

Ilmudeen, A.

Importance of Information and Communication Technology (ICT) Curriculum in Government School of Sri Lanka: A Critical Review of Educational Challenges and Opportunities

MIS Unit, Department of Accountancy & Finance, Faculty of Management and Commerce, South Eastern University of Sri Lanka (email: ilmudeen16@gmail.com)

Abstract

Information and Communication Technology (ICT) acts as a significant tool in achieving vital goals in education sector. The development of ICT is a major objective under Sri Lanka's development vision of becoming the "Emerging Wonder of Asia" as outlined in the Mahinda Chintana 2010 – vision for the future. The research objectives are to explore (1) the importance of the ICT curriculum for the government schools in Sri Lanka (2) find the educational challenges and opportunities for ICT education in Sri Lanka. This research is primarily qualitative in nature, where the survey conducted based on the analysis of previous research papers, extensive literature surveys, previous survey reports and government publications on the above context. The importance of ICT curriculum in government school analyzed and presented using Bennett's Hierarchy 7 steps model such as *Inputs, Activities, Participants, Reactions of participants, Changes in knowledge, Practice change, End results*. Lack of computer laboratory and cost of devices, lack of qualified ICT teachers, less motivation towards ICT among school children, require more funds for the implementation and maintenance of computer laboratories, inadequate knowledge in English (language barrier), ICT is not a major subject in the school curriculum, no National Level Certification for ICT for students were identified as a challenges and rising demand for the ICT sector career, high literacy rate of the citizens, properly established and scattered schools provide easy access to the school community, public – private sector partnership, government and INGOs projects

were identified as opportunities for the ICT implementation.

Key words: Information Communication Technology, Curriculum, School

Introduction

Since the mid-1990s, the Sri Lankan government has provided teacher education institutes with special facilities to play a pioneering role in the integration of ICT in education. Since 2000 there has been a big push to introduce computers into schools and integrate ICT into the education curriculum through a range of initiatives. The governments' policy has focused especially on teacher education institutes because they are responsible for the education of tomorrow children. These teachers must be able to prepare young people for the knowledge society in which the competency to use ICT to acquire and process information is very important. Information and knowledge have become increasingly important in the contemporary globalized economy, as advancement in ICTs has enabled larger amounts of information to circulate at a much higher speed and at lower cost. Sri Lankan government views ICT as a key tool for transforming the economy, with the education sector playing an important role in developing the necessary human resources. Government objective is to embed ICT into primary and secondary education, vocational training and adult education as well as the teacher training colleges. In addition higher vocational training and tertiary education at university

level have received an ICT stimulus. Further the future of the education shall be reached in e-learning with the adoption of ICT. Though Sri Lankan government made several attempts in ICT education programmes, it has not been reached the expected results. According to the Department of Census and Statistics data in 2011 in Sri Lanka about 4,214,941 students enrolled in 9,715 Government schools and 716 Pirivenas. These schools contain a teaching force about 223,574. The government spends 2.8% of GDP for education amounting to Rs 14 billion.

Introducing ICT into the school curriculum, the Ministry has developed two approaches such as (1) ICT as a subject (2) ICT as a tool in learning and information handling. One of the key achievements of this programme is the introduction of General Information Technology (GIT) as a common subject for Grade 12 students in the GCE Advanced Level. The National Examination for GIT held first time on 21st August 2005. The examination will be conducted by the Department of Examinations Island wide. More than 80,000 students have applied for this examination. Most of the work has been completed to introduce ICT as a technical subject in GCE (O/L) commencing January 2006. The necessary planning has been completed to introduce ICT into Junior Secondary (Grades 6-9) and primary (Grade 1-5) levels. These programmes follow the policy framework approved by the Government in 2001 and various programmes such as teacher training, electronic education content development, ICT students associations and various other initiatives are in action to support them. On the other hand the circular 2004/20 of Ministry of Education, Sri Lanka mentioned that there should be a basic requirement to conduct ICT education in government school such as

- a minimum of four computers.
- one teacher with sufficient subject knowledge and training.
- a secure room (laboratory) with electricity supply.
- sufficient furniture.

Table 1 : Public Schools By Type Against Student & Teacher Information

No.	Type	Type of Schools						Total		
		1AB		1C		Type 2			Type 3	
Schools		659	7%	1,854	19%	4,225	43%	2976	31%	9,714
Students		1,191,030	30%	1,250,235	33%	1,057,071	28%	338,214	9%	3,836,550
Teachers		54,111	26%	63,962	31%	67,532	34%	19,312	10%	204,908
Stud/Teacher Ratio		25		22		17		19		19

Source : ICT in Education in Sri Lanka - Secondary Education Modernization Project, Ministry of Education

Computer Literacy in Sri Lankan context

The rapid developments in ICT have greatly contributed in enhancing human living standards as the advanced capability of the technology facilitates with extremely efficient collaboration and access to correct, consistent and effective information worldwide. According to the last survey report from census and statistics released in December 2009, Sri Lankan Computer Literacy rate is as follows.

Table 2 : Computer literacy (Percentage) of population aged 5 – 69 years by Sex, Age, Level of education - 2009

Sex, Age group, Educational attainment	Computer Literacy (%)
Sri Lanka	20.3
By Sex	
Male	22.0
Female	18.7
By Age Group(Years)	
5-9	10.2
10-14	31.5
15-19	47.6
20-24	40.6
25-29	27.7
30-34	19.4
35-39	15.6
40-49	10.3
50-59	6.4
60-69	2.8
By Educational Attainment	
No Schooling	1.2
Below Grade 6	7.1
Grade 6-10	13.7
G.C.E (O/L)	33.4
G.C.E (A/L) / Above	59.7

Source: Department of Census and Statistic, Computer Literacy in Sri Lanka - 2009

On the other hand Sri Lankan government has initiated several projects with the participation of large agencies such as UNDP, World Bank, ADB, USAID, private sector organization and NGO organization. These initiatives include wide range of ICT programs and projects with the aim of IT infrastructure and rural ICT skill development. Those are as follows in brief. *e-Sri Lanka initiative* - The goal of the e-Sri Lanka initiative is to use ICT to develop the economy of Sri Lanka, reduce poverty and improve the quality of life for people. *Nanasala Project* - The Nanasala project is focused on bridging the digital divide exactly means “knowledge center.”. Under this project, NGOs, private companies and individual entrepreneurs apply to ICTA to establish a Nanasala. Once selected, ICTA provides the organization/entrepreneur with computers, a printer, a scanner, telephone/fax, photocopier and a VSAT internet connection for 4 years, free of cost. The Nanasala provide people access to the internet, to other ICT services, and training. *e-Government Initiative* - This program is designed to provide citizen services in an efficient way by improving the way government works, by re-engineering and technologically empowering government business processes. The key citizen service areas identified are: eMotoring, ePension, eCitizen ID, eForeign Employment, Ministry of Public Administration and Home Affairs. The goal of this project is to develop ICT solution for DSs to carry out all these citizen oriented functions in a more efficient and transparent manner.

Table 3 : Comparison of Sri Lankan ICT Curriculum With Edexcel

G.C.E A/L Grade 12 & 13 ICT Syllabus	Edexcel GCE A Level Applied ICT
Competency 1: Explores the basic concepts of ICT together with its role and applicability in today’s knowledge based society.	Unit 1 : The Information Age
Competency 2: Explores the evolution of	Unit 2 : The Digital Economy

computers so as to be able to describe and compare the performance of a modern computer.	
Competency 3: Investigates how data are represented in computers and exploits them in arithmetic and logic operations.	Unit 3 : The Knowledge Worker
Competency 4: Uses Logic Gates to design basic Digital Circuits and Devices in Computers.	Unit 4 : System Design & Installation
Competency 5: Uses Memory Management to improve performance of a Computer.	Unit 5 : Web Development
Competency 6: Uses Operating Systems to manage the overall functionality of computers.	Unit 6 : Technical Support
Competency 7: Uses Programming Languages to program computers to solve problems.	Unit 7 : Using Database Software
Competency 8: Explores the use of Data Communication & Computer Network Technologies for effective communication of data & voice and resource sharing.	Unit 8 : Managing ICT Projects
Competency 9: Designs and develops database systems to manage data efficiently and effectively.	Unit 9 : Communications & Networks
Competency 10: Develops websites incorporating multi-media technologies.	Unit 10 : Using Multimedia Software
Competency 11: Explores the systems concept and uses Structured System Analysis and design Methodology (SSADM) in developing Information Systems	Unit 11 : Using Spreadsheet Software
Competency 12: Explores applicability	Unit 12 : Web Management

of ICT to today's business organizations and the competitive marketplace	
Competency 13: Explores new trends and future directions of ICT.	
Competency 14: Designs and Implements a simple Information System as the Project.	

The above comparison shows that, the Edexcel ICT curriculum is more specific and consist core subject areas for G.C.E A/L 12 & 13 grade students than Sri Lankan ICT syllabus. Today the industry trend is to more specifically development oriented. Therefore when introducing ICT in government school the curriculum should cover the fundamentals of programming, software engineering concepts, software development concepts. Further the reason for the Edexcel ICT curriculum's recognition in worldwide is it gives the chance to acquire competence, ability and critical skills through the implementation, use and evaluation of a range of ICT knowledge areas. It shows that, there are more room exist for the improvement in Sri Lankan ICT syllabus.

Objective of the research

This research has the following two objectives such as

- To explore the importance of the ICT curriculum for the government schools in Sri Lanka
- Find the educational challenges and opportunities for ICT education in Sri Lanka.

Literature Review

In successful world most of the economically effective countries are increasingly ICT dominant and therefore investing on ICT in the 21st century has become a compulsory requirement for a country to survive. Researchers referred few research articles. They were in different context in different countries and in different time frames. For example Nurit Zaidman et al (2008) conducted a research on “Challenges to ICT implementation in multinationals” and

Vachara Peansupap and Derek H.T. Walker (2006), “Information communication technology (ICT) implementation Constraints A construction industry perspective”. But this research is in different perspective and it looks not only the ICT implementation challenges but also the opportunities in education sector. Pádraig Wims and Mark Lawler (2007) conducted a research on *"Investing in ICTs in educational institutions in developing countries An evaluation of their impact in Kenya"* and concluded that there should be a immediate development in terms of infrastructure, staff training, private collaboration and internet connectivity. Chandima H. de Silva (2009) did a research on *"ICT Curriculum in Sri Lankan Schools: A Critical Review"* and compared the current ICT curriculum and analyzed the minimum input requirement for introducing ICT curriculum in Sri Lankan schools. Palagolla W W N C K and Wickramarachchi A P R found on their research ICT infrastructure, leadership support and school planning are revealed as major organizational constraints for the effective integration of ICT in schools.

Methodology

Basically this research is qualitative in nature where the researcher conducted a extensive literature survey of previous research papers, journal articles, previous survey reports and government publications on the above context. Secondary sources of information were used for the data collection such as government publication and census department reports. The importance of ICT curriculum in government school analyzed and presented using Bennett’s Hierarchy 7 steps model such as *Inputs, Activities, Participants, Reactions of participants, Changes in knowledge, Practice change, End results*. Previously the researcher conducted a research title *"Implementing e-learning : Challenges and Opportunities in Ampara District "*. The above paper's findings inspired the researcher to extend the scope of the research and explore more on the above context.

The seven stages of Bennett’s Hierarchy of Evidence can be summarized as follows in the context of ICT curriculum in government school in Sri Lanka :

Table 4: seven stages of Bennett’s Hierarchy

1. Resources	Human resources e.g. consultant, coordinators, syllabus review committee, ICT advisors, computer laboratories, funds and related infrastructure.
2. Activities	Formulation of ICT policy , development of curriculum, evaluation methods, acquisition of ICT skills and competencies, subject matter taught, methods delivery.
3. Participation	Number of teachers and students in the school, teachers and students involvement in the ICT subject, students interest towards ICT subject, intensity of exposure to programme etc.
4. Reactions	Reaction of teachers in terms of degree of interest, as well as positive or negative feelings toward ICT integration in teaching and learning, students positive / negative interest towards ICT subjects
5. Learning	Change in knowledge, attitudes and skills acquired, aspirations, ambitions and hopes in relation to students’ and teachers’ understanding of the importance of ICT integration in teaching and learning. student’s hope and future plan towards the job market and higher studies, ICT teacher’s interest towards their higher studies and professional qualifications
6. Actions	If the target audience is students, evidence of their ability to search and use ICT information or teachers actually integrating ICT in teaching using various software, type of materials used for the teaching, usages of online library catalog and electronic materials for the students learning
7. Impact	Represents end results, impact or benefit of a programme e.g. improvements in quality of teaching and learning, better academic performance, positive impact on national development, achievement of national educational goals. ICT skilled labour force

Students are keenly interested in learning ICT since this subject is related to practical aspects. Students pay more attention than

others subjects because other subjects are related to theories and memorizing as a contents. Economic factors are those which are necessary for the implementation of ICT. This covers cost incurred for the ICT projects. These cover price for ICT equipments, financial ability to purchase ICT infrastructures such as.

1. Hardware cost: Purchasing cost of Monitor, CPU, Printer, Scanner, network switches and hub, keyboard, mouse, headset, network cables, other peripheral devices.
2. Software cost: Purchasing cost of Operating System, Application Software
Ex : Office package, Animation and graphic software, Antivirus programs, Educational Learning software, server operating system, Driver software, etc.
3. Live ware cost: Teacher training and development, Workshops, Seminars, Short Courses, skills development.

Social factors cover ergonomics such as sophisticated Laboratory, user friendly software, tutorial demonstration sessions, video demonstration session with native language / sub title, comfortable hardware and furniture (adjustable monitors, rotating chairs), individual computers for practical sessions, separate PC, furniture, air condition laboratory, uninterruptable Electricity, lighting facility and favorable location of the ICT laboratory.

Challenges in implementing ICT in government Schools.

From this research the researcher indentified the followings challenges such as lack of computer laboratory and computers, lack of sufficient qualified ICT human resources, cost of computers and its devices, less motivation towards ICT among school children, lack of infrastructure necessary to disseminate literacy of ICT, require more funds for the implementation and maintenance of computer laboratories, lack of awareness on ICT among the adults /senior level officials, and parents, inadequate knowledge in English (language barrier), Information and Communication Technology is not a major subject in the School Curriculum, lack of monitoring mechanism for the programmes conducted to ensure compliance with national ICT policy, lack of development of content and

preparation of software in education to suit the national languages and the culture, no National Level Certification for ICT for students, lack of Plan and implement in a suitable methodology for the maintenance of computers and the computer laboratory, Schools without electricity facility in rural areas. It is obvious that, there is a great inequality in the distribution of educational ICT resources between the urban and rural schools. In Sri Lanka there should be a massive reform should be undertaken in the telecommunication sector in the area of internet connectivity. In the school level some of the burning issues should be solved immediately such as ICT staff training needs, include ICT as a main subject in the curriculum, computer laboratory with sufficient computers and equipment for the students and staff. Most of the rural area government schools facing lack of communications infrastructure. Most of the ICT materials, notes, books are available in English, without teaching English will always limit students from fully accessing the immense resources available via the internet. Specially in Sri Lankan government schools, there is a large gap between urban and rural areas in terms of infrastructural facilities, qualified teaching force, standard of training programmes, teaching manuals, study materials. Weaknesses in ICT curriculum, evaluation and appraisal systems, continuous supervision and follow up, policy and administration weaknesses, language barriers and low public awareness are the major challenges in implementing ICT education.

Opportunities of implementing ICT in Sri Lankan Government Schools

Contribute to the High literacy rate of the citizens (92 %), properly established and scattered schools provide easy access to the school community which helps to deliver the skills, provide Public - Private sector partnership, Rising demand of the career opportunities in ICT sector, the rising demand for the IT skilled workers in future. While the number of ICT-related jobs are growing in Sri Lanka and becoming knowledge hub in Asia strengthening ICT education in government school would create much job opportunities even where student do not speak much English. Further there are plenty of IT jobs are available not only local country but also in foreign

countries too. Therefore uplifting ICT knowledge would help the students to continue their higher studies and professional courses in IT field to compete foreign job markets.

Possible Measures And Policies To Surmount ICT Implementation Issues

Providing ICT education for school students from Grade 3-13, Provide the necessary infrastructure to introduce ICT literacy at schools, Introduce Information and Communication Technology as a major Subject in the School Curriculum, Establish a management structure at the Ministry and Provincial levels to strengthen the capacities of ICT teaching in the school system, Establish a monitoring mechanism for the programmes conducted to ensure compliance with national ICT policy, Development of content and preparation of software in school education based on the languages and the culture, Introduce National Level Certification/ standardization for ICT for subjects, provide administrative and financial support to computer laboratories in the school system to strengthen their performance, Update curricula of ICT Education by the National Institute of Education, All teachers training on ICT Education to be planned and coordinated by the Ministry of Education and the National Institute of Education, Prepare and maintain national standards for ICT. Sri Lankan context introducing ICT to the school system is crucial for several reasons. Introducing ICT syllabus in school system is not just to introduce ICT subject for the student but it help the student's higher studies and the future career.

Table 5: Recommendation and ICT policy makers considerations

General Recommendation	Policy Makers Consideration
Build infrastructure facilities	<ul style="list-style-type: none"> • Provide schools with infrastructure necessary for disseminate literacy of ICT • Establish a management structure at the Ministry and Provincial levels to strengthen the

	<p>capacities ICT teaching in the school system</p> <ul style="list-style-type: none"> • Use ICT as a subject and as an aid for teaching and learning in all teacher education programmes • All teachers training on ICT Education to be planned and coordinated by the Ministry of Education and the National Institute of Education • Build infrastructure and streamline regulatory structure and process
Create the capacity to use technology	<ul style="list-style-type: none"> • Modernize suitable computer and English courses for the students • Develop CDs to easily learn English • Develop translation tools and applications • Design training programs to fulfill the student's IT and English needs
Create rural employment for youth	<ul style="list-style-type: none"> • Encourage private sector to invest in rural areas for ICT employment • Develop ICT-enabled enterprise initiatives in island wide for students • ICT based enterprise development programs focusing market linkage
Political and peace building	<ul style="list-style-type: none"> • Develop information resources on

	<p>employee's and employer's rights, laws, wages...etc</p> <ul style="list-style-type: none"> • link government initiatives such as ICTA to develop forum to citizen development • Develop program for Tamil to learn Sinhala and vice versa
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Conclusions

Information & Communication Technology (ICT) has become the state of the art technology of the contemporary world. In this information era, we must consider global changes and the demand of stakeholders in education in Sri Lanka. This knowledge-based economy is endlessly and rapidly changing the world, where people often change their jobs and the way of life. Distribution of physical resources and use of human resources, revised ICT curricula enhancing practical component, usage of distance learning methods to increase ICT penetration among students, continuous and ongoing training system are essential for the ICT implementation in Sri Lankan government schools. Since Sri Lanka is in the early stages of introducing ICT to lower grades, the present syllabus does not demand any ICT knowledge as an entry requirement. Therefore, this syllabus is intended to introduce ICT as a technical subject to be offered at the G.C.E (O/L). The main objective of this syllabus is to develop the competencies to use the ICT tools and to build a basic theoretical base for students to pursue higher studies in ICT. This research highlights lack of computer laboratory, cost of devices, lack of ICT skilled teachers, less motivation on ICT among students, high cost of implementation and maintenance of computer laboratories, language barrier, no national level certification for ICT for students were identified as a challenges and rising demand for the ICT sector careers, high literacy rate of the citizens, properly established and scattered schools provide easy access to the school community, public – private sector partnership, government and INGOs projects, new ICT initiatives were identified as opportunities for the ICT implementation in Sri Lankan government schools.

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