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Managing Information and Communication Technology in Sudanese Secondary School

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Abstract
This research article is based on a larger study whose purpose was to investigate the current status and implementation of ICT in Khartoum State secondary schools. The study, adopted a descriptive survey design. Two instruments questionnaires' and a structured interview schedule were used to collect data. The target population comprised of 320 secondary schools in Khartoum State at the time of data collection. Stratified sampling was used to select 48 secondary schools for the study. Data collected by questionnaires from 48 principals and 5 administrators were analyzed using descriptive statistic and chi square with the help of Statistical Package for Social Sciences (SPSS). The findings of the analysis of data revealed that the school principals have positive attitudes regarding the use of ICT in their schools. The results also indicated that, although a significant number of schools have a policy goal to use ICT for administration and for keeping track of student data, very few schools realized these goals. Out of this study recommendations were made to the secondary schools in Khartoum State and the Sudanese Ministry of Education in general.
Keywords: Computer coordinator, Khartoum State, ICT implementation, ICT management, School Principals

1. Introduction

More than ever, the advent of the knowledge economy and global economic competition compel governments to prioritise educational quality, lifelong learning and the provision of educational opportunities for all (UNESCO, 2014). Computers, either alone or in combination with other technologies, enable us to record, process, store or share information with other often at great distances from us (Bialobrzeska & Cohen, 2005). The term Information and Communication Technology (ICT) includes the technologies which together support people's ability to manage and communicate information electronically. ICT includes not only computers, but also equipment such as printers and scanners as well as the software needed for communication, such as the Internet (Bialobrzeska & Cohen, 2005). Shariati and Gholami (2013) state that, policymakers widely agree that access to Information and Communication Technology (ICT) in education can help individuals to compete in a global economy by creating a skilled work force and facilitating social mobility. They emphasise that ICT in education has a multiplier effect throughout the education system, by enhancing learning and providing students with new sets of skills; by reaching students with poor or no access; by facilitating and improving the training of teachers; and by minimising costs associated with the delivery of traditional instruction (UNESCO, 2014).

2. Literature Review

2.1 ICT in Education in Sudan

According to Sudan Country report of ICT in education by Hamdy (2007), the use for ICT in Education has been launched in 2002. As a result, some initiatives have been identified and some activities related to ICT have been carried out. ICT equipment has been offered in most schools, computer science has been taught and teacher training for using computers has provided (Ahmed, 2015). For example, the Ministry of Education has been providing training to the teacher; educational technology in Master's Levels are run by different colleges under various universities (e.g., Sudan University of Science and Technology, Khartoum University and Alzaiem Alazhri University); and various Training Institutes conduct technical education and pedagogical training courses in computer and ICT. The Ministry of Education and the Ministry of Communication have implemented various programs related to ICT in Education. They decided to develop capacity in the region by offering bursaries to promising Bachelor of Education graduates for a Master's programme in Computer-Integrated Education. After completing the programme they would train teachers to use ICT in schools in Sudan" (Cronje, 2006). The project is a collaborative initiative between Sudan University of Science Technology and the University of Pretoria. The programme was sponsored by UNESCO Institute for International Capacity Building in Africa (IICBA). As agreed in the IT summit in Geneva (Ahmed, 2010), the Ministry of Education was planning to have computers available at all education levels by the year 2015. Both the government and the private sector provide access to the Internet as a learning resource (Ahmed, 2010). The Ministry of Education in Sudan provided 10 computers and other accessories to the majority of Khartoum secondary schools (Ahmed, Howie, & Osman, 2013). In addition, the Ministry of Education in Sudan provided some schools with internet

connectivity provided the teachers with basic computers training to teachers (Ahmed, 2015). The vision of the DOE is to use the ICT tools in teaching and learning process and in administrative side. The importance of using ICT tools is to improve the quality of education and to prepare students for future life. However, such ICT equipments were mostly used for administrative purposes. This is due to the lack of contents as well as lack of proper skill and awareness to the teachers and education managers. For this a comprehensive policy and programme yet to be developed in order to provide relevant ICT education to the students and to use ICT for improving teaching learning activities. Like other counties (Slovenia and South Africa), Sudan has experienced major adversity from the civil war between the North and the South, and recently in Darfur. This means that much of the county's little financial resources, are spent on the military. Even though Sudan has had to lives though such circumstances, the government has continued to incorporate ICT in learning and teaching in Sudanese Education (Ahmed, 2015). Since the legislation education framework in Sudan was presented in the report to the International Conference on Education at Geneva in August 2001 (Hamdy, 2007), a number of studies report on the use of ICT in educational system and show that progress has been made on two fronts in particular. Firstly, teachers have demonstrated their enthusiasm and willingness to incorporate ICT in their teaching by their high participation rates in ICT professional development programmes (Izzeldin, 2010) and, secondly, integration of ICT in learning and teaching has taken place in secondary schools (Ahmed, Howie & Izzeldin, 2013; Ahmed, 2015). However, the general conclusion of these studies is that, while the majority of Sudanese secondary schools is equipped with some computers and has internet access, no provision for technical support and the majority of the schools strive to manage appropriate ICT equipment into their classrooms.

IEA (International Association for the Evaluation of Educational Achievement) in the year 1990s decided that they would conduct the Second Information Technology in Education Study (SITES). This program is an international comparative research program, which explores the importance and use of ICT in the field of education (Law, Pelgrum & Plomp, 2006). The program (SITES) contains numerous modules and projects (Law 2002, Kozma & Anderson, 2002). In the module one of the program, the survey conducted by technology coordinators and principals of 26 schools situated in different countries (Pelgrum & Anderson, 2001). Module 1 focuses on the extent to which schools have implemented and adopted pedagogical practices, which are known as imperative tool in the field of education and information society (Kozma & Anderson, 2002). The results of ICT implementation in schools around the world can vary considerably depending on the vision and understanding brought to bear on the matter by the school management (Pelgrum & Law 2003). SITES-M1 (Law ,Pelgrum & Plomp, 2006) contains an observation that school managers can play an important role in facilitating and encouraging the implementation and use of ICT for administrative and managerial work, as well as instructional activities. Support from different levels of the school organization is one of the key aspects needed for successful implementation of technology in education. Administrators can provide the conditions that are needed, such as a school-wide policy, incentives and resources.

2.2School principals and ICT strategy at school level

The key to successful use of ICT to improve education for people is to have an ICT strategic document which has been developed within the school. This will probably require the involvement of all of the schools key stakeholders e.g. school principals, business manager, ICT coordinator, staff representatives, etc. and it should outline the vision that the school has for ICT and its use in teaching and learning (Crown, 2014). Therefore, such a significant drive for ICT use in schools, which would inevitably reform the way that schools work, could never be achieved without the contribution of the school leader who must lead the school's efforts and act as a change agent (Murphy & Shipman, 1999). Of course, this can only be done if the principal believes in the ICT and has a positive attitude towards it. Actually, the attitude of the principal will determine if this ICT is going to succeed or fail (Pelgrum, 1993). Howie, Muller and Paterson (2005) conducted study regarding the use of ICT in South African schools, that school principals should have a policy in place regarding the use of ICT to support the execution of their administrative and managerial tasks, as this may also encourage and facilitate the use of ICT for administrative and managerial work. The extent to which school principals encourage the use of ICT in their schools depends largely on how useful they consider these technologies to be.

3. Research Questions

The primary research question is as follows: How do the school principals manage the use of ICT in Sudanese secondary school?

The sub-research questions are:

3.1 What are the attitudes and beliefs of secondary school principals towards ICT?

3.2 How can a school build a shared vision for ICT use?

3.3 To what extend Sudanese secondary schools have developed and realized an ICT-related vision and policy?

4. Terminologies of the Study

ICT:

ICT resources: refers to the hardware, software, services and content and services provided by, or facilitated through the Directorate.

Computer Coordinator: refers to a member of the teaching staff (delegated by the principal) that is responsible for the technical and pedagogical leadership and strategic management of ICT in the school.

5. Importance of the study

The findings of this research may provide valuable data, which could help Sudanese national policy-makers to judge the status of managing ICT in education and it can provide a baseline for future assessments. The study also can offer a foundation and encouragement for further research into implementing ICT in the field of education in developing countries, specifically Sudan. In addition, through this study, the problems and difficulties faced by the policymakers regarding ICT in learning and teaching will be identified, and best possible solutions will be highlighted.

6. Research Design and Methods

The study was conducted using descriptive survey approach to examining the status of managing ICT's in Sudanese Secondary Schools. The investigation consisted of three instruments. Two instruments are questionnaire surveys which were used to obtain results from schools' principals regarding their attitudes towards ICT, school shared vision for ICT use and their development of an ICT-related vision. Most of the questionnaire items were taken from the instruments of SITES-M1 (survey questionnaires) and were used to compile new questionnaires for principals. The items of the M1 questionnaires are important for this study because they are focused on the ICT implementation aspects and particularly on the first phase or process of introducing ICT in education. The second instrument was an A semi-structured interview. The interviews were conducted to collect further data from the administrators in the Ministry of Education regarding the policy of managing ICT in schools.

6.1 Population and Sample

The population featuring in this study was drawn from secondary schools in Khartoum State in Sudan where there is a policy aimed at pedagogical practice. The population was divided into subgroups of schools according to the regions of Khartoum (163), Bahri (50), and Omdurman (107). The total number of the school population was 320 schools. A stratified sample of 48 schools was drawn from secondary schools in Khartoum State, Khartoum (35.4%), Bahri (29.2%), and Omdurman (35.4%). The schools were not mixed gender, and the size is ranged between 200 to 600 students. Table1 shows the total number of schools according to the gender.

Table 1. The of number of schools sample- gender

Region	No. of schools for boys		No. of schools for girls		Total	
	N	%	N	%	N	%
Khartoum	9	18.7	8	16.7	17	35.4
Omdurman	9	18.7	8	16.6	17	35.4
Bahri	8	16.7	6	12.5	14	29.2
Total	26	54.1	22	45.8	48	100

Regarding the sample respondents, 48 principals participated in the study as respondents to the principal questionnaire and only five administrators from the Ministry of Education were interviewed.

6.2 Data Collection and Analysis

The questionnaires were administered by personal administration approach by the researcher to all schools sample. The administration of the questionnaires took place during February and March 2014 in all schools sample in Khartoum state. In addition, the researcher used a semi-structured interview. The data analysis was done by using descriptive analysis with the aid of the Statistical Package for Social Science (SPSS).

7. Findings and Discussion

7.1 Profiles of the principals

The majority of the principals have experience as school principals. Their experience ranged between (1- 23 years) for the entire sample. This means that the Sudanese educational system depends on the years of the experience and to some extent on the qualifications for the school management. More than half of the principals (n= 28) have Bachelor or honors' degrees and a number of principals (n= 12) have postgraduate degrees in education. The principals were asked about their use of computer. The results show that a significant number of principals never use a computer with only a quarter (N= 12) of principals use computers. The principals also were asked to indicate their computer use. Table 2 shows their responses.

Table 2. The purpose of using computer by the principals

The use of computer	N	Yes Responses (n)	%
Writing documents and letters	48	40	83.3
Using spreadsheets	48	26	54.1
For planning purposes	48	13	27
For communication the Internet, email	48	11	23
For searching and using information on WWW	48	13	27
For teaching/instruction	48	6	12

Table 2 shows that the largest proportion of principals (83.3%) used the computers for writing documents and letters. Secondary school principals also indicated that they used spreadsheets (54.1%). Using computer for planning purposes, for searching and using information on WWW, for communication the Internet, email, and for teaching/instruction are the purposes which principals don't gave attention in their schools. This can be attributed to the insufficient ICT tools in the schools; the low access to computer tools for administrative purposes; and the lack of the skills and low competences for using computer applications and Internet by most school principals and teachers. Similar results were found in many researches in other countries (Felton, 2006; Bishop, 2002). The lack of skills and low competence of teachers and principals in using ICT tools in their schools is a matter that should make policymakers aware, because these are purposes that could guide and manage the use of ICT and facilitate schools' administrative workload.

Very few (12%) used them for teaching and learning. About a quarter of the principals, use the computers for communications and searches on the Internet.

7.2 Attitudes and beliefs of school principals towards ICT

The researcher considered the importance of school principals as important agents of change. Tables 3 and 4 present the outcomes for the scales used to measure the principals' attitudes and beliefs towards ICT.

Table3. Principals' attitudes to the role of ICT (Computer)

Statement	N	Strongly disagree		Slightly disagree		uncertain		Slightly agree		Strongly agree	
		n	%	n	%	n	%	n	%	n	%
Students are more attentive when computers are used in class.	48	1	2.1	0	0.0	2	4.2	17	35.4	28	58.4
Computer improves the efficiency of the school administration.	48	1	2.1	0	0.0	0	0.0	13	27.1	34	70.8
Computer improves the effectiveness of school management.	48	0	0.0	0	0.0	0	0.0	0	0.0	48	100
Using computer in class lead to more productivity of students	48	0	0.0	0	0.0	0	0.0	18	37.5	30	62.5
Computer are valuable tools to improve the quality of education	48	0	0.0	0	0.0	0	0.0	25	52.1	23	47.9
Computers help to teach more effectively	48	0	0.0	2	4.1	1	2.1	17	35.4	28	58.4
The achievement of students can be increased when using ICT for teaching	48	0	0.0	1	2.1	0	0.0	20	41.7	27	56.2
ICT can accommodate students' varied needs, preferences by providing new tools	48	0	0.0	0	0.0	1	2.1	25	52.1	22	45.8
ICT can help teachers to attune to the learning level and pace of the individual student	48	0	0.0	0	0.0	0	0.0	24	50	24	50
ICT should be used more by teachers to create environments for students' independent learning	48	0	0.0	1	2.1	1	2.1	24	50	22	45.8
ICT is a valuable support in solving problems that our school is confronted with	48	0	0.0	0	0.0	3	6.2	26	54.2	19	39.6

Table 3 reveals that all school principals (100%) strongly agree that the ICTs improve the effectiveness of school management. The table also showed that a significant number of principals (100%) *strongly* or *slightly agreed* that ICTs are valuable tools to improve the quality of education and that their use in class leads to more

productivity of students. In addition, a large number of school principals (97.9%) have a positive attitude towards the use of ICT for teaching realizing that it can increase the achievement of students. These results indicate that the school principals have positive attitudes regarding the use of ICT in school management.

Table 4. Principals' attitudes to the role of ICTs (Internet/WWW, e-mail)

Statement	N	Strongly disagree		Slightly disagree		uncertain		Slightly agree		Strongly agree	
		n	%	n	%	n	%	n	%	n	%
Every school should have access to the Internet/World Wide Web	48	1	2.1	2	4.2	2	4.2	16	33.3	27	56.2
Every student should learn about e-mail	48	1	2.1	2	4.2	2	4.2	20	41.6	23	47.9
Internet/WWW offers excellent opportunities for educational applications	48	0	0.0	0	0.0	3	6.2	21	43.8	24	50
All teachers should have their own e-mail address	48	0	0.0	4	8.3	4	8.3	19	39.6	21	43.8
The use of e-mail increases the motivation of students	48	0	0.0	1	2.1	7	14.5	19	39.6	21	43.8

Table 4 shows that the majority of the principals (93.8%) strongly or slightly agreed that the Internet/WWW offers excellent opportunities for educational applications. Therefore, a large number of the principals (89.5%) agreed that every school should have access to the Internet/WWW. The table also showed that a significant number of principals (89.5%) have positive attitudes regarding the use of e-mail by students that could help them o communicate with their teachers. Charalambous & Papainannou (2012) indicated that teachers and students who have greater computer and Internet experience were more likely to have higher self-perceived competence to undertake several computer tasks for administrative purpose, classroom practice and lesson planning and preparation. Accordingly the result showed the relationship carried out between skills of using ICT and attitude. This result is similar to Jegege, Dibu-Ojerinde and Ilori (2007) who found a significant link between the changes related to ICT in attitude and practices and the ICT integration. Their findings revealed that, as self-skills improve and personal ICT competencies reach a high level, interest in ICT is increased.

Chi-Square test for the attitudes and beliefs of school principals towards ICT

Scale reliability and Chi-Square test of the principals' attitudes and beliefs towards ICT use in schools are presented in table 5 and 6.

Table 5. Reliability test to the principals' attitudes to the role of ICTs in school management

Scale Statistics				
Reliability Statistics	N	Mean	Std. Deviation	Variance
0.92	48	22	3	10.87

Table 6. Chi-Square test for the principals' attitudes and beliefs to the role of ICTs in school management and administration

Test Statistics		Descriptive Statistics				
Chi-Square	Asymp. Sig.	df	St.	N	Mean	Std. Deviation
195.3	0	3	5	48	4.5	0.77

Tables 5 and 6 provide data on the reliability statistics and the Chi-Square's values for differences of the principals' attitudes to and opinions of the role of ICT in school management and administration. Table 5 shows that the reliability of the test is high = 0.92. In addition, from the test statistics illustrated in Table 6, it is clear that the Chi-Square for the principals' attitudes and beliefs to the role of ICTs in school management and administration has great value (Chi-Square= 195.3). This shows that the aspect was significant which means that there were differences in all principals' opinions about the use of ICT in schools management and administration. The value of Sig. = zero, df= 3, mean= 4.5. Although the use of ICT resources was very limited in many schools in the study sample, many school principals had a positive attitude toward ICT use in their schools. This result is similar to South Africa and Chile, where principals tended to have a positive attitude towards using ICT in their schools (Muller, 2003; Andrea et al., 2003). Across the three localities (Khartoum, Omdurman, and Bahri) generally, many schools appeared to be using computers for school administration, which may mean that computers are already providing much support for routine school administrative work. Teachers benefit considerable from monitoring student progress using computers. However, the study shows that while some schools do use computers for monitoring, many do not. The interview supported this result and showed that about half of the schools in the sample did not use computers for this purpose.

7.3 How can a school build a shared vision for ICT use?

In order to answer this question the researcher collected data regarding the availability of written policies in the schools, the development of the ICT-related vision, the regulation of computer-related activities, and the priority given to resource allocation and further external support in schools.

Availability of a written policy for secondary schools

School principals were asked to indicate whether their school had a written policy regarding the use of ICTs for educational use by students in schools. The results revealed that, few number of schools (10%) in the sample have a written policy on the use of ICT for educational purposes by students. The interview with administrators from the ministry of education also yielded the fact that the majority of the schools in the Khartoum have no written ICT policies. However, in many countries (e.g. Slovenia, and South Africa) a half of their schools or more had written ICT policies on the use of computers for educational purposes by students (Howie et al., 2005). This could be explained by the fact of the poor management on the parts of school administrators and government as well as the lack of inadequate ICT facilities in Sudanese secondary schools.

7.4 Development of an ICT-related vision

School principals were asked whether they had developed a common vision regarding the use of ICTs, as well as whether norms and values associated with the use of the Internet had been identified and then realized. The findings concerning these issues are presented in Tables 7 and 8.

Table 7. Existence and realization of common vision on the use of ICT for administration

	Policy goal			Realized			
Statement	N	No	Yes	N	Not or hardly	Partially	Almost or fully
Using ICT to keep track of student data	48	19 39.5%	29 60.5	48	19 39.5%	23 48%	6 12.5%
Using ICT for other school administrative matters	48	16 33.3%	32 66.7%	48	16 33.3%	23 48%	9 18.7%

Table 7 shows that a significant number of schools (66.7%) have a policy goal to use ICT for administration. However, the realization of this goal is very weak. The table also, shows that more than half of schools have a policy goal to use computers for keeping track of student data. Nevertheless, very few schools realized this goal. Schools can express their interest in ICT through their school policies and, as such, develop a framework for action concerning the use of computers in their institutions. The findings of this study show that none of the schools in the sample has a written ICT policy on the use of ICT for educational purposes by students. However, in many countries (e.g. Chile, Slovenia, and South Africa) a half of their schools or more had written ICT policies on the use of ICT for educational purposes by students (Howie et al., 2005). Slovenia has a long history with incorporation of ICT policy in its educational system. In 1994, the Slovenian Parliament approved the establishment of a six-year project called the Computer Literacy Programme (RO) (Pelgrum & Anderson, 2001; Brecko, 2003). One of its goals was unifying computer software used in schools for teaching, administration, and management. Pay attention to norms and values when using the Internet was a policy goal in more than a half of the schools in these countries (Howie et al., 2005).

7.5 Regulation of computer-related activities

The researcher also collected data regarding the steps that schools took to regulate ICT-related activities. The findings are shown in Table 8.

Table 8. Existence of measures to regulate computer-related activities

		Mean	
Statement	N	Statistic	Std. Error
Rewards (salary or other bonus) given to teachers who use ICT	48	0.40	0.114
Incentives for teachers to take ICT courses or training	48	0.35	0.105
Security measures to prevent unauthorized system access or entry	48	0.25	0.076
The honoring of intellectual property rights, e.g. software copyrights	48	0.23	0.068
Restricted game playing on school computers	48	0.31	0.095
Specifications of compulsory students computer-related knowledge	48	0.35	0.105
Local community access to school computers or the Internet	48	0.29	0.089

Table 8 showed that the most common measures taken by the school principals' are related to rewards given to teachers who use ICT (mean= 0.40(0.114)). A much lower number of schools specified the honoring of intellectual property rights, e.g. software copyrights (mean= 0.23(0.068)).

8. Conclusion

The successful implementation of ICT is important for schools. One of the keys to successful ICT implementation is the development, and implementation, of a thoughtful ICT policy (Bialobrzeska & Cohen, 2005). This is often dependent on effective technology leadership who actively and enthusiastically promotes the new technologies. The findings of this study therefore examined the aspect of managing ICT in secondary schools by the leaders. Attempts to introduce new ICTs and the necessary training and technical support can easily be frustrated if the necessary resources are not available. It is therefore the ministry of education should provide schools with adequate infrastructure and school principals need to be more practically involved in the ICT projects in their school and in ICT management. Moreover, it is important that the principal and/or management team give careful thought to the implementation process and to creating the necessary climate at the school for supporting it. This will provide opportunities to be role models to others in the use of ICT.

8.1 Limitation of the research

Two main limitations with research were encountered. These are sampling and research in developing countries. First, the 50 schools were not intended to be a representative sample of schools in Sudan, because of the lack of financial support and the political instability in Sudan. Rather, they were chosen as remarkable examples of using ICT in teaching and learning. This sample is obviously insufficient if the objective is to yield significant statistical conclusions. However, as the selected schools are similar in nature to most secondary schools in Sudan, the results can shed light on similar patterns and processes in the other schools by way of "naturalistic generalizations". Secondly, there was a deficit of previous studies conducted in developing countries for managing of using ICT in teaching and learning. Future studies should also be carried out with schools from different Arab states in order to understand better whether different socio-cultural contexts may influence managing ICT in education.

9. Recommendations and considerations for principals and policymakers

1. The implementing of ICT policy in education should be followed with a long-term commitment from various levels of the government and charitable institutions.
2. Government policy has to be filtered through macro, meso and micro levels, as policy is mediated through national agencies (macro), regional agencies (meso) down to individual schools and teachers at the micro level.
3. Government policy should address the need for all principals to be ICT literate. Principals have a particular role to play in encouraging the use of ICT – they in turn need to be aware of the benefits of ICT across the school, in all contexts, and can set examples by being seen to be using ICT themselves where appropriate.
4. Government policy should encourage the production of instructional materials by Arabic language on the CD devices and the Web which could be consider as one of the business sectors as part of its economic development program.
5. Government policy should provide more support for schools in their ICT development planning; increase support for ICT leaders in schools in co-coordinating staff and curriculum developments.
6. Government policy should formulate long-term resource and professional development plans, and build on existing training programmes, by targeting continued support for those who need it most, so that their confidence in using ICT in the classroom continues to grow.

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