Ministry of Education, Human Resource Development, Youth and Sports
Government of St. Lucia

Draft Policy

for the

Integration of Information & Communication Technology in the Education System

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ABBREVIATIONS

CAI	Computer Aided Instruction
CMC	Computer Mediated Communication
CMI	Computer Managed Instruction
DSS	Decision Support Systems
EMIS	Education Management Information System
EPIE	Educational Products Information Exchange
ESS	Executive Support System
ICT	Information and Communication Technology
ILS	Integrated learning Systems
ISDN	Integrated Services Digital Network
ISP	Internet Service Provider
ITU	Information Technology Unit
IT	Information Technology
ICT	Information & Communications Technology
MOE	Ministry of Education
OAS	Office Automation Systems
OECS	Organisation of Eastern Caribbean States
OERU	OECS Education Reform Unit
OETEC	OECS Education Technical Committee
PC	Personal Computer
TESS	The Educational Software
TPS	Transaction Processing Systems
WAN	Wide Area Network

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- Mr. Urban Dolor - Sir Arthur Lewis Community College;
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- Mr. Lawson Caldron (deceased) - St. Lucia Manufacturers Association (SMA).

1.0 BACKGROUND

This document is the output of an extensive consultation process, which was organized with the express purpose of customizing, for the education system of St. Lucia, a model Information and Communication Technology (ICT) policy document developed by the OECS Education Reform Unit (OERU). The process was launched with a two-day consultation, where educators and representatives of various stakeholder groups throughout the island were given an opportunity to examine critically all aspects of the model ICT policy document and to make recommendations that would suit the needs of St. Lucia.

OERU's model ICT Policy document was embraced by the Ministry of Education, St. Lucia because it included some key guidelines that could be pursued in ensuring the successful integration of ICT in the education system of St. Lucia. Further, the model ICT Policy document was the result of an initial refinement process, in which various representatives from the education systems of St. Lucia and the other OECS territories participated. The refinement process included the following steps:

(1) The development of initial *Guidelines for the Development of an ICT Policy and Strategy*, which were reviewed by the OECS Education Technical Committee (OETEC) in November 1999,

(2) The preparation of a *Model ICT Policy for the Education System* document which was presented to OETEC in May 2000,

(3) A comprehensive review of the revised Model ICT Policy document by members of the OECS ICT Education Committee, who met in July 2000 upon the recommendation of OETEC.

(4) The further revision of the *Model ICT Policy for the Education System* document which was presented to OETEC in June 2001.

During the course 2003, an extensive consultation process was undertaken at the National level. Sessions were held with the following:

- National Principals Association;
- District Education Officers and Curriculum Officers (IT and TVET);

- Sir Arthur Lewis Community College (relevant Science & Technology academic staff);
- Saint Lucia Chamber of Commerce, Industry and Agriculture; Saint Lucia Hotel and Tourism Association (SLHTA), the Saint Lucia Small Business Association (SLISBA); and the Saint Lucia Manufacturer's Association (SMA).;
- National Skills Development Center; and
- Poverty Reduction Fund and the Basic Needs Trust Fund[1].

[1] These institutions have constructed Computer Labs for various Schools and Resources Centers in several communities.

2.0 INTRODUCTION

Throughout the world, information and communications technologies (ICTs) are changing the face of education. It has been argued that the transformation of education may be the most important of the many practical revolutions sparked by computer technology. No facet of civilization will be altered more radically. Just as computers are about to (some would argue have already) replace books as our main repository of information, computers will come to occupy the central position in education once occupied by books[2].

More generally, profound changes have occurred in the business and economic environment globally, over the last decade. The recognition of a fundamental shift in the business and economic environment is not just a recent phenomenon, and can be traced back a few decades, to the work of Machlup (1962) and Bell (1974). Current writings on the emergence of a "Digital Economy", the "Information Age" and the "Knowledge Economy", though generally associated with the impact of the new information and communications technologies, have their genesis in the rise in importance of 'information' and 'knowledge' as the drivers of the transformation of the western industrialised societies to more 'services based economies' (Masuda, 1983).

The key driving forces resulting in the global changes that have significantly altered the environment in which organisations, including educational institutions, operate today can be summarized as follows:

1. the emergence and strengthening of the global economy;
2. the transformation of agrarian and industrial economies into knowledge and information-based service economies; and
3. the radical transformation of business enterprises (Laudon and Laudon, 2003).

Fundamentally, there are two distinct factors propelling the changes in ICT's and education:

(1) ICTs are radically changing the nature of work and the workplace, and more generally, the "information and knowledge revolution", combined with globalization, have created conditions in which countries that have focused on knowledge-based

[2] Robertson, D.S. (2002). 'The New Renaissance: Computers and the Next Level of Civilization'. Oxford University Press.

industries have been able to reap significant rewards. Knowledge-based industries require an educated labour force of computer-literate individuals who themselves understand and can harness the power of ICT. In response to the demands for producing such a labour force, many countries have changed the objectives of their education system and have directed much of their attention to the development of ICT skills in schools.

(2) More specifically, ICTs offer tremendous possibilities in:

a. improving student's learning by enhancing the teaching/learning process;
b. developing teachers' professional capability; and
c. strengthening institutional capacity.

The following are a few examples of such possibilities:

- Computer aided instruction (CAI) applications allows for individualize learning, while giving immediate reinforcement and feedback;
- Computers are multimedia tools and can therefore integrate graphic, print, audio and video into interesting and captivating computer-based instructional units, lessons, games and learning environments;
- Computer managed instruction (CMI) technology utilises the computer's branching, storage and retrieval capabilities to organise instruction and track students' progress;
- Education Management Information Systems (EMIS) can improve individual school administration, as well as nation-wide management of all schools and educational facilities and processes.
- Computer mediated communication (CMC) technologies (such as instant messaging, electronic mail, bulletin boards and computer conferencing) facilitate communication among students, teachers, researchers and other individuals of similar interest.

Educators in St. Lucia, like those in other countries, are cognizant the benefits of utilising ICT in the learning environment and have undertaken many initiatives aimed at doing so. These initiatives, however, have been implemented in the absence of a carefully thought-out national plan with guiding policies and strategies.

The introduction of ICT in the education system requires careful planning. ICT, like any powerful tool, can do as much harm as good. Bad pedagogy implemented on a computer may have its harmful effects multiplied many fold by the power of the technology. Educational leaders and planners thus bear the tremendous responsibility of ensuring that the introduction of ICT into the classroom is managed with great care so that the potential benefits are realised, while the dangers are eliminated or minimised.

The introduction and sustainability of ICT in the education system are also expensive. The capital cost of the equipment needed to begin the process is obvious. A little less obvious is the high level of recurrent costs associated with the effective use of ICT, which results in a more accurate analysis of the total cost of ownership. Every attempt must therefore be made to optimize the benefits of such large investments, and to develop cost effective implementation, integration and maintenance procedures.

One of the primary benefits of the extensive consultation process was the validation and consolidation of many of the provisions in the draft policy document. Four (4) primary themes were dominant and recurrent throughout the process. Consequently, the Philosophy, Objectives and the policy statements with respect to the "utilisation of ICT in the curricula and in education administration" are presented under the following areas:

1. Access
2. Creativity and End-User Development
3. Economic and Social Development
4. Reform and Capacity Building

3.0 ICT PHILOSOPHY OF THE MINISTRY OF EDUCATION

The Ministry of Education recognizes that the following principles are critical to the success of the integration of ICTs in the Education System:

3.1 Access

- Accessibility to and utilization of information and knowledge are fundamental to the development of the Country's citizenry;

- In light of the growing impact of advanced Information and Communication Technologies (ICTs) on the economy of St. Lucia, each student must be provided with access to up-to-date computer-based tools so as to make a valid contribution to society.

3.2 Creativity and End-User Development

- Knowledge creation and development and the assimilation and utilization of indigenous knowledge are also essential to the development of the Country's citizenry;

- The availability and creative use of authoring packages by teachers in the development of their own instructional material can have positive impact on the teaching-learning process;

- ICTs must be exploited using innovative methods in order to allow students greater control and flexibility over their learning and thus develop skills at their own level and speed. Consequently, the potential of all individuals (including the mentally and physically challenged) can be enhanced by the use of computer-based resources, including multimedia packages and other electronic learning tools;

- The strategic goal of integration initiatives must be the increased production and creation of knowledge and technologies, in particular software solutions and information systems that are relevant and instrumental in the development process of all sectors of the society.

3.3 Economic and Social Development

- The debate in the 1990s over choosing between the adoption and integration of ICTs in the education system, and at the National level, versus other development imperatives (e.g. by stating that, in poor countries, investment in ICT draws precious resources away from urgent development needs) has now shifted from one of tradeoffs to one of complementarity;

- It has become clear that ICTs can play an important role by providing new and more efficient methods of production, bringing previously unattainable markets within the reach of the poor, improving the delivery of government services, and facilitating management and transfer of knowledge. For example, the integration of ICTs in the education system can eventually boost the economic engine of St. Lucia as computer-based instructional material developed by St. Lucian educators can be exported;

- Increased participation in the global economy in trade and other such exchanges would require that the copyright laws of St. Lucia be respected by all individuals involved in the integration of ICT into the education system.

3.4 Reform and Capacity Building

- Curriculum reform, including the adoption of modern pedagogical and instructional techniques and methods of evaluation are indispensable for successful integration of ICTs in the education system;

- The introduction of ICT in the Education Sector necessitates the enhancement of knowledge and skills of all education officers, principals and teachers in the system;

- The utilization of computerized management tools, for example a comprehensive education management information systems (EMIS), can strengthen the institutional capacity of the Ministry, education offices and schools;

- The implementation and sustainability of ICT projects in the Education System must be done through a partnership approach involving the community, private and public organizations, and funding agencies.

4.0 OBJECTIVES OF ICT POLICIES FOR EDUCATION

The ICT policy statements in this document reflect general guidelines, intentions and standards that the Ministry of Education upholds and seeks to implement for the education system. The specific objectives of this ICT policy document are outlined, based on the four philosophical elements presented in the previous section:

4.1 Access

- Ensure that there exists equitable access to ICT resources by all students and teachers within the Education system;

- Ensure that all school leavers are provided with the required ICT skills for employment or entry to specialized training in the Information Technology field.

4.2 Creativity and End-User Development

- Facilitate the implementation of information systems that enhance efficiency within administration;

- Encourage innovative partnerships between the various stakeholders in the Education Sector in undertaking IT related ventures;

- Make provisions for the frequent upgrade of all ICT tools including software used for educational purposes;

- Increase the awareness of intellectual property and copyright laws with respect to the use of software and information resources in general.

4.3 Economic and Social Development

- Encourage and facilitate the use of the Internet as a research and communication tool among students, parents, teachers, principals, other MOE officials and members of the community;

- Provide avenues for increased electronic networking and collaboration of educators and students in St. Lucia, regionally and internationally.

- Facilitate the development of software products; computer based instructional resources and other information resources that have commercial potential.

4.4 Reform and Capacity Building

- Promote the harmonization of activities, approaches and standards in the educational uses of Information and Communications Technology (ICT) within the Education System;

- Encourage principals, teachers and students to use ICT within the education system more extensive, to enhance the teaching-learning process;

- Foster the concept of Life Long Learning among students and teachers and also within the general populace of St. Lucia;

- Provide greater professional development opportunities and make provisions for the continuous upgrade of skills of all ICT educators in St. Lucia;

- Create a cadre of ICT educators with the requisite skills and competencies to use and promote ICT as a tool in the enhancement of the teaching/learning process;

5.0 ICT GUIDELINES AND POLICY STATEMENTS

The ICT Guidelines and Policy Statements of the education system have been categorized into three areas: (1) ICT in the curricula and education administration; (2) planning and implementation of ICT initiatives; and (3) sustaining, supporting and evaluating ICT initiatives.

5.1 ICT in the Curricula and Education Administration

In formulating policies relating to the utilisation of ICT in the curriculum, and in education administration, consideration must be given to the diversity in forms and applications of ICT, the potential benefits, as well as the possible dangers.

With the availability of many advanced technologies and software tools, the potential benefits of computers in education are phenomenal. Only a few examples can be noted here.

- With tools such as computer-aided instruction (CAI) software, lessons can be presented in a manner which is captivating and is more likely to be retained by students. In particular, the range of games that have instructional possibilities is limitless. Computerized simulations of real-life situations offer a wealth of possibilities.
- Many instructional applications provide an objective means of assessment. They can also maintain records of individual progress of each student and can assist teachers in identifying students' weaknesses and in determining measures that can be taken to address such weaknesses.
- Courseware designed for secondary and tertiary levels makes it possible for students to model and test physical systems through simulation.
- The Internet not only provides access to a wealth of resource material for research, but also facilitates networking and communication among educators, students, and other stakeholders such as parents.
- Computers can be used in schools as a tool for writing and presenting. Word-processing, spreadsheet and database applications all have their uses for project writing and information management.
- In respect to education administration, there are various types of information systems that can be used in making informed decisions at all levels and in improving efficiency of operations.

Improving the ***quality of education and training*** is a critical issue, particularly at a time of educational expansion. ICTs can enhance the quality of education in four fundamental ways: increasing learner motivation and engagement, facilitating the acquisition of basic skills, enhancing teacher training and transforming the learning environment into one that is learner-centered.

1. Motivating to learn. ICTs such as videos, television and multimedia computer software that combine text, sound, and colourful, moving images can be used to provide challenging and authentic content that will engage the student in the learning process. More so than any other type of ICT, networked computers with Internet connectivity can increase learner motivation as it combines the media richness and interactivity of other ICTs with the opportunity to connect with real people and to participate in real world events.

2. Facilitating the acquisition of basic skills. The transmission of basic skills and concepts that are the foundation of higher order thinking skills and creativity can be facilitated by ICTs through drill and practice. Most of the early uses of computers were for computer-based learning (also called computer-assisted instruction) that focused on mastery of skills and content through repetition and reinforcement.

3. Enhancing teacher training. ICTs have also been used to improve access to and the quality of teacher training.

4. Research has shown that the appropriate use of ICTs can catalyze the paradigmatic shift in both content and pedagogy that is at the heart of education reform in the 21st century. If designed and implemented properly, ICT-supported education can promote the acquisition of the knowledge and skills that will empower students for lifelong learning. When used appropriately, ICTs enable new ways of teaching and learning rather than simply allow teachers and students to do what they have done before in a better way.

These new ways of teaching and learning are underpinned by constructivist theories of learning and constitute a shift from a teacher-centered pedagogy—in its worst form characterized by memorization and rote learning—to one that is learner-centered.

Many avid proponents of ICT in education will admit that along with the benefits of introducing computers in the classroom come numerous critical considerations and challenges. Some of these are outlined below:

Professional Development of Teachers

The success of any classroom ICT project depends on the teacher ultimately. While ICTs themselves can be used to improve the quality of teacher training, if teachers are not comfortable with the technology, they will not use it. Training and orientation of teachers must therefore be a priority. Training of teachers must focus not merely on developing proficiency in the use of various technologies, but in particular, in the application of modern pedagogical methods.

Various competencies must be developed throughout the educational system for ICT integration to be successful. Teacher professional development should have five foci: 1) skills with particular applications; 2) integration into existing curricula; 3) curricular changes related to the use of IT (including changes in instructional design); 4) changes in teacher role; and 5) underpinning educational theories. Ideally, these should be addressed in pre-service teacher training and built on and enhanced in-service. In some countries, like Singapore, Malaysia, and the United Kingdom, teaching accreditation requirements include training in ICT use.

ICTs are swiftly evolving technologies, however, and so even the most ICT fluent teachers need to continuously upgrade their skills and keep abreast of the latest developments and best practices. While the first focus—skills with particular applications—is self-evident, the four other foci are of equal, if not ultimately greater, importance. Research on the use of ICTs in different educational settings over the years invariably identify as a barrier to success the inability of teachers to understand why they should use ICTs and how exactly they can use ICTs to help them teach better. Unfortunately, most teacher professional development in ICTs is heavy on "teaching the tools" and light on "using the tools to teach."

Teacher anxiety over being replaced by technology or losing their authority in the classroom as the learning process becomes more learner-centered (an acknowledged barrier to ICT adoption) can be alleviated only if teachers have a keen understanding and appreciation of their changing role.

Misuse of Computers and the Internet

There are many forms of computer misuse, from financial fraud to hacking and introducing viruses and worms into computer systems. An area that is of primary concern in the education system is the use of computers and the Internet to access and disseminate inappropriate material such as pornographic material and extreme political or religious views and ideas. In order to detect and control such incidents, action must be taken on several fronts: the Ministry, in schools, and at home.

Widening of the Digital Divide

There is the concern among some educators that with the introduction of computers in the classroom, students from households that can afford computers are likely to advance faster in the curriculum than those who do not have a computer at home or have never used one before. It is believed that those who have computers at home and are more comfortable with the technology are likely to dominate in the classroom. Further, it is possible for them to continue their schoolwork at home and to access invaluable information from the Internet.

The Ministry, in its efforts to minimize the effects of the access gap between the 'haves and the have-nots', with respect to information and communications technologies, must put in place appropriate measures such as ensuring that new teaching methods are "friendly" to all students, irrespective of prior or present access to computer resources outside the class room. Simultaneously, efforts must also be made towards establishing computer facilities that are accessible to students who do not have computers at home.

Environmental Issues

In light of the significant rate of obsolescence for computer equipment, environmentalists are becoming increasingly concerned about expanding 'technology graveyards'. This is an issue of paramount importance, particularly in third world countries, like St. Lucia, that are usually recipients of donated used computers. Having used computers may appear to be a better option than having no computer at all. However, one must be cautious in accepting used equipment because the disadvantages may, in some cases, far outweigh the advantages of doing so.

Health and Social Issues

The introduction of ICT in schools sometimes entails more emphasis on the technology and less on the physical, emotional, social and cognitive needs of the child (Alliance for Childhood, 2001). This can result in the weakening of children's bonds with teachers, other students, and families, while strengthening connections to trivial games, inappropriate adult material, and aggressive advertisements. Additionally, there are health risks associated with prolonged use of computers: repetitive stress injuries, eyestrain, and obesity.

Cognizant of the potential benefits and the challenges associated with using ICT in the curricula and in education administration, the following policy statements are proposed:

5.1.1 Access

Statement No. 1:

The MOE will work with educational institutions and other partners in the private and public sectors, to make available the facilities, equipment and personnel to permit equitable access to ICT for all students.

5.1.2 Creativity and End-User Development

Statement No. 2:

The MOE will liaise with other public agencies and private organizations with the express purpose of ensuring that the Education ICT programme is relevant to the needs of all stakeholders.

Statement No. 3:

The MOE will establish an ICT integration team (comprising curriculum, subject, ICT and assessment specialists, as well as representative students), which will co-ordinate, in collaboration with the OECS Education ICT Committee, the approach for the use of computers in the teaching and learning of every subject area.

Statement No. 4:

The MOE will ensure that ICT is used in the classroom to support the mastery of numeracy, literacy, problem solving and creative thinking skills.

Statement No. 5:

The MOE will provide the opportunity for fostering the creative capacity of students and teachers in the development of multimedia software and web-based systems.

5.1.3 Economic and Social Development

Statement No. 6:

The MOE shall ensure that ICT in the education system serves to support the provisions of the National ICT Policy and the overall National Social and Economic Development Plan, which will contribute to the establishment of an information and knowledge-based economy (see Appendix C).

5.1.4 Reform and Capacity Building

Statement No. 7:
The MOE will ensure that ICT is effectively integrated into the curricula and that all school leavers are computer literate.

Statement No. 8:

The MOE will ensure that ICT is used in the classroom to address the individual needs of students.

Statement No. 9:

The MOE will collaborate with educational institutions to decide on the optimal configuration that can be used in classroom/library/lab for learning and instruction with ICT.

Statement No. 10:

The MOE will ensure that instructional software is thoroughly evaluated before being introduced in the classroom.

Statement No. 11:

The MOE will ensure that control mechanisms are put in place to prevent access to obscene material and undesirable sites on the Internet.

Statement No. 12:

The MOE will work with other stakeholder groups to establish rules and procedures for the acceptable use of ICT in all areas of the education system.

Statement No. 13:
The MOE will work with Principals of Educational Institutions to ensure that the guidelines for acceptable use of ICT in education are incorporated into the School Rules.

Statement No. 14:

The MOE, cognizant of the potential of harm that users may be exposed to after the prolonged use of computers, will ensure that standard ergonomic principles are adhered to, including the proper design of computer workstations. Recommended workstation specifications are detailed in Appendix B.

Statement No. 15:

The MOE will implement mechanisms for attracting and retaining ICT teachers within the education system.

Statement No. 16:

The MOE will include computer literacy as a pre-requisite for being recruited into the teaching service.

Statement No. 17:

The MOE will liaise with the Sir Arthur Lewis Community College Community College and other similar educational institutions to ensure that subject-specific pedagogy includes adequate coverage of the integration of ICT in the classroom. If necessary, courses may have to be modified or new courses be introduced.

Statement No. 18:

The MOE will ensure that training of teachers in computer literacy and the educational uses of ICT will precede the introduction of equipment into the classroom.

Statement No. 19:

The MOE will provide in-service training to teachers throughout the education system.

Statement No. 20:

The MOE will employ and encourage the use of various information systems, at different levels in the educational administration process:

- Executive support system (ESS) and decision support systems (DSS) in order to assist with handling of structured and unstructured decision making at all levels of administration;
- Knowledge work systems (KWS) that can assist in the creation and integration of new knowledge in schools e.g. timetable systems and computer managed instruction (CMI) systems;
- Office automation systems (OAS) such as word processing, electronic mail, and scheduling applications are used effectively throughout the education system;
- Transaction-processing systems (TPS) that can assist in performing routine transactions such as registration, attendance, budget preparation and examination grading.

Statement No. 21:

The MOE will provide training in appropriate technologies to officers involved in administration at all levels.

5.2 Planning and Implementing ICT Initiatives

There are a number of issues to be considered in the planning and implementing ICT initiatives[3] in education:

- Curriculum goals, and instructional and evaluation methods
- Professional development of educators in order to make them more effective in using computers for teaching and for other purposes
- Selection of equipment (hardware and software) with specific consideration to new and emerging technologies
- Estimated timelines and proposed schedule for completing various components of the implementation plan
- Possible establishment of incentive/reward programmes
- Procurement: the entire process of researching, comparing various options and actual purchasing
- Availability of community resources that can be tapped
- Legal issues such as software piracy
- Infrastructure – computer networks in particular
- Maintenance of equipment and facilities
- Special needs learners such as the visual, hearing/speech or physical impaired as well as exceptional students or those with learning disabilities
- Security or measures that should be taken to protect the computers, networks, personnel and software from destruction, misuse and harm
- Funding from various sources: grants, loans, fund raising activities, partner-in-progress programmes
- Facilities or anything needed to house or power the chosen technology equipment
- Obsolescence, environmental issues, equity of access, ergonomics and standards

In countries like St. Lucia where financial resources are limited, special attention ought to be given to the acquisition of equipment (hardware and software), the rationalisation of such equipment, and cost effective implementation methods.

[3] Guidebook for Developing an Effective Instructional Technology Plan. Mississippi State University, 1996.

Generally, hardware has a finite life span because it can become technologically obsolete or due to wear and tear. Further, users often demand improvement in the performance of their systems and this is usually dependent on an upgrade in hardware. Flexible and open architectures are usually recommended for purchase in order to minimise the cost of upgrade and to reduce the time to replace defective components.

Software acquisition decisions fall into two categories: (i) those relating to general productivity tools (such as word processing, spreadsheets, databases, e-mail, browsers, graphics, etc.) and (ii) those specific to instructional software or courseware. For general productivity tools, choices can be guided by observing what is most widely used elsewhere. Students benefit by becoming familiar with the packages that they are most likely to meet in the workplace and at home. However, a compelling argument can be presented for the use of, perhaps lesser known alternatives: Free and Open Source Software (FOSS).

5.2.1 Free and Open Source Software (FOSS)

5.2.1.1 Policy Issues

It has been argued that FOSS has an important role to play in education[4]. It can be used in the setting up and running of the ICT infrastructure of academic institutions and to meet some of the specialized administrative needs of these institutions, such as the management of libraries and the setting up of learning management systems. Its use can potentially lower the costs of providing ICT facilities to educational institutions. The use of FOSS also makes possible improvements in the teaching of computer literacy, programming, software engineering and other non-IT subjects. FOSS has a role to play in academic research and it has influenced and contributed to a more open dissemination of academic and research content. Nevertheless, in considering the adoption of FOSS in education, various issues need careful consideration:

[4] Tan Wooi Tong (2004). Free/Open Source Software in Education, United Nations Development Programme: Asia-Pacific Development Information Programme (UNDP-APDIP), Malaysia

5.2.1.2 Software procurement

Since there are numerous advantages to using FOSS in educational institutions, including lower costs, reliability, better performance and, arguably, better security, strategic plans or policies for education at the national or institutional level should have guidelines for procurement of software that give due consideration to FOSS. These guidelines should also apply to decisions on software acquired for use in various curricula.

The different approaches that can be taken for developing guidelines for the procurement of software are:

1. Making it mandatory to use FOSS unless no suitable FOSS that is equivalent to the proprietary software is available;
2. Recommending that FOSS be used whenever possible; and
3. Ensuring that FOSS is given due consideration and not excluded in favour of proprietary software. This approach will be the guideline used for the procurement of software for the Education System in St. Lucia.

5.2.1.3 Migration

In many situations, educational institutions are already using proprietary software for both backend servers and desktops. In these cases, a strategy can be developed to migrate to the use of FOSS, beginning with the backend servers since the migration will be transparent to users and a wide range of high-quality FOSS is already available for servers.

For desktop applications, the adoption of FOSS can potentially result in greater cost savings. However, a migration policy will have to take into account the existing use of proprietary software and the need to maintain the use of some proprietary applications for academic requirements. A gradual approach can be taken, for example by first introducing and supporting FOSS applications that run on Windows, followed by the introduction of Linux as part of a dual boot system. There may be a transitional period where dual or multiple operating systems have to be maintained.

The available FOSS expertise within the institution will determine the training requirements for system administrators and other IT support staff. User training will also be required for other administrative users.

5.2.1.4 Curricula in Schools

More and more schools are being equipped with computer facilities and many have already implemented curricula to teach computer literacy to their students. These curricula should be examined to ensure that they are not based exclusively on specific proprietary software. If necessary, modifications should be made to the curricula so that the emphasis is on teaching concepts and generic skills. This does not necessarily mean that proprietary software should be excluded entirely. If the resources are available, proprietary software can be used to demonstrate the range of software available to accomplish certain tasks.

FOSS educational software for specific subjects is available and teachers should be encouraged to use these to enhance teaching and learning. If they have the skills, the teachers should also be encouraged to develop appropriate software for their classes and make these available as FOSS. To introduce FOSS in the curricula of schools, appropriate training for teachers is likewise required.

With educational software, there are also issues specific to content, cultural appropriateness and linguistic and cognitive style because many of the software packages available on the market are developed outside St. Lucia and the Caribbean. Further, there is the issue of cost. Software applications (with teachers' guide and assessment modules) designed for use in the classroom are sold under site licences and can be prohibitively expensive in some cases.

It is important to ensure that, in the initial stages of integrating ICT in education, people are not demoralized by weak or disastrous results from expensive investments[5] (Mauro Castro, 1999). Effective management is therefore critical in implementing any ICT initiative in education.

At the national level, it is necessary to have the institutional framework in place to coordinate an ICT programme for all educational institutions. The IT Unit at the Ministry has been assigned this responsibility. Unfortunately, this Unit has never been adequately staffed since its establishment in January 1998. With the increasing use of ICT throughout the education system, it has become absolutely imperative to have a full complement of staff within the IT Unit and to provide the Unit with the resources necessary to manage the national ICT programme effectively.

[5] Claudio de Moura Castro (1999) Computers in Schools: 10 Points to Avoid Past Errors.

5.2.2 Policy Statements

In light of the issues specific to planning, and implementation of ICT initiatives, the following policy statements are proposed:

Statement No. 22:

The MOE will make the necessary budgetary provisions (in collaboration with other stakeholders) for the planning, implementation and sustenance of ICT systems.

Statement No. 23:

The MOE will establish the appropriate organizational framework to plan and manage the integration of ICT into the education system.

Statement No. 24:

The MOE will establish mechanisms that foster collaboration between the private sector and educational institutions in the implementation ICT initiatives.

Statement No. 25:

The MOE will work with stakeholder groups to develop strategies to deal with issues such as: licensing[6]; intellectual property rights; use of software; disposal of used computer equipment; security; and privacy of personal data.

Statement No. 26:

The MOE will work with stakeholder groups to establish procurement guidelines and procedures for the acquisition of ICT equipment, peripherals and accessories.

Statement No. 27:

The MOE will establish protocols for the identification, evaluation and selection of appropriate software for use in instruction at all levels of the education system.

[6] Some regulatory statements are provided in Appendix A.

Statement No. 28:

The MOE in collaboration with other stakeholders will adopt a common set of standards for hardware and system architecture for use in the education system.

Statement No. 29:

The MOE will periodically (at least every year) review its hardware and software standards and recommend changes/upgrades as needed.

Statement No. 30:

The MOE will adopt a standard suite of productivity tools as the general-purpose software package for all computers used in the education system.

Statement No. 31:

The MOE will ensure the establishment of the necessary infrastructure to facilitate the installation of ICT within the education system.

Statement No. 32:

The MOE will ensure that all educational institutions are linked in a secure network that will be used for various purposes: such as administration, communication and lesson sharing.

Statement No. 33:

The MOE will assist every school to develop a Technology Plan, which will act as a guide for that school's integration of ICT into its curriculum.

Statement No. 34:

The MOE will assist Principals of Educational Institutions in ensuring that records of all software and software upgrades acquired by their institutions are kept and that their institutions have the appropriate licences for the use of such software.

Statement No. 35:

The MOE will assign the responsible for all ICT resources on the school premises to Principals.

5.3 Sustaining, Supporting, and Evaluating ICT Initiatives

The sustenance of information technology equipment in schools, like in any environment has proven to be very expensive. The Ministry of Education has been able to furnish twenty (20) secondary schools and approximately the same number of primary schools with computer labs. On average, the computer labs at the secondary schools have been designed and equipped in order to facilitate the training of twenty students. The average cost of computer hardware and general productivity software for these labs (furniture and infrastructure such as electrical and network installations excluded) has been estimated at $ 120,000.00 XCD.

A common mistake in estimating the cost of a particular ICT educational application is to focus too much on initial fixed costs—purchase of equipment, construction or retrofitting of physical facilities, initial materials production, and the like. But studies of the use of computers in classrooms, for example, show that installation of hardware and retrofitting of physical facilities account for only between 40% to 60% of the full cost of using the computers over their lifetime, or its total cost of ownership. In fact, while at first glance it may seem that the initial purchase of hardware and software is the costliest part of the process, the bulk of the total cost of ownership is spread out over time, with annual maintenance and support costs (known as variable or recurrent costs) constituting between 30% to 50% of the total cost of hardware and software.

The cost of professional development, another variable cost, also accumulates over time. For computer-based approaches the total cost of ownership therefore includes:

<u>FIXED COSTS</u>

- Retrofitting of physical facilities
- Hardware and networking
- Software
- Upgrades and replacement (in about three - five years)

VARIABLE OR RECURRENT COSTS

- Professional development
- Connectivity, including Internet access and telephone time
- Maintenance and support, including utilities and supplies

It must be noted that based on the experience with earlier installations such as those at the Castries Comprehensive, the Corinth Secondary, and the Vieux Fort Comprehensive, a three-year amortization period is more realistic. Consequently, the estimated recurrent cost can be more significant.

Consideration must therefore be given to implementing a maintenance strategy that can prolong the life span of the computer equipment installed in schools and minimize any additional cost associated with the malfunctioning of equipment. In devising this strategy, consideration must be given to the limited resources, in terms of finance and manpower, available to the Ministry.

One aspect of ICT implementations in organizations that is often neglected is sustainability. This is true for many ICT-based educational projects as well. In many instances, these projects are initiated by third party donors—such as international aid agencies or corporations—and not enough attention is paid to establishing a mechanism by which the educational institution or community involved can pursue the project on its own or in partnership with other stakeholders after the initiating donor exits. But cost and financing are not the only barriers to sustainability. According to Cisler (2002), the sustainability of ICT-enabled programs has four components: social, political, technological, and economic.

Economic sustainability refers to the ability of a school and community to finance an ICT-enabled program over the long term. Cost-effectiveness is key, as technology investments typically run high and in many cases divert funds from other equally pressing needs. Planners should look to the total cost of ownership, as outlined above, and build lucrative partnerships with the community to be able to defray all expenses over the long term. The need to develop multiple channels of financing through community participation ties economic sustainability closely to social and political sustainability.

Social sustainability is a function of community involvement. The school does not exist in a vacuum, and for an ICT-enabled project to succeed the buy-in of parents, political leaders, business leaders and other stakeholders is essential. Innovation can happen only when all those who will be affected by it, whether directly or indirectly, know exactly why such an innovation is being introduced, what the implications are on their lives, and what part they can play in ensuring its success. ICT-enabled programs must ultimately serve the needs of the community. Thus community-wide consultation and mobilization are processes critical to sustainability. In short, a sense of ownership for the project must be developed among all stakeholders for sustainability to be achieved.

Political sustainability refers to issues of policy and leadership. One of the biggest threats to ICT-enabled projects is resistance to change. If, for instance, teachers refuse to use ICTs in their classrooms, then use of ICTs can hardly take off, much less be sustained over the long term. Because of the innovative nature of ICT-enabled projects, leaders, the political directorate, educational administrators and educational providers, must have a keen understanding of the innovation process, identify the corresponding requirements for successful adoption, and harmonize plans and actions accordingly.

Technological sustainability involves choosing technology that will be effective over the long term. In a rapidly changing technology environment, this becomes a particularly tricky issue as planners must contend with the threat of technological obsolescence. At the same time, there is the tendency to acquire only the latest technologies (which is understandable in part because these are the models which vendors are likely to push aggressively). Generally, however, planners should go with tried and tested systems; stability issues plague many of the latest technologies. The rule of thumb is to let the learning objectives drive the technology choice and not vice versa—the latest technologies may not be the most appropriate tools for achieving the desired educational goals. When making technology decisions, planners should also factor in not just costs but also the availability of spare parts and technical support.

Continuous evaluation of ICT initiatives implemented in schools is absolutely necessary in order to justify further investments (i.e. money, time and effort) in the integration of ICT in

education. Generally, it is difficult to evaluate the effectiveness of any IT initiative because most of the benefits are not tangible, and are therefore, difficult to quantify. In education, the simplest and most obvious indicator of the effectiveness of any programme is students' scores.

5.3.1 Policy Statements

The following are proposed in order to the address the issues associated with support, sustenance, and evaluation of ICT initiatives:

Statement No. 36:

The MOE acknowledges that there are recurrent costs associated with the support of ICT in the education system and will make the necessary annual budgetary allocation.

Statement No. 37:

The MOE will adopt a partnership approach with stakeholders in order to finance the initial investment and recurrent expenses associated with the use of ICT in education.

Statement No. 38:

The MOE will explore all possible options of procuring computer hardware and software, giving due consideration to the upgrading, maintenance and eventual replacement of these systems.

Statement No. 39:

The MOE will devise a strategy for minimising the cost of maintaining ICT (hardware and software) throughout the education system.

Statement No. 40:

The MOE will adopt an explicit strategy for the decentralisation of technical support (including preventative maintenance), in order to efficiently service the needs of all users and computers in the education system.

Statement No. 41:

The MOE will encourage educational institutions to make available, with effective monitoring, ICT facilities to the community. Further, the Ministry will endorse the use of revenue generated from the use of these facilities for maintenance, upgrade and sustenance, as long as such use does not compromise access and the quality of services to the students.

Statement No. 42:

The MOE will establish appropriate mechanism for educators to undertake research and to evaluate the impact of ICT in the education system.

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7.0. APPENDICES

Appendix A: Regulatory Statements

(I) Software Acquisition, Use, Installation and Distribution Procedures

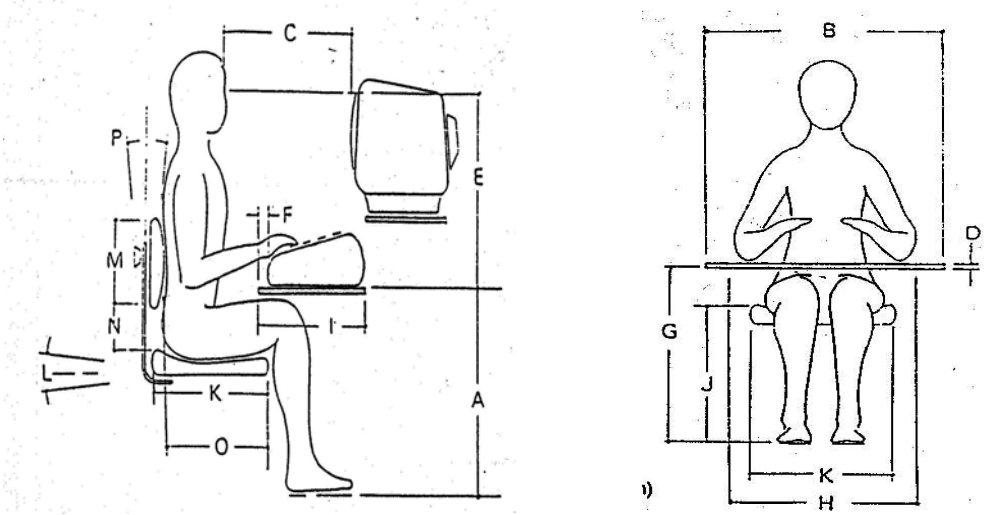
1. All requests for software and software upgrades shall be submitted to the School's Principal, where possible.
2. All software and software upgrades not procured by the Principal shall be documented and reported to the Principal, who will verify that the School has an appropriate license for the use of such bundled software.
3. All software acquisitions that are bundled with hardware shall be documented and identified to the Principal, who will verify that the School has an appropriate license for the use of such bundled software.
4. The Principal shall store in a secure, central location all original software licenses, diskettes, CD-ROMs, and documentation upon receipt of all new software.
5. No staff member shall install software on the School's computers without being authorized to do so by the Principal.
6. No staff member or students shall install, use or distribute software for which the School lacks appropriate license.
7. No staff member shall install any software upgrade on a computer that does not already have resident on it the original version of the software.
8. The Principal or designated staff member shall destroy all copies of software that are obsolete or for which the school lacks the appropriate license. Alternatively the Principal may obtain the license(s) necessary to maintain such software on the School's computers.
9. The School shall conduct an inventory and review of all its hardware and installed software on a periodic (at least annually) and random basis.
10. The School shall establish and maintain a record keeping system (preferably computerized) for software licenses, hardware, original CD-ROMs and diskettes, user information and assessment information.
11. No staff member may use or distribute personally owned software (excluding freeware and sharewares) on the School's computers or networks.

12. All software to be used in schools must first be evaluated by the software Evaluation Team.

(II) Acceptable Use of On-Line Information Resources Guidelines

1. All use of school Local Area Networks (LANs) and Wide Area Networks (WANs) including access to the Internet must be consistent with the educational mandate of the School.
2. Any use of the Internet by students and teachers for commercial purposes, without authorization by the Principal, is prohibited.
3. Network accounts are to be used only by the authorized owner of the account. The sharing of passwords is prohibited.
4. All network/Internet users shall not seek information on obtaining copies or modified files, data or passwords belonging to other users, or misrepresent other users on the network/Internet.
5. All information accessible on the Internet shall be assumed to be private property. All copyright issues regarding software information and copyrights must be respected. The unauthorized copying or transferring of copyrighted materials may result in a loss of network privileges.
6. Malicious use of the network to develop programs that harass other users; infiltrate a computer or computer system and/or damage the software components of the computer or computer system (locally or on the Internet) is prohibited.
7. Fraudulent, harassing, offensive or obscene messages or materials and other anti-social behaviours are prohibited on the network/Internet. All users of the school network shall use language appropriate for school situations.
8. All programmes and files brought on the premises (downloaded or otherwise) must be examined for viruses before being used on any computer.
9. The access or downloading of inappropriate materials or files unsafe to the integrity of the Local Area Network is forbidden.
10. No student addresses, phone numbers or individual photographs linked to student names may be published under any circumstances.

Appendix B: Recommended Specifications for Computer Workstations[7]



- *A - Height of work surface*: adjustable 23 to 28 inches (584 to 711 mm)
- *B - Width of work surface*: 30 inches (760 mm)
- *C - Viewing distance*: minimum 12 Inches (305 mm); hard copy distance 12 to 16 inches (305 to 406 mm); typical eye to keyboard distance 18 to 20 inches (457 to 508 mm)
- *D - Thickness of work surface*: 1 inch (25 mm)
- *E - Height of screen*: Top of screen at approximately eye level (maximum 0 deg. to horizontal, or 0 deg. to – 60 deg.)
- *F - Palm rest*: 11/2 inches (40 mm)
- *G - Knee room height*: minimum of 26.2 inches (665 mm) non-adjustable surface;
- 20.2 inches (513 mm) adjustable surface
- *H - Knee room width*: 20 inches (510 mm) minimum
- *I - Knee room depth*: minimum of 15.0 inches (381 mm) knee level; 23.5 inches (597 mm) toe level
- *J - Seat height*: adjustable 16 to 20.5 Inches (400 to 521 mm)
- *K - Seat size*: 15 to 17 Inches (381 to 432 mm) depth, 17.7 Inches (450 mm) width, "waterfall" front edge
- *L - Seat slope*: adjustable O deg. to 10 deg. backward slope
- *M - Backrest size*: 7 Inches high (180 mm), 13 Inches wide (330 mm)
- *N - Backrest height*: adjustable 3 to 6 Inches (80 to 150 mm) above seat
- *O - Backrest depth*: adjustable 14 to 17 Inches (350 to 430 mm)
- *P - Backrest tilt*: adjustable ± 15 deg.
- *Other* - Angles between back rest and seat 90 deg. to 105 deg.; between seat and lower leg 60 deg. to 100 deg.; between upper arm and forearm 70 deg. to 135 deg.

[7] Source (TBD)

Appendix C: Policy Development Framework