

Setback of Implementation of Smart Education in Schools (A Research Review)

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ABSTRACT

This paper aims to identify the conditions that hinder achieving the objective of integrating ICT in education or hinder the' adoption of ICT-based education. This paper is to present a comprehensive review of search relating to barriers encountered when introducing ICT into school education. It is based on an extensive review of the literature associated with barriers for smart education, i.e. Teacher-level barriers, School-level barriers, System level barriers. It is divided into different sections which examine the Lack of ICT Skills and training, Lack of motivation and confidence in using ICT, The absence and poor quality of ICT infrastructure and resources, the lack of high quality hardware and suitable educational software, Inappropriate organization and limited access to ICT equipment, Absence of ICT into schools' strategies. The review suggested that successful implementation of ICT needs to address three interconnected frameworks for change the teachers, the schools and policy makers.

Keywords: Setback, Implementation, Smart education, Schools.

INTRODUCTION

Implementing ICTs is becoming a mainstream in education and is believed to empower both teachers and students by making the educational process more interactive. According to Pelgrum (2001) "It seems that the current belief is that ICT is not only the backbone of the Information Society, but also an important catalyst and tool for inducing educational reforms that change our students into productive knowledge workers". Despite this belief, there have been notable complaints that the growth of ICTs has not been accompanied by an equal growth in technology integration in classrooms (Belland, 2009).

Earle (2003) stated, integration of ICT is not a product but a process. Integration of ICT into schools means using ICT effectively and efficiently in all dimensions of the processes including the necessary infrastructure, teaching program and teaching-learning environments. ICT for education is more critical today than ever before since its growing power and capabilities are triggering a change in the learning environments available for education (Pajo & Wallace, 2001). The use of ICT offers powerful learning environments and can transform the learning and teaching process so that students can deal with knowledge in an

active, self-directed and constructive way (Volman & Van Eck, 2001; de Corte et al., 2003). At present ICT is considered as an important means to promote new methods of instruction (teaching and learning). It should be used to develop students' skills for cooperation, communication, problem solving and lifelong learning (Plomp et al., 1996; Voogt, 2003). ICT improves the students' cognitive development (Nir-Gal & Klein, 2004), increase creativity (O'Hara, 2008), and improve their problem solving skills (Sarama & Clements, 2001). During the last two decades, the implementation of ICT in education has become an important topic in research on educational reform (Drent and Meelissen 2008). Research findings over the past two decades provide some evidence as to the positive effects of the use of information and communications technology (ICT) on pupils' learning (Mumtaz, 2000; Hattie, 2009). Sanyal (2001) states that there are four ways ICT can support basic education: (i) supporting education in schools, (ii) providing non-formal education for out-of-school children and adults, (iii) supporting pre-service distance education of teachers and their in-service professional development, and (iv) enhancing the management of schools by adopting ICT, we can offer high quality education. Ehrmann (1994) identified four distinct faces of quality education, which can be supported by ICT: learning by doing, real time conversation, delayed time conversation and directed instruction. Hawkrigge et al (1990) suggested that the use of ICT could improve performance, teaching, and administration, have a positive impact on education as a whole.

Studies identified important relationships that could maximise impact

either in the area of learning outcomes or teaching. The necessary conditions for transforming the potential of ICT into concrete outcomes for both areas. Schools with higher levels of e-maturity demonstrate a more rapid increase in performance scores than those with lower levels (Becta, 2006). ICT investment impacts on educational standards only when there is fertile background for making efficient use of it (Machin, 2006). The greatest impact is found in relation to teachers who are experienced users and who from the start had already come far with the integration of ICT in their teaching (Ramboll, 2006). Schools with good ICT resources also achieve better results. Embedded ICT over a longer period of time has led to more use of ICT by teachers and considerably increased their confidence in using ICT (Ramboll 2006). Teachers that assess to experience a more positive impact of ICT are most likely to be found in schools where principals have used ICT to support the development of the school's values and goals (Ramboll, 2006). Some of the best examples of the use of ICT were where lessons moved through different modes of teacher-pupil interaction which involved both in a variety of roles and where intended and actual use coincided (Comber, 2002). Teachers, who report a great positive impact of ICT, think that ICT improves pupil performance, consider ICT as a tool to support both subject content and pedagogy and think ICT has an impact on teaching. They use ICT in the most project-oriented, collaborative and most experimental way (Ramboll 2006). ICT will be able to provide more flexible and effective ways for present school education. As a result, both teachers and students will get enormous benefits for their

empowerment and development. Research findings over the past 20 years provide some evidence as to the positive effects of the use of information and communications technology (ICT) on education. Integration of ICT influences the entire school systemic can offer the excellent opportunities in everyday school practice; ICT is also seen as a major driver for change. 'ICT has the potential to act as a force for change in education' that is, to bring about changes that will affect learners, practitioners as well as the whole institution. In spite of such impact, there has been a disappointingly slow uptake in schools (Cox et al, 1999; Passey & Samways, 1997). The question to be addressed is whether, and most of all, how and by whom the potential of ICT in education is fully exploited in teaching and learning in schools and what barriers remain to the effective deployment of ICT.

PURPOSE OF THE STUDY

This review aims to bring together the findings and key points of the evidence from a literature review to include the more recent research that has been carried out in this area. Each identified barrier will be dealt with in turn, and research and survey evidence specific to each barrier will be considered. The following analysis aims to present the perceived barriers to the use of ICT which were highlighted in the reviewed studies and examine their causes and effects.

BARRIERS FOR SMART EDUCATION

The barriers to the integration of ICT into teaching and learning environments have been discussed in many studies. Researchers identified many barriers

affecting ICT integration process (Pelgrum, 2001; Ertmer, 2001; Pelgrum and Law, 2003; Hew and Brush, 2007). Lawson and Comber (1999) determined 4 factors, which affect integrating ICT successfully into schools: attitudes of teachers towards innovation, the role of ICT coordinator, attitude of senior administrators and lack of appropriate support and training. Moreover, Williams et al. (2000) state that the basic factors, which prevent using ICT in teaching-learning process are lack of knowledge, skill and support, lack of ICT, access to technology. As a result of a study held in 26 countries, it has been found that the basic barriers faced during integration of ICT are lack of computer and teachers' lacking of knowledge (Pelgrum, 2001). According to Snoeyink and Ertmer (2001), divides the barriers into two main categories: first-order and second-order barriers. First-order barriers refer to those obstacles concerning essentially different types of resources (e.g., lack of equipment, unreliability of equipment, lack of technical support and other resource-related issues), which are extrinsic to teachers. Lack of adequate resources is a constraining barrier to any integration effort. If teachers do not have sufficient equipment, time, training, or support, it will be very difficult to achieve a meaningful integration. Second-order barriers include both school level factors, such as organizational culture and teacher level factors, underlying beliefs about teaching and learning, teacher-student roles, curricular emphases, assessment practices, and openness to change etc. The second-order barriers relate to teachers'. "Learning to use new technology tools and taking major steps to change one's classroom practices will be a challenge for most teachers. Yet if teachers are prepared

to confront both first- and second-order barriers, success will be more likely". (Keengwe, Onchwari et al. 2008) also categorized barriers as external (first-order) or internal (second order). Bingimlas (2009) comments on two different types of barriers that are stopping us from using ICT in the classrooms daily, they are Extrinsic and Intrinsic barriers. Extrinsic barriers being issues such as time, support and resources. The other, intrinsic barriers being the influences that teachers, administrators and individuals may have on the integration. Bingimlas (2009) also identifies two main categories of barriers: teacher-level barriers and school-level barriers. The major teacher-level barriers are lack of teacher confidence, lack of teacher competence, resistance to change and negative attitudes. The basic school-level barriers are lack of time, lack of effective training, lack of accessibility to ICT-based resources and lack of technical support in classroom.

BECTA (2003) report further classifies the barriers into the four factors namely a) resource-related factors b) factors associated with training, skills, knowledge and computer experience c) attitudinal and personality factors, and d) institutional and cultural factors. According to the BECTA (2004) report, barriers identified in the literature can be broadly grouped into two levels: those relating to the institutions (school-level barriers) which are first order barriers and those relating to the individual (manager-level barriers) or second order barriers (Siegel, 1999). Although this may be a useful distinction to make in beginning to address the subject, the literature points to a complex interrelationship between school-level and teacher-level barriers, and

between the barriers within those levels (Siegel, 1999). Managerial-Level Barriers are: (a) Lack of time for both formal training and self-directed exploration (Higgs, 1997) and for preparing ICT resources for lessons, (b) Lack of self-confidence in using ICT (Farris, 2001), (c) Negative experiences with ICT in the past (Siegel, 1999), (d) Fear of embarrassment in front of pupils and colleagues, loss of status and an effective degrading of professional skills (Zhao and Frank, 2003), (e) Lack of the knowledge necessary to enable managers to resolve technical problems when they occur (Tee, 1993), (f) Lack of personal change management skills (Venkatesh and David, 2000), (g) Lack of motivation to change long-standing pedagogical practices (Campbell and Sellbom, 2002), (h) Perception of ICTs as complicated and difficult to use (Yang, 2003). School-Level Barriers are: (a) Lack of ICT equipment (Tee, 2003), and the cost of acquiring, using and maintaining ICT resources, (b) Obsolescence of software and hardware (Higgs, 1997), (c) Unreliability of equipment (Butler & Sellbom 2002; Cuban et al. 2001), (d) Lack of technical support (Farris, 2001), (e) Lack of administrative support (Siegel, 1999), (f) Lack of institutional support through leadership, planning and the involvement of teachers as well as managers in implementing change (Bigum, 2000).

The barriers are broadly divided into three categories: teacher-level barriers, i.e. those related to teachers' attitudes and approach to ICT, school-level barriers, i.e. those related to the institutional context and system-level barriers, i.e. those related to the wider educational framework. Major barriers preventing more successful integration of ICT and achieving higher

impact. They can be grouped under teacher level barriers (micro level), school level barriers (meso level) and system level barriers (macro level). On the micro level the lack of ICT skills of teachers and the updating of these skills is still a major barrier as it affects teachers' choice of a specific ICT much more than professional consideration. This, on the other hand influences the capacity of teachers to embrace new pedagogical practices with ICT. As mentioned beforehand there are other outside barriers that prevent teachers to embrace new technologies to the full extent. On school level, ICT infrastructure and access to ICT is still a major issue. As often shown the availability of technology alone is not the only factor for successful integration of ICT, but its absence or poor quality due to insufficient maintenance is a crucial hindrance. Schools without sufficient ICT resources are clearly missing out on the extra educational opportunities ICT can offer. Other inherent barriers at school level are organisational set ups which are linked to leadership issues and a strategy for ICT. The latest evidence shows that ICT strategies, in order to be effective, need to be integrated into the overall vision of the school. Moreover, where headmasters have used ICT to develop the school's values, teachers perceive a more positive impact of ICT. The evidence also proves the recurrent claim of reducing system level barriers mainly that of existing assessment and evaluation methods which do not take into account new competencies acquired by using ICT in learning. Teachers are under pressure in reaching the standard objectives and fear that schools using ICT will be less performing than traditional schools.

TEACHER-LEVEL BARRIERS:

Lack of ICT Skills and Training

Many teachers still chose not to use ICT and media in teaching situations because of their lack of ICT skills rather than for pedagogical/didactics reason'. On the other hand, teachers' ICT knowledge and skills is not regarded anymore as the main barrier to ICT use. But even though they are regarded as less of a problem, and despite teachers' ICT training, there is still a lack of follow-up on the utilization of newly acquired skills. According to Pelgrum (2001), the success of educational innovations depends largely on the skills and knowledge of teachers. Teachers' lack of knowledge and skills is one of the main hindrances to the use of ICT in education both for the developed and underdeveloped countries (Mamun, & Tapan, 2009; Pelgrum, 2001; Ihmeideh, 2009; Williams 1995). Integrating technology in the curriculum requires knowledge of the subject area, an understanding of how students learn and a level of technical expertise (Morgan 1996). Moreover, Berner (2003) found that the faculty's belief in their computer competence was the greatest predictor of their use of computers in the classroom. Many teachers who do not consider themselves to be well skilled in using ICT feel anxious about using it in front of a class of children who perhaps know more than they do. Larner and Timberlake (1995) found that teachers were worried about showing their pupils that they did not know how to use the equipment. Therefore, lack of knowledge regarding the use of ICT and lack of skill on ICT tools and software have also limited the use of ICT tools in teaching learning. Cuckle and Clarke (2002) add that another barrier to student teachers' use of ICT in the classroom is the lack of ICT

pedagogical training in teacher training institutions. They found that although the student teachers in their study had good ICT skills in terms of their own personal use, they were unable to transfer these skills to using ICT in the classroom. In addition, after receiving pedagogical training in ICT, the students were still not able to make full use of that training as what they had been taught did not transfer easily to what was available in the classroom during teaching practice. Inappropriate training styles result in low levels of ICT use by teachers. Courses which lack pedagogical aspects are likely to be unsuccessful (Veen, 1993), but there also needs to be an element of ICT skills training (Preston et al., 2000). Teachers who do not realise the advantages of using technology in their teaching are less likely to make use of ICT. Any training programme needs to ensure that teachers are made aware of the benefits of using ICT. (Cox et al.1999).

Lack of Motivation and Confidence in Using ICT

Literature stresses the importance that each use of ICT needs a pedagogical approach to improve learning. On the other hand, the overwhelming body of evidence shows that the majority of teachers have not yet embraced new pedagogical practices. Teachers do not feel confident yet in exploiting ICT to support new approaches in teaching. Most of the teachers are still in stage of using ICT to enhance existing pedagogical practice. Their limited ICT knowledge, makes teachers anxious about using ICT in the classroom and thus do not feel confident to embrace new pedagogical practices. (Becta 2004) survey on the perceived barriers to the uptake of ICT by teachers also refers to the teachers' fear of

admitting to their pupils their limited ICT knowledge'. Furthermore, training courses are usually not differentiated to meet the specific learning needs of teachers and they are rather 'up-front' than regularly updated and followed-up sessions. Developing the skills to engage effectively with the technology and creating structures to enhance ICT use is as important as investing in ICT infrastructure. Therefore, effective training is crucial if teachers are to implement ICT in an effective way in their teaching. On the contrary, when training is inadequate or inappropriate, teachers are not sufficiently prepared, and perhaps not sufficiently confident, to make full use of technology in the classroom. If they increased the knowledge about the use of ICT in pedagogy, but teachers could not translate this knowledge into efficient everyday practices. Where ICT has been embedded over a longer period this has led to more use of ICT by teachers and increased considerably their confidence using ICT. Moreover, an experimental approach using ICT in everyday practice is an important factor in increasing teachers' pedagogical competence. (Ramboll Management, 2005) illustrates the current dilemma concerning the pedagogical use of ICT. Even though a large number of teachers have gained more pedagogical knowledge (through better access to ICT-based learning material and pedagogical concepts via training and discussions), teachers have increased the use of ICT but only a few have had the goal to integrate ICT in the curriculum. In some cases, the reasons for selecting a technology are affected more by teachers' user skills than by professional considerations. A very significant determinant of teachers' levels of engagement in ICT is their level of

confidence in using the technology. Teachers who have little or no confidence in using computers in their work will try to avoid them altogether (Dawes, 2000; Lerner and Timberlake, 1995; Russell and Bradley, 1997.)

SCHOOL-LEVEL BARRIERS:

The Absence and Poor Quality of ICT Infrastructure and Resources

Even after receiving basic and pedagogical training in ICT, some teachers are still not able to make use of that training since they are hampered by a range of school level factors. The availability of technology is important factor for the successful implementation of ICT, absence of technology is a crucial hindrance. The effective use of ICT would require the availability of equipment, supplies of computers and their proper maintenance including other accessories. Implementing ICT demands other resources, such as computers, printers, multimedia projectors, scanners, etc. which are not available in all the educational institutions? Besides, ICT requires up-to-date hardware and software. Using up-to-date hardware and software resources is a key feature in the diffusion of technology (Gulbahar 2007) but a rare experience in educational institutions. Lack of resources within educational institutions are major hindrance to the implementation of ICT. Lack of computers (both hardware and software) and other ICT-supported tools in the classroom can seriously limit the use of it by a teacher. Limited resources result in lack of computer integration, which in turn results in lack of sufficient computer experience for both pupils and teachers (Rosen & Weil, 1995; Winnans & Brown, 1992; Dupagne & Krendl, 1992; Hadley & Sheingold, 1993). The

stakeholders and school authorities need to be provided with adequate facilities and resources for effective implementation of ICT. High-speed internet connection is another prerequisite for integrating ICT into the teaching-learning situation. But unfortunately internet access is very poor. Effective implementation of technology into education systems involves substantial funding. ICT-supported hardware, software, internet, audio visual aids, teaching aids and other accessories demand huge funds. Mumtaz (2000) stated that many scholars proposed that the lack of funds to obtain the necessary hardware and software is one of the reasons teachers do not use technology in their classes. Afshari, Bakar & Su-Luan et al. (2009) state that efficient and effective use of technology depends on the availability of hardware and software and the equity of access to resources by teachers, students and administrative staff.

The Lack of High Quality Hardware and Suitable Educational Software

The lack of high quality hardware and suitable educational software is also considered by the majority of ICT coordinators as an important hindrance to further development of ICT in education. Poorly maintained computers are usually unreliable and likely to cause disruption to even the best planned lessons. Pelgrum (2001) found that the most frequently mentioned problem when teachers were asked about obstacles to their use of ICT was the insufficient number of computers available to them. Guha (2000) found similar results, with many teachers surveyed indicating that the number of computers in their classrooms was insufficient, and that if teachers were to

continue to implement ICT into their work then they required the appropriate hardware and software to familiarise themselves with first, then guide their students accordingly. In school, the frequency of technical problems that occur can have a direct effect on a teacher's confidence in attempting to use that equipment, due to the fear of it breaking down during a lesson, or the fear of them breaking the equipment themselves (Cuban, 1999; Bradley and Russell, 1997). Similarly, inappropriate software does not enhance a lesson in any way and rather disengages both teachers and students from the learning process. Inappropriate software is identified as a barrier in the research undertaken by the Centre for Guidance Studies (Bosley and Moon, 2003). Therefore, the amount, range and quality of ICT resources available to the teachers are an important influence on the use made of ICT in subjects and classes. The range of software that is available for subject teachers also encourages some teachers to take up ICT (Goodwyn et al, 1997; Clariana, 1992; Scrimshaw, 1997; Sepehr & Harris, 1995). It could be that teachers are able to match what they teach and how they teach it with appropriate software. Of course, the high cost of ICT maintenance, and software licenses should be also taken into consideration since it further inhibits ICT usage in schools. In addition, there is the need to customise and standardise software. Teachers are sometimes unable to make full use of technology because they lack the time needed to fully prepare and research materials for lessons, particularly where this involves online or multimedia content. Time is also needed for teachers to become better acquainted with hardware and software. (Fabry and Higgs, 1997; Manternach-Wigans et al., 1999).

Inappropriate Organization and Limited Access to ICT Equipment

The inability of teachers and students to access ICT resources is a result of a number of other factors and not only of the lack of ICT infrastructure. Sometimes a school may have high quality of ICT resources but these are inappropriately organized and thus not optimally used. According to Earle (2002), ICT integration will not be insured by only providing hardware and software and establishing infrastructure. Similarly, Hew and Brush (2007) asserted that beside lack of hardware and software, insufficient opportunities to access to these resources will decrease the chance of teachers to integrate technology into teaching programs. In some schools for instance, prior booking of the ICT classroom is required, or the internal school network cannot be accessed from outside. As a result, teachers and students do not have the opportunity to use ICT at any time according to their needs. Levels of access to ICT are significant in determining levels of use of ICT by teachers (Mumtaz, 2000). However, it is not necessarily the case that a school with low access does not have enough equipment; it may be that the amount of equipment is adequate but inappropriately organised in the school. Equipment should be organised in such a way to ensure maximum access for all users (Pelgrum, 2000; Fabry and Higgs, 1997). Technical faults with ICT equipment are likely to lead to lower levels of ICT use by teachers. Recurring faults, and the expectation of faults occurring during teaching sessions, are likely to reduce teacher confidence and cause teachers to avoid using the technology in future lessons (Bradley and Russell, 1997). The lack of available technical support is also likely to

lead to teachers avoiding ICT, for fear of a fault occurring that cannot be rectified and lessons being unsuccessful as a result (Cuban, 1999; Preston et al., 1999). Pelgrum (2000) suggesting that in some cases it is the organisation of resources, rather than the physical lack of them, which is creating a barrier to the use of ICT by teachers. Fabry and Higgs (1997) noted that numbers of computers alone do not necessarily ensure adequate access, and that it is important to locate the proper amount and right types of technology where teachers and students can effectively use them. There is evidence (Preston et al., 2000) to suggest that teachers are less enthusiastic about using ICT where the equipment available is old and unreliable.

Absence of ICT into School Strategies

Schools provide no supportive network for teachers who are not confident enough to take up ICT (Rosen & Weil, 1995; Winnans & Brown, 1992; Dupagne & Krendl, 1992; Hadley & Sheingold, 1993). Thus, schools seem to be slow in embracing ICT, and there is a resistance to change (Fullan, 1991; Cuban, 1993). This resistance is based on an unclear understanding of what change should constitute and the reasons why changes should take place in the first place. This leads to confusion and misunderstanding. Schools do not feel a need to change; they are content with their familiar tried and tested ways of teaching. As Cuban claims, schools are firmly grounded in cultural beliefs about the student teacher and not student-machine relationship and this dominates schooling. Thus, there is little scope for opportunities to adapt to technologies. The school as an institution gives little time to teachers to manage and familiarise themselves with

ICT (Robertson et al, 1996). Lack of support by administrators is also identified as a significant barrier toward implementation of ICT in classrooms. Successful implementation of ICTs can only occur if administrators offer teachers support and leadership. Schools face the problem of unsuccessful organisational implementation of ICT because ICT is not seen as a part of the general strategy at school level. Even if some schools have developed ICT strategies, these are not integrated into the school's overall strategies. Yet ICT is no longer a goal itself, an isolated phenomenon requiring a special strategy. Instead, it should be used to support whole school development.

SYSTEM LEVEL BARRIERS:

The Rigid Structure and Traditional Schooling System

Current pedagogy is subject centred, and uses ICT for differentiation and project based teaching in more advanced cases. Collaboration between students is not yet sufficiently exploited. The evidence base gives important insight into the process in which teachers adopt new technologies which is has to be taken into account with new decisions being made at policy level. Sometimes education systems work against ICT impact and even if educators are not ICT-resistant, in some cases the system under which they work is. The study 'Innovative learning Environments' (2004) has shown that teachers and parents are still nervous about the new methods. The use of ICTs in educational management is greatly under-emphasized. As such, a more holistic approach requires that schools be receptive and open to the changes ICTs may make, and to the ongoing evaluation of these changes for the schools' purposes. The lack

of institutional support; it can be argued that there is a common feeling among teachers and principals that the authorities concerned with education doesn't provide institutional support for the process of utilizing ICT in education. The authorities' supervisors from the ministry come to supervise classrooms and evaluate teachers, they are only concerned to see whether the teacher has finished the curriculum and not about the use of technology or how it is being employed. Overall, there seems to be a trend among teachers in thinking that the authority does not have clear policy regarding the use of ICT in schools.

One more barrier that can be associated with facilitating conditions. Facilitating conditions refer to the resources and opportunities that can facilitate or hinder the use of ICT in education. Some of these barriers are related to financial issues; the government does not have enough funds to provide the schools with sufficient number of computers, internet access, or technical staff. On the personal level, many teachers and students cannot afford to have a personal computer. On the other hand, Schools do not budget adequately for maintaining the use of ICTs, and instead dedicate their ICT budgets, where these exist, to the purchase of computers and software. In schools, the costs of installation, maintenance and expansion remain hidden unlike in the commercial sector where the capital costs of a PC represent only one fifth of the yearly cost of running that PC (Farris, 2001). There are multifaceted relationships between the barriers and for a successful integration of ICT into teaching and learning environments, all of these components must be taken into account in the process.

CONCLUSION AND SUGGESTIONS

Currently ICT has had an effect on school education but it has failed to deliver its promise on a larger scale. Correspondingly impact studies and evaluations often measure against traditional systems, where the potential of ICT cannot be fully exploited. Better outcomes will be therefore visible only in the years to come much later than expected and hoped for on the basis of the potential of ICT. An important research finding is that ICT impacts most in e-mature schools and with e-confident teachers, suggesting that once the foundations are laid the benefits will be considerable. The challenge is to enable all teachers and schools to reach e-maturity. There are close relationships between many of the identified barriers to ICT use; any factors influencing one barrier are likely also to influence several other barriers. For example, teacher confidence is directly affected by levels of personal access to ICT, levels of available technical support and the amount and type of training available, all of which can be seen as barriers to ICT themselves (Ertmer, 1999). The problem of lack of confidence as a barrier is closely related to several other key issues, which themselves alone can be viewed as barriers to teachers' use of ICT. For example, teachers' confidence in using ICT is directly affected by the amount of personal access to ICT they have, at home (Ross et al., 1999; Cox et al., 1999; Guha, 2000). The lack of teacher competence, or teachers' perceptions of their competence and the quality of the training they receive, is also related to the degree of confidence they have about using ICT (Pina and Harris, 1993; Lee, 1997). If training is inadequate or inappropriate, then teachers will not be sufficiently prepared, and perhaps not

sufficiently confident, to make full use of technology in and out of the classroom. The lack of teacher competence, then, together with the associated lack of quality training for teachers, can be seen as a barrier to teachers' use of ICT. The issue of training teachers in how to use ICT to effectively manage children's learning, both during the lesson and also in the preparation of lessons beforehand (pedagogical training), rather than simply training them in the skills of using ICT equipment, is an important one. Having expressed the need for pedagogical training, there is evidence to suggest that there still is an important need for training teachers in specific ICT skills.

It is noted that teacher training has a significant relationship with the successful implementation of ICTs. Teacher training should also not be limited to teachers who teach computer studies. There is need to train all teachers on the use of computers. Teacher training and continued, on-going relevant professional developments are essential if benefits from investments in ICTs are to be maximized. Teachers remain central to the learning process. Integrating any information technology, into educational settings requires change. It requires change in the way teachers think about teaching and in their teaching practices. A factor which is directly related to teacher confidence levels is that of teacher competence. In order to achieve high levels of teacher competence in ICT, there is a need to provide training, and perhaps unsurprisingly, there is a great deal of literature evidence to suggest that effective training is crucial if teachers are to implement ICT effectively in their teaching (Kirkwood et al., 2000).

To implement the use of any type of educational technology effectively,

teachers must feel confident in its operation and their own ability to integrate it into daily classroom practice. Teachers still fear using ICTs, and thus are reluctant to use them in their teaching. Teachers require additional motivation and incentives to participate actively in professional development activities. A variety of incentives can be used, including certification, professional advancement, pay increases, paid time off to participate in professional, formal and informal recognition at the school and community levels. The most significant factor for continuing the development of teachers' ICT-related skills is for them to have regular access to functioning and relevant ICT equipment. Teachers must have adequate access to functioning computers, and be provided with sufficient technical support, if they are to use ICT effectively. Hardware and software are obvious resources that must be available. Teachers also need other types of resources, such as onsite computer support. Teachers often need technical assistance as well as pedagogical support such as advice on choosing relevant software and integrating it into instruction. Teachers also need recommendations for ways that technology can be used to meet educational objectives, along with ideas on how to organize a classroom to take full advantage of only a few technologies. It is reported that technology support personnel for assisting teachers is limited in most schools. There is need for the Government to give priority to providing teachers with access to ICT through professional development, quality digital content and ICT infrastructure. Consequently, this would ensure a steady rise in the ICT competency of teachers. There is need for a comprehensive and

forward-looking ICT policy, which creates an enabling framework for the development of ICT in education management in schools. The policy would guide proper deployment of ICT in education. Local expertise, possibly from members of the specialized committee, need to be involved in this process. Policy makers continue to introduce strategies for ICT, with the intention of increasing its use in schools, such strategies are likely to have an effect on the school level barriers. The teacher level barriers are more difficult for policy makers to tackle as it is the teachers themselves who need to bring about the required changes in their own attitude and approach to ICT (BECTA, 2004). Educational managers need to have basic information on quality of teaching, student and teacher flows, probably also of school supplies, and how much the school as a system is spending on various inputs, in order to make the most basic resource allocation decisions. Studies (Becta, 2003; Yang, 2003) indicate that ICT has played an important role in improving management in educational systems. Authorities concerned with education are responsible for playing a bigger role in allocating more resources and opportunities to facilities the process of integrating technology into education. Ministry should take serious steps to facilitate the process by offering occasions for sharing the best practices and provide more institutional support.

Information and communication technology has a direct role to play in education and if appropriately used, ICT can bring many benefits to the classroom as well as education and training processes in general. Its use will provide new opportunities for teaching and learning, including, offering opportunity for more

student centered teaching, opportunity to reach more learners, greater opportunity for teacher-to-teacher, and student-to-student communication and collaboration, greater opportunities for multiple technologies delivered by teachers, creating greater enthusiasm for learning amongst students, and offering access to a wider range of courses (Republic of Kenya, (2005). ICT should be more strategically exploited, better planned and focused on the solving of a joint problem or given task. These skills should be much more formally be taken into account in the future as they present important outcomes of a new and changed educational context. It is the lack of realization that school administrators control policy making, financial allocation, and program implementation within schools. Thus, administrators must be educated about the use of technology in schools and value of implementing technology in their schools. The actions, interests, and priorities of the building principle have made a significant difference between effective and ineffective implementation of program change. Effective implementation of ICT in education is not merely a vision. Rather, it needs a proper plan, policies, execution and monitoring. It is hoped that this paper will be useful for the educators, policymakers and other decision makers who are directly involved in introducing ICT into school education.

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