share of knowledge with other educational systems as well as the status of students to gain technological knowledge and develop more skills related ICT (Hubackova & Semradova, 2013). Continuously, for the goal of working to achieve application of standards that issued by the competent authorities, and achieve global connectivity. The national strategic council achieved five years' strategic plan (2007-2011) also supported gain access to the knowledge society through the working manufacture of information between networks and hardware and content. It has been encouraged investment in infrastructures for communication, and facilitate the internet access in all states of the country began the content industry to take shape. However, the above parameters still below the desired level.

The government working to encourage departments, civil society organizations, sectors of students and youth to achieve the electronic publishing, learning content, providing knowledge and business development (ESCWA, 2013). Despite the proliferation of computers and the rapid expansion in the use of internet, does not meet the aspirations of those concerned. The learning content is still weak on the government sites, and engineering procedures continued to be affected in a lot of sites, which requires submission of initiatives with partners to develop new services contribute the benefit of the good infrastructure (ESCWA, 2013). Literature review suggested that it is necessary for FMGE to develop ICT policy, make efficient collaboration with other national authorities, particular the private sector to developed the ICT application in K-12 education and further work to overcome weaknesses in the current plan. FMGE also have to consider standards for related aspects like teacher competencies standards, student competencies, digital learning resources, etc.

5. Findings

The result of this study showed the need for policy emphasis on using technology in education. K-12 education in Sudan requires better technology equipment(A. Ahmed, 2015; A. A. Alamin & shaoqing, 2014; Elemam, 2016; Elsunni, 2014; Tairab et al., 2016).

The analysis of the documents indicates that inclusive ICT policy includes primary and secondary education need to formulate. General policy plans have been made, however, there is no detailed future plans through the data collections and analysis. Data analysis and literature reviewed showed the implementation of ICT exclusively to secondary education than primary, this means the implementation of ICT needs to focus on the primary education. The master plan explains how to infuse the policy goals and assist the schools to effectively implement it is needs.

It is required to support schools to make equity of ICT and raise the level of the policy implementation(Mominó & Carrere, 2016a). Interview with Educational planning manager shows that K-12 education in Sudan still lacks behind many educational systems regionally and globally (Ahmed, 2015). Planning for K-12 education is more required and urgent matter to assist the policy makers make the policy of ICT based on efficient decisions. Implemented ICT and support schools to make effective implantation is a crucial issue for K-12 education in Sudan (Tairab, Huang, Chang, & Zheng, 2016). Providing more applications of technology to schools is required to create an integrated technological environment (Price, 2015). More evaluation and assessment studies required to get more effective solutions and cope with the regional and international educational progress of ICT in K-12 education (A. A. Alamin & shaoqing, 2014; Elemam, 2016).

6. Conclusion

The technology changed and developed rapidly as well as ICT policy demand change to enable implementation process. As a result, status of the ICT policy in Sudan need guidelines to help the federal ministry of general education to improve K-12 education. This study shows the lack of ICT application in K-12 education, where some schools have infrastructure and other have not. Moreover, the number of computers relative to the number of students recommended a lack of equity in the access and the use of computers among the students. ICT policies need to be more deeply evaluated and provide more details in term of implementation. There is a need for ongoing revising for educational policy to keep up with regional and global ICT progress in K-12 education. Still, there is much need to design more effective policy to support school technically, to offer suitable digital learning content, to assess the impact of ICT in education. The factors affect implementation of ICT need more improvement to contribute the comprehensive development of the education first and then shift to social and economic development. Sudan as many developing countries in Sub-Saharan and Middle East need to inclusive reforms of ICT in K-12 education. Advanced evaluation and assessment are required to get more effective solutions and cope with the international educational progress of ICT in education. To raise high quality for Sudanese K-12education, educational system may also need to get an idea of whether these policies failed or not, in other meaning whether these policies were implemented, and this point needs more deep research and more flexibility from official governance to provide information from the ground. The procedure of more effective evaluation with a support of FMGE can preclude the policy to not implement (not fail), because one of the reasons for policy fails is the not implementation according to designing, and the other reason, or the incorrect of underlining theory. This reflects the need to investigate whether the policy was properly implemented at the schools.

References

(ESCWA), United Nations - Economic and Social Commission for Western Asia. (2013). National Profiles of the Information Society in Sudan

(UNESCO), United Nation Education Scientific Organization. (2000). The Dakar Framework for Action- World Education Forum Dakar- Senegal

Ahmed, A. (2015). A preliminary study of ICT's infrastructure and pedagogical practices for technology integration in Sudanese Secondary schools. *International Journal of Instructional Technology and Distance Learning, 12*(7), 37-54.

Ahmed, Einas. (2009). The Comprehensive Peace Agreement and the dynamics of post-conflict political partnership in Sudan. *Africa Spectrum*, 133-147.

Alamin, Alnuaman Ali, & shaoqing, Guo. (2014). Educational Technology in General Education of Sudan – Current Situation and Planning Issues. *International journal of Science Commerce and Humanities, 2*(4).

Alamin, Haysam A Ali, & Elgabar, Eltyeb E Abed. (2016). Success Factors for Adopting E-learning Application in Sudan. *International Journal of Soft Computing and Engineering, 3*(6), 128-131.

Atkinson, Paul. (2014). *For ethnography*: Sage.

Bryman, Alan, & Bell, Emma. (2015). *Business research methods*: Oxford University Press, USA.

Communications, Ministry of, & Egypt, & Information Technology-Arab Republic Of. (2012). National ICT Strategy 2012-2017.

Education, Ministry Of General. (2012). Interim Basic Education Strategy. 1-64.

Elemam, Abdelwahed Elsafi. (2016). Barriers to Implementation of Information and Communication (ICT) in Public Sudanese Secondary Schools: Teacher's Prospective. *Journal of Sociological Research, 7*(1), 33-43. https://doi.org/10.5296/jsr.v7i1.8956

Elmagboul, N., S., I. (2014). The Education Sector in Khartoum State, Project for the Promotion of Civil Society in the Sudan. A Study on framework and actors. *Internationale Zusammenarbeit (GIZ) GmbH*.

Elsunni, Hesham Abdelwahed Yang Xiaohong. (2014). Elsunni, Hesham Abdelwaheda,b Yang Xiaohongb. *International journal of Science Commerce and Humanities, 2*(2), 161-168.

Gorghiu, Gabriel, Gorghiu, Laura Monica, Brezeanu, Iulian, Suduc, Ana-Maria, & Bîzoi, Mihai. (2012). Promoting the effective use of ict in Romanian primary and secondary education-steps made in the frame of edutic project. *Procedia-Social and Behavioral Sciences, 46*, 4136-4140. https://doi.org/10.1016/j.sbspro.2012.06.213

Hamdy, Amr. (2007). ICT in Education in Sudan. *Survey of ICT and Education in Africa: Sudan Country Report*.

Holmes, Brian. (2013). School teachers' continuous professional development in an online learning community: Lessons from a case study of an eTwinning learning event. *European Journal of Education, 48*(1), 97-112. https://doi.org/10.1111/ejed.12015

Hsieh, Hsiu-Fang, & Shannon, Sarah E. (2005). Three approaches to qualitative content analysis. *Qualitative health research, 15*(9), 1277-1288. https://doi.org/10.1177/1049732305276687

Hubackova, Sarka, & Semradova, Ilona. (2013). Comparison of on-line teaching and face-to-face teaching. *Procedia–Social and Behavioral Sciences, 89*, 445-449. https://doi.org/10.1016/j.sbspro.2013.08.875

Ibrahim, Amr. (2008). IT and Educational Policy in North Africa and Middle East Region *International handbook of information technology in primary and secondary education* (pp. 1161-1169): Springer.

Khanna, Neetu, & Goyal, Hina. (2016). Students' Feedback System and Credibility of Teaching Learning Process: Complementary or Contradictory. *Journal of Commerce and Management Thought, 7*(1), 54. https://doi.org/10.5958/0976-478X.2016.00004.5

Kong, Siu Cheung, Chan, Tak-Wai, Huang, Ronghuai, & Cheah, Horn Mun. (2014). A review of e-Learning policy in school education in Singapore, Hong Kong, Taiwan, and Beijing: implications to future policy planning. *Journal of Computers in Education, 1*(2-3), 187-212. https://doi.org/10.1007/s40692-014-0011-0

Kozma, RB. (2010). ICT policies and educational transformation. *Retrieved August, 10*, 2015.

Kozma, Robert B. (2008). Comparative analysis of policies for ICT in education *International handbook of information technology in primary and secondary education* (pp. 1083-1096): Springer.

Lee, Jae Kyu. (2016). Invited Commentary—Reflections on ICT-enabled Bright Society Research. *Information Systems Research, 27*(1), 1-5. https://doi.org/10.1287/isre.2016.0627

Malone, Ruth E. (1999). Policy as product: morality and metaphor in health policy discourse. *Hastings Center Report, 29*(3), 16-22. https://doi.org/10.2307/3528188

Managers, 25th Co-ordination Forum for Ministers of Education and Educational. (2014). The Current Stuation of General Education in Suan from the Statistics View. 1-19.

Miao, F. (2008). ICT-Capacity Standards for Teachers in China. *ICT in Teacher education: Case studies from the Asia-Pacific region*, 53-61.

Mingaine, Laaria. (2013). Skill challenges in adoption and Use of ICT in public Secondary Schools, Kenya. *International Journal of Humanities and Social Science, 3*(13), 61-72.

Mominó, Josep M., & Carrere, and Juli. (2016a). *A Model For Obtaining Ict Indicators In Education*. UNESCO Working Papers on Education Policy N° 3, Josep.

Mominó, Josep M., & Carrere, and Juli. (2016b). *A Model For Obtaining Ict Indicators In Education*. Unesco Working Papers On Education Policy N° 3, 7, place de Fontenoy, 75352 Paris 07 SP, France.

Nour, Samia Mohamed. (2015). Overview of Sudanese Economy and the Status of ICT in Sudan *Information and Communication Technology in Sudan* (pp. 13-40): Springer.

OECD. (2016). Education at a Glance *3*(510).

Osman, & Köhler. (2013). Does community matter? Social and cultural influence on expectance and use of collaborative educational technologies.

Peeraer, Jef, & Van Petegem, Peter. (2015). Integration or transformation? Looking in the future of Information and Communication Technology in education in Vietnam. *Evaluation and program planning, 48*, 47-56. https://doi.org/10.1016/j.evalprogplan.2014.09.005

The Ministry of Education-Educational. (2014). Forum Coordinating Ministry of Education And education managers in the States-Report on the experience of e-learning in the States.

Planning, Educational. (2008). Base Line Survey on Basic Education in the Northern States of Sudan Final Report. *(7)*.

Planning, Sudan National Council for Strategic. (2012). General plan for e-government 1-41.

Pouezevara, Sarah, Mekhael, Sabry William, & Darcy, Niamh. (2014). Planning and Evaluating ICT in Education Programs Using the Four Dimensions of Sustainability: A Program Evaluation from Egypt. *International*

Journal of Education and Development using Information and Communication Technology, 10(2), 120.

Powell, Allison. (2016). An Overview of K-12 Digital Content in North America *ICT in Education in Global Context* (pp. 123-141): Springer. https://doi.org/10.1007/978-3-662-47956-8_7

Price, Jon K. (2015). Transforming learning for the smart learning environment: lessons learned from the Intel education initiatives. *Smart Learning Environments, 2*(1), 1-16. https://doi.org/10.1186/s40561-015-0022-y

Punie, Y., Law, NWY., & Kampylis, P. (2013). ICT-enabled Innovation for Learning in Europe and Asia: Exploring Conditions for Sustainability, Scalability and Impact at System Level. *Luxembourg: Publications Office of the European Union*.

Rhoads, Robert A., Torres, Carlos A., & Brewster, Andrea. (2005). Neoliberalism, globalisation, and Latin American higher education: The challenge to National Universities *International handbook on globalisation, education and policy research* (pp. 131-145): Springer.

Saeed, Mozamel M., & Fadlallah, Abdulwahid A. (2015). Challenges Facing Quality Application in Higher Education Institutions in Sudan. *IJITR, 3*(6), 2488-2492.

Steve, E., & Adam, L. (2012). What is happening in ICT in Tanzania A supply- and demand side analysis of the ICT sector. *Research ICT Africa.net. Evidence for ICT Policy Action Policy Paper, 11*(11).

Stubbé, HE, van der Klauw, M, Langefeld, JJ, Theunissen, NCM, van der Hulst, AH, & Holland, Sponsor War Child. (2016). E-learning Sudan Final report Phase II.

Sudan, Federal Ministry of General Education. (2012). Seventh National Education Conference Recommendations-Khartoum.

Suliman, AAM, Raman, M, & Hamid, RA. (2007). ICT for higher education in Sudan: issues and perspectives: Managing Worldwide Operations &Communications with Information Technology. *Multimedia University, Malaysia*.

Tairab, Adam, Huang, Ronghuai, Chang, Ting-Wen, & Zheng, Lanqin. (2016). *A Framework to Promote ICT in K-12 Education in Developing Countries: A Case Study in Sudan.* Paper presented at the International Conference on Blending Learning. https://doi.org/10.1007/978-3-319-41165-1_28

Tay, Lee Yong, Lim, Cher Ping, & Lim, Siew Khiaw. (2015). Differences in ICT usage across subject areas a case of an elementary school in Singapore. *Journal of Educational Computing Research*, *53*(1), 75–94. https://doi.org/10.1177/0735633115585930

Technology, Office Of Education. (2015). National Technology Plan-Learning Powered By Technology.

Technology, Office of Educational. (2016). National Education Technology plan -Future Ready Learning.

Tilak, Jandhyala. (2015). Global trends in funding higher education. *International Higher Education, 42*.

Tilya, Frank. (2008). IT and educational policy in the sub-Saharan African region *International handbook of information technology in primary and secondary education* (pp. 1145-1159): Springer.

Twining, Peter, Davis, Niki, Charania, Amina, Chowfin, Aleta, Henry, Fiona, Nordin, Hasniza, & Woodward, Clare. (2015). Developing new indicators to describe digital technology infrastructure in primary and secondary education.

UNESCO. (2010). World Data On Education. *7*, 1-20.

Wastiau, Patricia, Blamire, Roger, Kearney, Caroline, Quittre, Valerie, Van de Gaer, Eva, & Monseur, Christian. (2013). The use of ICT in education: a survey of schools in Europe. *European Journal of Education, 48*(1), 11-27. https://doi.org/10.1111/ejed.12020

Wilson, Mark, Scalise, Kathleen, & Gochyyev, Perman. (2015). Rethinking ICT literacy: From computer skills to social network settings. *Thinking Skills and Creativity, 18*, 65-80. https://doi.org/10.1016/j.tsc.2015.05.001

Young. (2013). The Fate of Sudan: The Origins and Consequences of a Flawed Peace Process. *Journal of Modern African Studies, 51*(4), 718-719.

Zhang, Jinbao, Meng, Linglin, & Jing, Qianxia. (2016). ICT Supported Instructional Innovative Practice and Diffusion Mechanism of K-12 in China *ICT in Education in Global Context* (pp. 17-56): Springer.

Zhao, J., & Xu, F. (2010). The State of ICT Education in China: A Literature Review. *Frontier Education China, 5*(1), 50-73. https://doi.org/10.1007/s11516-010-0006-1