

Guidelines for Schools **ICT Hardware Specifications**



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA



Published by the Department of Basic Education
222 Struben Street
Private Bag X 895, Pretoria, 0001

For Enquiries:
Mr Phil Mnisi (Director: Curriculum Innovation and e-Learning)
Email: Mnisi.p@dbe.gov.za
Tel: 012 357 4017
Fax: 012 321 2490
website: www.education.gov.za

©Department of Basic Education – August 2012 (All rights reserved).
For use in publication please obtain the written permission of the Department.
ISBN: 978-1-4315-1553-0



CONTENTS

CONTENTS	2
Foreword	4
1. Introduction	5
1.1 Scope	5
2. Strategic issues	8
2.1 Schools funding for ICT	8
2.2 Sources of funding	8
2.3 Standardisation	9
3. ICT requirements	12
3.1 Functional profiles	12
3.2 ICT requirements analysis	13
3.3 Computer laboratory deployment model	15
3.4 Donated and refurbished equipment	16
4. Recommendations for ICT in schools	17
4.1 Computers	17
4.2 Peripheral equipment	24
4.3 Software	28
4.4 General recommendations	30
5. Conclusion	32
Annex A: Glossary	33



Figures

Figure 1:	<i>ICT House of Value</i>	11
Figure 2:	<i>User requirements process</i>	13
Figure 3:	<i>Typical school ICT lab</i>	19
Figure 4:	<i>Desktop PCs</i>	20
Figure 5:	<i>Notebook, Netbook and Tablet PCs</i>	22
Figure 6:	<i>Thin client computer mounted on back of LCD monitor</i>	24
Figure 7:	<i>Server</i>	24
Figure 8:	<i>Laser and inkjet printers</i>	26
Figure 9:	<i>Data/video projector</i>	27
Figure 10:	<i>Interactive whiteboard</i>	28
Figure 11:	<i>e-book reader</i>	29
Figure 12:	<i>Document camera/visualiser</i>	29

Tables

Table 1:	<i>Desktop PC configurations</i>	21
Table 2:	<i>Portable PC configurations</i>	23
Table 3:	<i>Server configurations</i>	25
Table 4:	<i>Printer configurations</i>	27
Table 5:	<i>Projector configurations</i>	28



FOREWORD BY THE DIRECTOR-GENERAL

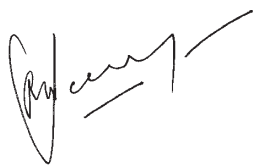
The White Paper on e-Education calls for the development of Guidelines for Schools Information and Communication Technology (ICT) Hardware and Software Specifications and for the update of such guidelines whenever necessary in order to keep pace with the evolving technology. The Department first published the Guidelines for Schools ICT Hardware and Software in 2008. I am pleased to introduce this updated edition that is intended to reflect the rapidly changing ICT developments in order to ensure that quality standards in ICT technologies are maintained in our schools.

The importance that the Department of Basic Education places on e-Education is reflected through the Action Plan to 2014: Towards the Realisation of Schooling 2025, the Department's long term strategy to achieve quality education. The role of ICT in education cannot be overemphasized in our quest for quality teaching and learning for all our teachers and learners. The Action Plan highlights the need for teachers to be computer literate and to ensure that our learners have increasing access to a wide range of media, including computers that will enrich their education.

Schools need ICT equipment but this often is hampered by the shortage of funds. The Department of Basic Education is working to address these through several initiatives, including enabling cost-effective procurement, researching appropriate technologies and providing guidance to the Provincial Education Departments regarding the effective deployment and use of affordable ICT. The Department is also working closely with the private sector to invest in ICT for education.

However, we need to ensure that the ICT equipment that reaches our schools meets the appropriate ICT standards, in order that our learners and teachers may optimally benefit. We cannot waste valuable resources on obsolete or inappropriate ICT equipment and software.

I trust that this publication will be a useful guide for the National and Provincial Departments of Education, other Government Departments, as well as our partners in the private sector who wish to dispose of ICT equipment to schools. It should also be used by schools themselves who have access to funds to purchase ICT equipment.



MR PB SOOBRAYAN
DIRECTOR-GENERAL

DATE:



1. Introduction

The White Paper on e Education (September 2004) states that the introduction of Information and Communication Technology (ICT) in schools creates new ways for learners and teachers to gather and analyse information. According to the paper, ICT can also enhance management and administration in schools.

This document is the second approved version of the Guidelines for Schools ICT Hardware and Software for Department of Basic Education. The document is updated in response to a tasking received from the Department to address changing needs in schools and Government. This is part of the process identified originally, which required that the specification must be updated regularly to reflect changes in technology and the environment.

During the research phase of the project, it was clear that only minimum standards should be set, which are recommended for implementation in all provinces. This leaves opportunity for provinces to exceed the specifications depending on maturity, funding and requirements. As with the King Code of Best Practice, where schools do not adhere to these norms and standards, they will be required to motivate why the recommended practices were not followed.

1.1 Scope

This document defines minimum norms and standards for the following elements:

1.1.1 Hardware

- a) Computing needs:
 - i) Desktop computers
 - ii) Mobile computers (notebooks, netbooks, tablet PCs)
 - iii) Integrated/combination systems (PC and projector)
 - iv) Servers
- b) Peripheral needs:
 - i) Printing
 - 1) Monochrome (black and white)
 - 2) Colour
 - 3) Multifunction printers (MFPs)
 - ii) Data/ video projectors
 - iii) Interactive whiteboards

- iv) Document cameras/ visualisers
 - v) e-Book readers and tablet devices (media consumption)
- c) Connectivity:
 - i) Switches
 - ii) Routers
 - iii) Cabling
- d) Data backup and disaster recovery
- e) Disposal of equipment
- f) Refurbished equipment

1.1.2 Software

Software specifications will include both proprietary and open source versions where applicable.

- a) Operating systems
- b) Desktop application software:
 - i) Office suite:
 - 1) Word processor
 - 2) Spreadsheet
 - 3) Presentation
 - ii) Database
 - iii) Web browser
 - iv) e Mail, calendar and contacts
 - v) PDF reader
- c) Learning management systems
- d) Logical security (access control, firewall, viruses, hacking, security software, content filtering software)

1.1.3 LSEN requirements (special-needs schools)

The following disabilities have been categorised by DBE:

- a) Visual impairment



- b) Deaf and hard of hearing
- c) Cerebral palsy
- d) Chronic illness or health condition (hospital schools)
- e) Challenging behaviour (school of industry, reform school, clinic school)
- f) Specific learning disability
- g) Mild and moderate intellectual disability (schools of skill)
- h) Neural disorder
- i) Physical disability
- j) Severe intellectual disability

All of these disabilities can conceptually be addressed via ICT solutions. While initiatives are underway to standardise methods of handling users with disabilities, a detailed discussion of this is beyond the scope of this document.

1.1.4 Exclusions

The following aspects were excluded from this version of the document, and will be addressed in subsequent iterations:

- a) WAN connectivity
- b) Physical security of the equipment (access control, physical protection of devices and internal components)
- c) Facilities to accommodate the equipment
- d) Environmental issues such as humidity, dust, heat, cabling, etc.
- e) Personnel aspects
- f) Community involvement
- g) Specialised schools (e.g. technical or art, with intensive computing requirements such as CAD and music composition)

2. *Strategic issues*

Given that South Africa has between 25 000 and 27 000 schools in 9 provinces, it is clear that policies, methodologies, standards and accountability structures will vary within the environment. Issues such as funding, asset management and standardisation should ideally be dealt with at national level.

Over time it is expected that the Department of Basic Education will provide further guidelines on the matters raised in this section. Until then provinces should take responsibility by setting provincial guidelines. This section provides a short overview and some recommendations with regards to several strategic issues.

2.1 *Schools funding for ICT*

The urgent requirement for ICT in schools is evident from the enormous demand for computer resources. However, an equally serious issue is the shortage of funds to deploy ICT in schools. The Department of Basic Education is trying to address this via several initiatives, including enabling cost-effective procurement, researching appropriate technologies, and providing guidance to the PED regarding the effective deployment and use of affordable ICT.

A policy for containing operational costs associated with ICT equipment must be formulated at provincial level. This policy should address matters such as consumables (paper and ink), electricity, and maintenance and support.

2.2 *Sources of funding*

There are different methods by which schools can acquire ICT equipment:

- a) Procured using provincial funds (i.e. regulated by the PFMA).
- b) Procured directly by schools and controlled by school governing bodies (funds not governed by National Treasury).
- c) Donated to schools by other Government departments (typically older systems that have been written off).
- d) Private donations also contribute to school ICT infrastructure.

Each of these methods has different implications regarding ownership, and hence asset management for schools and PEDs (Provincial Education Departments). Typically school governing bodies will take responsibility for equipment bought via school funds or via private sector donations. However, the PED is



responsible for setting asset management guidelines for equipment transferred from other Government departments, as well as those procured by provinces and schools.

2.3 Standardisation

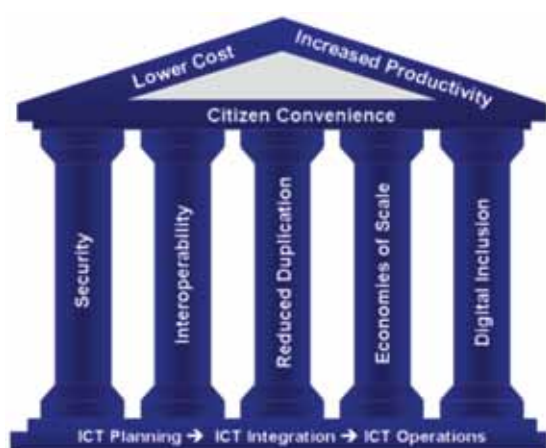


Figure 1: ICT House of Value

This section describes the process to be followed to arrive at appropriate ICT standards for schools under the auspices of DBE.

2.3.1 Definitions

Standardisation helps Government to realise the ICT House of Value, which includes economies of scale, interoperability, reduced duplication, and security. Standards can be specified and implemented at various levels, including the following:

- a) **Open industry standards (de jure):** These include standards such as TCP/IP, HTML, PCI, USB, etc. These standards are required for basic interoperability in the ICT world. The repository for interoperability standards in Government is the Minimum Interoperability Standard (MIOS).
- b) **Generally-accepted vendor standards (de facto):** These are not open standards, but they are so widespread that the industry needs to conform to them. Environments and applications such as MS Windows and MS Office may be included here. These standards also enable interoperability, but more by virtue of their wide deployment (Windows is estimated at >95% penetration) than inherent superiority.

- c) **Configuration standards:** This is where an organisation decides on a specific configuration of device per functional profile. Configurations should primarily be informed by business needs. This standard can be used as a procurement and communication tool within the organisation. For example, configuration standards are used by LSEN schools who standardise based on school type (e.g. embossers for blind learners). As another example, a single master hard drive image to all PCs can be provided, ensuring consistent deployment of software.
- d) **Product standards:** Configuration standards can be taken to the next level where an organisation selects a standard brand and model that conforms to the stated configuration requirements. This can ease the burden associated with ICT operational issues such as procurement, support, logistics and maintenance. For example, maintaining several different product standards is more expensive in terms of managing software configurations.

Within the framework of the MIOS this document will focus on establishing configuration standards.

2.3.2 Functional profiles

An important tool in defining user requirements for any organisation is the concept of functional profiles. A functional profile describes the basic functions of a user (e.g. teacher or learner), which in turn informs the ICT requirements in terms of software, after which the hardware required to run the applications can be specified.

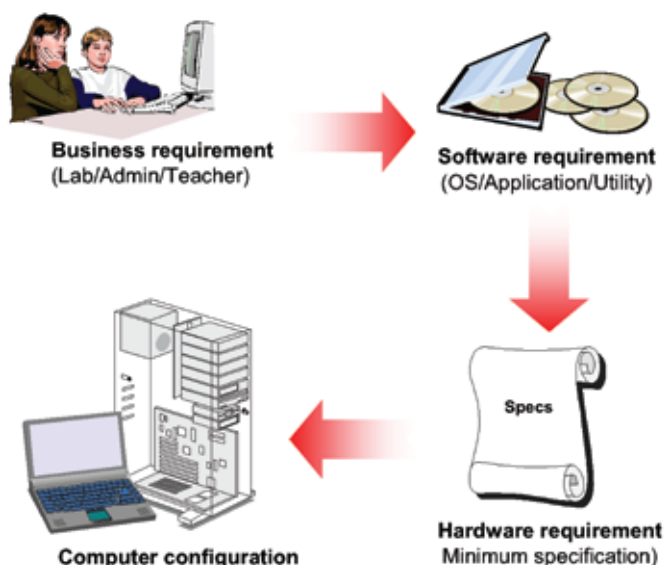


Figure 2: User requirements process



For example, a school administrator, whose primary function is typing correspondence and updating the EMIS system, would require a word processing application, EMIS software, an operating system (OS) to support these packages. The combined size requirements for the OS and applications are then used to define the minimum configuration of a PC that will support the administrator function.

Computer users in schools typically also require a web browser and e mail/sched-uling tools. These should therefore be included as a minimum standard for all functional profiles.

The diagram illustrates the process followed to arrive at a hardware specification per functional profile. It shows that the starting point should not be the technology, but the business requirement, classified per job type. The business requirement (not job level, department or status) determines software requirements, which in turn inform the final PC configuration.

The ultimate purpose of this process is to lower Total Cost of Ownership by only deploying hardware that supports the business need. Implementing a “one-size-fits-all” approach in terms of computer hardware will either be (1) very expensive, in that the biggest system is deployed everywhere; or (2) insufficient for some requirements when only the smallest system is deployed.

2.3.3 Functional requirements for Basic Education

Inputs used to guide the development of applicable norms, standards and configurations for schools include:

- a) A list of functions required by the Department in the various environments (e.g. Admin, CAT Lab, etc.)
- b) A list of software applications required by each function (e.g. e mail, browser, office suite, etc.)
- c) Functional profiles based on these functions and software requirements (e.g. High-end Lab, Low-end Lab, Admin, etc.)

3. *ICT requirements*

Two major areas of ICT requirements are identified by DBE: Classroom/Lab and Administration/Management. The Classroom requirements identify different types of computer configurations, which will be elaborated on below.

- a) Classroom / computer laboratory requirements:
 - i) Computer Application Technology (CAT) and Information Technology (IT) Labs
 - ii) Computing in classroom and libraries (curriculum integration)
 - iii) Mobility requirements for teachers
- b) Administration/management requirements:
 - i) Computers for office personnel
 - ii) Computers for management
 - iii) Computers for teacher use (including the Teacher Laptop Initiative)
- c) Printing requirements
- d) Presentation requirements
- e) Media requirements

Each of these requirements are expanded and analysed below.

3.1 *Functional profiles*

3.1.1 *Classroom or lab requirements*

PCs are required to teach IT and CAT subjects at FET level (Grades 10, 11 and 12). Provinces currently aim to provide at least one computer lab to each school, and make it available from Grades R through 12.

However, even if this is achieved, it will not be sufficient to address the available computer requirements for CAT and IT together with curriculum integration, given the available computer time to be shared among hundreds of learners per school.

The Teacher Laptop Initiative is currently operational. This will enable teachers to prepare lesson material and exam papers when away from the school.



3.1.2 School administration requirements

PCs used for school administration and/or management must support several functions, including liaison/communication at school and district level, e mail, statistics, day-to-day management of school (e.g. report cards, SA SAMS, finances, attendance, EMIS), etc. For security reasons, this equipment must be on separate segments of the network. Separate virtual circuits may be required on the network, as teachers need access to resources and systems that must not be available to learners, and additional protection is required against viruses and other malware.

3.1.3 Peripheral requirements

Schools generally have a basic requirement to print both monochrome and colour documents. Printers must be connected on the network as to obtain maximum access for both learners and teachers. Teachers should be able to print to printers located on both the secure education network side and learners will only be able to print to printers on the unsecure side. It is vital that access to printing resources be controlled to contain printing costs. In general terms, printing colour can be four times more expensive than monochrome.

In addition to printing, there are requirements for projecting data and video, displaying physical objects via the projector, using interactive whiteboards and tablets/e-book readers.

3.1.4 Electricity supply

The lack of electrical power at many rural schools is an important factor. These environments would obviously have difficulty establishing and maintaining ICT infrastructure without sustainable alternative forms of energy (e.g. high-capacity solar circuits). In some cases, learners miss their once-a-week computer class due to power failures. Energy-efficient technologies and alternative energy sources need to be investigated and implemented where practical.

In most instances older equipment is far more power-hungry than modern or optimised devices. Ironically, donated or refurbished equipment is therefore often the least suited equipment for schools in poorer areas with insufficient infrastructure.

In rural schools the power supply is often not stable, and to protect ICT equipment, a UPS is recommended. This is an important consideration for servers which store data and shared resources.

3.2 ICT requirements analysis

Based on the functional profiles described above, school requirements can be categorised as follows.



3.2.1 Hardware

Given the observed schools ICT environment, the following hardware devices are typically required.

- a) PCs: mostly fat clients are deployed currently in schools, but some provinces are considering “thin clients” due to cost constraints.
- b) Printers: mostly monochrome use at this stage.
- c) Servers: mostly high-end PCs that are used as servers to share resources (e.g. optical drives).
- d) Peripherals:
 - i) Printers (mono, colour and multi-function)
 - ii) Projectors
 - iii) Interactive whiteboards
 - iv) Document cameras/visualisers
 - v) e-Book readers and tablets

3.2.2 Software

The following software has been confirmed to be in use in schools:

- a) Subject-specific educational titles
- b) Office suites (word processor, spreadsheet, presentation and graphic applications)
- c) Custom applications (developed for a specific school/provincial requirement)
- d) Operating systems
- e) Web browsers
- f) e-Mail programs
- g) Utility programs, including security and anti-virus



- h) Development tools (e.g. Visual Basic, Delphi or Java for IT teaching)
- i) Class/computer laboratory management: multi-cast and remote control software

The majority of schools in South Africa subscribed to the Microsoft Schools agreement, which included the following applications at no cost: Word, Excel, PowerPoint, Publisher, Visio and Access. However, the Schools Agreement came to an end in June 2010, and the benefits of this contract is no longer available.

3.2.3 Network

Network connectivity is an obvious requirement for all schools. However this document will not focus beyond documenting the current LAN infrastructure.

- a) Cabling in schools conform to the Category 5e or Category 6 standard in general.
- b) Cabling should preferably be done by local BEE/SMME organisations to stimulate the local economy.
- c) Ethernet switches should support 100 megabits transmission to clients, with a gigabit-speed uplink to the local server.
- d) Wireless LANs can be considered for the classroom part of the network, while security risks dictate that admin systems remain on wired networks.
- e) Schools should be “ring-fenced” by deploying 2 separate virtual private networks (VPNs) for school administration and laboratories. These can be connected to the SITA Next Generation Network (NGN) to access additional value-added services in a secure environment. These can include firewall, update services and internet.
- f) Bandwidth requirements for schools can be divided into small, medium and large sites, with capacities ranging from 256Kbps, 512Kbps and 1Mbps respectively.
- g) A router must be implemented at schools, with capabilities similar to the Cisco 2921. This would include 2 Gigabit Ethernet ports, 256KB flash memory and 512MB RAM.

3.3 Computer laboratory deployment model

The following is a conceptual drawing of a school lab configuration. Labs typically contain between 20 and 30 PCs. Optional components include PCs for teachers (incl. Laptops), servers, projectors and internet access.

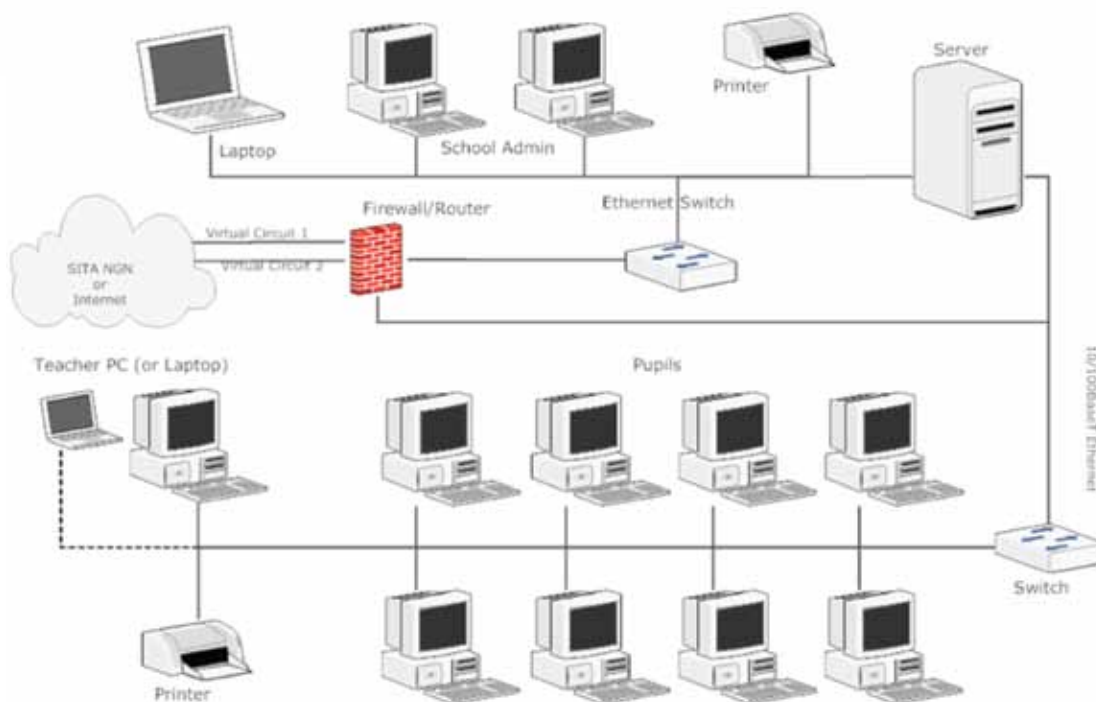


Figure 3: Typical school ICT lab

3.4 Donated and refurbished equipment

A typical problem experienced by PEDs is that schools get inundated with donations of outdated equipment that do not address educational requirements. This document will provide best practices and specifications for donated equipment to ensure that schools will be able to utilise such equipment effectively.

In addition the Department requires that existing regulations be followed for all donations. These are based on best practices as dictated by National Treasury.



4. *Recommendations for ICT in schools*

The ICT requirements identified above are mapped to a recommended system configuration below. In addition, general recommendations are made around policy and process issues.

Several different categories of equipment are available to fulfil the ICT requirements of the Department of Basic Education. These range from standard off-the-shelf solutions to refurbished equipment. A brief description and recommendation is provided for each of these categories. The final decision on which solution to deploy should be decided on a case-by-case basis.

Provinces may have a requirement for more capable systems, but this is not addressed by the above specification. All ICT systems and devices must be procured with a mandatory maintenance and support agreement to ensure availability of the system (ideally a 3-year on-site warranty).

4.1 **Computers**

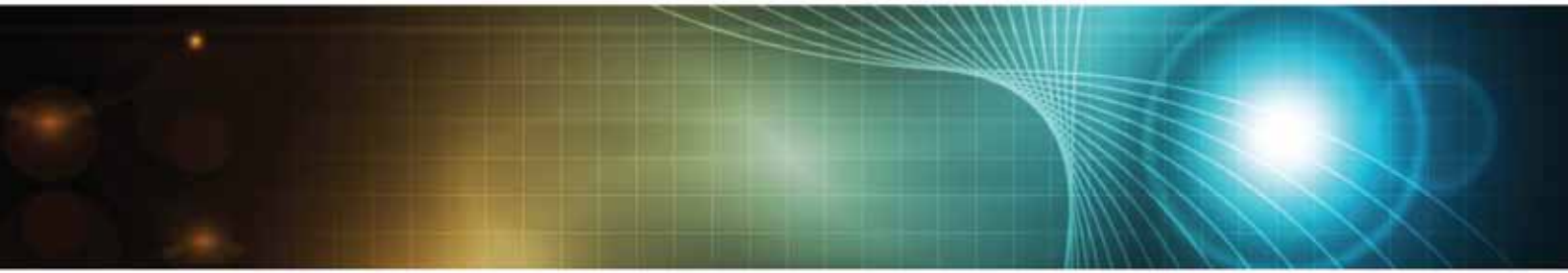
Schools must ensure that systems deployed for specific applications (e.g. CAD) must conform to the application's minimum requirements.

4.1.1 **Desktop PCs**



Figure 4: Desktop PCs

Desktop PCs are the standard computing platform used around the world. Around 90% of all computers in Africa today are desktop PCs, although a significant move is underway towards portable computers.



Currently, the split between new acquisitions of desktop and portable PCs is around 50/50 in South Africa. Large roll-outs of standard desktop PCs are currently in process in most provinces. These projects are at different phases of completion, and are managed at provincial level.

New desktop computers deployed in schools should conform to the following minimum specifications:

- a) Core2Duo 3.2GHz CPU (dual-core)
- b) 2GB RAM
- c) 320GB hard disk
- d) Integrated graphics controller
- e) 17" LCD monitor
- f) 1000Mbps Ethernet network card





Based on identified schools application requirements, the following configurations are recommended:

Requirement	Functional Profile	Typical Applications	Recommendation
CAT Lab	Basic computer application training primarily on productivity applications	Basic office applications (e.g. office suite, e mail, web browsing)	Basic PC (entry-level CPU, 2GB RAM, 320GB HDD, 100BT network card, 17" LCD monitor)
IT Lab	IT application training, including database, network hardware, etc.	More advanced applications (e.g. database) and training titles (e.g. network hardware)	Basic PC (entry-level CPU, 2GB RAM, 320GB HDD, 100BT network card, 17" LCD monitor)
Curriculum integration	Educational tools to teach standard curriculum subjects such as Geography, Maths, Life Science, etc.	Subject-focussed educational applications or titles, as well as browsing the web for research (e.g. Wikipedia)	Basic PC (entry-level CPU, 2GB RAM, 320GB HDD, 100BT network card, 17" LCD monitor)
School Admin	Day-to-day running of the school, including finances, communications, etc.	Office applications, e mail, web browser, financial applications, EMIS, SA SAMS	Advanced PC (midrange CPU, 2GB RAM, 500GB HDD, DVD-RW drive, 1000BT Network, 19" LCD monitor)

Table 1: Desktop PC configurations

4.1.2 Portable PCs



Figure 5: Notebook, Netbook and Tablet PCs

Portable PCs such as notebooks, netbooks and tablets are more convenient, since they can be carried around and used wherever the user needs a computer. However, they are usually significantly more expensive, not as powerful, and more difficult to support and maintain compared to desktop PCs.

Notebook PCs range in size from small units with 12" monitors to large, powerful systems with 17" monitors. By contrast, Netbooks are very small, with screens no larger than 10–11". Tablet PCs are relatively small, with 11-13" screens, and often have no keyboard, using only the included pen (stylus) as input device, along with handwriting recognition.

The minimum recommended configurations for portable PCs are:

- a) Notebook and Tablet PCs:
 - i) Celeron-M 2.2GHz CPU
 - ii) 1GB RAM
 - iii) 160GB hard disk
 - iv) Integrated graphics controller
 - v) 14" LCD monitor
 - vi) 100Mbps Ethernet network card
- b) Netbooks:
 - i) Intel Atom CPU
 - ii) 1GB RAM
 - iii) 160GB hard disk
 - iv) Integrated graphics controller
 - v) 10" LCD monitor
 - vi) 100Mbps Ethernet network card



Portable PCs should conform to the following minimum specifications:

Requirement	Functional Profile	Typical Applications	Recommendation
Teacher mobility	Produce teaching materials, papers and reports when away from school (e.g. at home)	Basic office applications (e.g. office suite, e mail, web browsing)	Basic laptop or tablet PC (entry-level CPU, 1GB RAM, 160GB HDD, 100BT Network, 14" monitor)
Netbook	Low-end applications, including communications (e-mail, web browsing, etc.)	Basic applications (mostly media consumption, not media creation)	Netbook PC (low-end CPU, 1GB RAM, 160GB HDD, 100BT network, 10" monitor)

Table 2: Portable PC configurations

4.1.3 Thin and low-cost clients



Figure 6: Thin client computer mounted on back of LCD monitor

This section describes a relatively new class of devices that will be available for procurement from a transversal contract from 2011. These include:

- a) Low-cost desktop clients (entry-level computers with a focus on small size and energy efficiency):
 - i) Desktops
 - ii) Laptops

- b) Thin clients (function could be supported by any kind of low-cost device, including refurbished equipment, but are usually specially-designed units):
 - i) Terminal Server-based solutions (using dedicated terminals)
 - ii) 1-to-many solutions (1 PC with several monitors and keyboards)

Compatibility, infrastructure and TCO must be taken into account on a case by case basis to ensure that that deployments of thin client architectures are cost-effective and viable. Budget constraints often force organisations to consider thin clients, as the solution appears more cost-effective at first glance. A thorough study needs to be done at provincial level to ensure that all factors are taken into consideration.

Significant research is still required in some of the low-cost categories before these solutions can be widely deployed.

4.1.4 Servers

Servers are used to share resources via a network, giving students and teachers access to information, documents, printers, etc. Servers deployed in schools must conform to the following specifications:



Figure 7: Server

Requirement	Functional Profile	Typical Applications	Recommendation
Share IT resources	Provide access to shared resources such as storage, printing, optical drives, mail store, etc.	File and device (e.g. printer, optical drive) sharing	Entry-level server (multi-core Xeon/C2D CPU, 4GB RAM, 500GB HDD, 1000BT network card, 17" monitor)

Table 2: Portable PC configurations



4.1.5 Refurbished and donated systems

Due to the Department's severe budget constraints (given the large volumes of devices that must be deployed), any possible form of cost-saving must be investigated for viability. The use of refurbished equipment or systems transferred from other Departments is a viable option to lower acquisition costs.

Where donated equipment are newly acquired systems, these must conform to the specification for new systems as defined in section 4.1.1.

Several factors should be taken into account when considering refurbished or donated systems, including the savings on acquisition cost, the functional capabilities of older architectures and components, and possibly lower reliability and higher maintenance costs associated with older equipment.

The following list is minimum specification for refurbished or donated equipment that will fulfil the Department's computing needs. Older equipment than this standard will typically be more expensive to maintain, and will perform below the required standards. The standards below represent the Government entry-level standard of around 4 years ago, and will be updated as required.

- a) 3.2GHz Pentium 4 / Pentium D CPU
- b) 1GB RAM
- c) 80GB hard disk
- d) 32MB graphics controller (integrated is acceptable)
- e) 15" monitor
- f) 100BaseT network card
- g) Operating system (installed and fully functional)
- h) Ideally a support and maintenance agreement should be supplied, but Government Departments are not in a position to provide this. Refurbished should be supplied with a 2-year warranty, with the exception of systems transferred under NT regulation 16A(7)7.
- i) No obligation will rest with the donating Department after the donation has taken place, including providing software applications, securing the facility, providing electricity, etc.

Refurbished or donated systems must be fully functional to support schools in their endeavours to provide low-cost but operational ICT equipment to learners. This includes supplying a hard drive with each system where drives were removed or destroyed for security purposes.

Refurbished systems must be supplied with an operating system, since schools do not have the capability or funds to procure or install this software. This is an issue, since a Windows OS is linked to the PC, cannot be unbundled when reselling or disposing of the system.

4.2 Peripheral equipment

4.2.1 Printers



Figure 8: Laser and inkjet printers

A vital factor in deciding which printer to buy is the total cost of ownership. The price of the unit is not adequate to determine the most suitable device. The expected number of printouts per month should be factored in along with ink or toner costs to arrive at a better estimation of cost over a period of time. Low-cost inkjet printers are typically extremely expensive to operate, and are not recommended for schools, except where very low print volumes are required.

- a) Monochrome (black and white) printers:
 - i) 25 page per minute monochrome laser printer
 - ii) 10/100BaseT Ethernet port
- b) Colour printers:
 - i) 20 page per minute business-class inkjet printer with 4 separate ink tanks for individual colours
 - ii) 10/100BaseT Ethernet port



Requirement	Functional Profile	Typical Applications	Recommendation
Print documents	Print black-and-white documents and reports	Assignments, reports, lessons, printing required for class activities	Basic monochrome laser printer (24 ppm, network card)
Print graphics or images	Print colour documents or graphics	Documents, presentations or reports containing colour	Network inkjet printer (20ppm, network card)

Table 4: Printer configurations

4.2.2 Media and collaboration devices



Figure 9: Data/video projector

Data/video projectors

As more multimedia is integrated into the teaching process, teachers need to display computer content to the class. This may take the form of a presentation, a quiz or even a live feed from a microscope or video camera. Projectors need to conform to the following minimum specifications:

- a) Basic LCD/DLP projector
- b) XGA resolution (1024x768)
- c) 2000 ANSI lumens brightness
- d) 500:1 contrast ratio

- e) 4kg or lighter (unit weight)
- f) Included infra-red remote control

Classrooms are often brightly lit by ambient light (i.e. sunlight through open windows) require projectors with higher brightness to ensure a bright projected image on screen.

Requirement	Functional Profile	Typical Applications	Recommendation
Project data or video	Entry-level projector for classroom use	Project lessons or media for teaching	Entry-level projector, 2000 lumens, 4kg

Table 5: Projector configurations

Interactive whiteboards



Figure 10: Interactive whiteboard

Interactive whiteboards are set to replace the traditional black chalkboard with an intelligent, interactive system that allows the teacher or learners to interact in real time with content displayed on the screen. Interactive whiteboards must conform to the following:

- a) At least 40" diagonal size
- b) Active or passive pen and board technology



- c) Software and drivers to operate board
- d) Compatible with standard operating systems and applications
- e) Since these devices are relatively complex to operate, training is a vital component of a functional solution.

Tablets and e-book readers



Figure 11: e-book reader

Gartner estimates that 1.2 billion people will carry devices capable of running rich applications and browsing the web. Many of these devices will be media tablets, a new class of device that enables easy, mobile access to media services, the web, and electronic books. e-Books have been steadily gaining popularity over the last few years, and in 2010 have really grabbed a lot of attention. e-Books are cheaper, more convenient, and easier on the environment, since no trees are killed to produce these books. However, to access e-books, a specialised reader device is required. These devices should conform to the following specifications:

- a) 8–12" LCD, OLED or e-ink screen
- b) Touch screen or button-based user interface
- c) Communication to host computer or network to download media
- d) Support for standard file formats such as HTML, PDF, TXT, ODF, Open eBook, ePub

Document cameras and visualisers



Figure 12: Document camera/visualiser

Document cameras allow teachers to duplicate the functionality of the old overhead projectors, displaying on screen any written or printed document, as well as 3D objects that need to be shown to the entire class. These devices need to have the following capabilities:

- a) USB or VGA port
- b) XGA resolution
- c) Built-in light source

4.3 Software

There are thousands of software applications that can add value in teaching.

4.3.1 General principles

- a) All software in schools must be licenced and legal.
- b) Where equivalent open source software is available, this should seriously be considered.
- c) Curriculum integration (i.e. using ICT to teach subjects) is more important than training learners to use specific applications. ICT should be leveraged to prepare learners for their careers after school.
- d) Software must supported the standards stipulated in the MIOS, including document and other interoperability standards.



4.3.2 Standards

The different types of software must support the following standards as a minimum:

- a) Operating systems:
 - i) Industry-standard PC architecture (X86 and X64)
 - ii) 32- and 64-bit computing
 - iii) Availability of a large collection of software applications
 - iv) Large pool of hardware devices and systems (PCs, laptops, printers, scanners, cameras, etc.)
 - v) Graphical user interface (GUI)
- b) Office suite and database:
 - i) De jure standard file formats (XML-based ODF)
 - ii) Legacy file formats (Microsoft's .doc, .xls, .ppt, .mde)
 - iii) Built-in scripting and development environment
 - iv) Standard functionality required from office suite applications, including document formatting, layout, text and graphics editing tools, language tools, templates, etc.
 - v) Exporting to standard file formats, including text, rich text, comma-separated, PDF, etc.
- c) Web browser:
 - i) HTML, including version 5
 - ii) ECMAScript
 - iii) Java
 - iv) Tabbed browsing
 - v) Bookmarks
 - vi) Plug-in such as Adobe Flash
- d) e Mail, calendar and contacts
 - i) Industry-standard file formats (iCal, VCF, etc.)
 - ii) POP3 and SMTP for e-mail
 - iii) Scheduling, tasks and notes
- e) PDF reader
 - i) Acrobat file format
- f) Anti-virus software
 - i) Automatic updates (downloadable via local cache or proxy server)
 - ii) Updates must be applied for the life of the PC

4.4 General recommendations

- a) A policy for managing operational costs associated with ICT equipment must be formulated at provincial level. This policy should address matters such as consumables (paper and ink), electricity, and maintenance and support. Where schools do not adhere to these norms and standards, they will be required to motivate why the recommended practices were not followed.
- b) An ICT code of ethics should be established to address computer use.
- c) A policy should be established around asset management.
- d) NT regulation 16A(7)7 requires the following:

The accounting officer or accounting authority must, when disposing of computer equipment, firstly approach any state institution involved in education and/or training to determine whether such an institution requires such equipment. In the event of the computer equipment being required by such a state institution, the accounting officer or accounting authority may transfer such equipment free of charge to the identified institution.

- e) When disposing of ICT equipment, Government departments are to consult educational institutions before auctioning off the equipment. Donating equipment without taking the minimum specifications into consideration results in a sub-optimal solution for Government.
- f) Access must be controlled to peripherals (e.g. printers, CD writers) and consumables (paper, ink). Security should also be implemented for removable/foreign devices and USB ports
- g) The costs of printing should be closely monitored, as significant difference in cost profiles exist between different printing devices and technologies. As a general rule, lower-cost printers have higher running costs, and are therefore less suitable over longer periods or for higher-volume printing.
- h) Alternatives should be investigated to replace proprietary software (e.g. Microsoft) with more a cost-effective solution.
- i) The following issues need to be considered when deploying ICT solutions within the Department of Basic Education:
 - i) Economies of scale (limited funds will necessitate serious consideration in this area)
 - ii) Service, support and maintenance



- j) ICT Norms and Standards process:
 - i) The Norms and Standards technology table should be updated on a six-monthly basis.
 - ii) The ICT Norms and Standards document should be updated annually.
- k) When disposing of ICT equipment, schools must ensure that the disposal is done in an environmentally responsible way. ICT equipment typically contains poisonous materials such as lead and mercury that are harmful to people and the environment.



5. Conclusion

The information presented in this document will assist the Department of Basic Education and Provincial Education Departments to achieve the goals set out in the White Paper on e Education regarding ICT norms and standards.

This ICT Norms and Standards document and the detail technology standards will be updated regularly, as required by the Department.

Any inputs into future revisions of the document or requests for additions should be addressed to:

The Director: Curriculum Innovation and e-Learning
Private Bag X895
Pretoria
0001



Annex A: Glossary

Term	Definition
ANSI	American National Standards Institute
CAD	Computer Aided Design
CAT	Computer Application Training
CD	Compact disk
CPU	Central Processing Unit
DBE	Department of Basic Education
DLP	Digital Light Processing
DOC	Department of Communications
DVD	Digital Versatile Disk
ECMA	European Computer Manufacturers Association
EMIS	Education Management Information System
FET	Further Education and Training
GET	General Education and Training
GUI	Graphical user interface
HDD	Hard disk drive
HTML	Hypertext mark-up language
ICT	Information and Communications Technology
IT	Information Technology
LAN	Local Area Network
LCD	Liquid Crystal Display
Linux	A free/open source operating system
LSEN	Learners with Special Education Needs
MFP	Multi-function printer
MIOS	Minimum Interoperability Standard
MS	Microsoft
NT	National Treasury
ODF	Open Document Format
OLED	Organic Light Emitting Diode
OS	Operating System
OSS	Open Source Software
PC	Personal Computer
PCI	Peripheral Component Interconnect

Term	Definition
PDF	Portable Document Format (Adobe Acrobat document)
PED	Provincial Education Department
PFMA	Public Finance Management Act
R&D	Research and Development
RFB	Request for Bid
SA SAMS	South African Schools Administration and Management System
SITA	State IT Agency
SMS	Seat Management Services (RFT 285)
TCO	Total Cost of Ownership
TCP/IP	Transmission control protocol/internet protocol
UPS	Uninterruptable Power Supply
USB	Universal serial bus
WAN	Wide Area Network



Bibliography

- l) Public Finance Management Act
- m) National Treasury Regulations
- n) White Paper on e-Education (September 2004)

Notes

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

