Buyers' Guide

for ICTs for Education

A series of recommendations on how to compile and evaluate bids to acquire equipment and services for school systems

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Introduction

With the continuing move towards the integration of ICTs into education systems, governments worldwide are having to acquire PCs, peripherals, software and services on a massive scale. This adds to the complexity of standard bidding processes.

In our experience this type of process in general presents particular challenges and government officials are usually confronted by a number of issues and questions including:

- What type of equipment to buy (technical specifications)
- Which brands/technologies offer the best characteristics and the longest life expectancy for the lowest price
- What types of operating system and software have to be installed and who will do this task
- Who will do the transport and related logistics, and the equipment installation at each destination
- Who will do the maintenance and technical support needed over the years
- How to organize the bidding process
- How to estimate the approximate budget needed for the bid
- How to evaluate the different offers in a transparent and efficient way

This document is a summary of our recommendations for Ministries of Education when carrying out a tendering process to acquire ICTs for Education. It contains a series of suggestions which each country can adapt to their specific needs

Note: this document concentrates on the technical content of the bid and related processes and NOT on administrative, legal or bureaucratic clauses and procedures, which vary from country to country.

The document is organized as follows:

- Planning for the bid
- Writing the technical specifications of the bid

- Bidding strategies and models
- The technical evaluation
- Post-bidding considerations
- Annexes

The intended audience of this document is Government officials from Ministries of Education planning nationwide deployments of hardware, software and/or IT solutions for the education sector.

Planning

Preparation and planning before writing a comprehensive and detailed bid document will help in ensuring a transparent selection process and getting the best value for money. It will demand time, expertise and consideration of the whole process of acquiring, installing, operating and maintaining the equipment.

This section of the document will take you through some of the key steps in planning for the procurement of ICTs for Education. These steps include:

- Determining and defining the ICT products and services required, including options for deployment, connectivity and maintenance and technical support.
- Reviewing the local environment and local constraints that might impact on the selection, acquisition, deployment and use of the ICTs
- Selecting the educational institutions that will receive the equipment
- Budgeting for ICTs

Determining the ICT products and services required

The first step in planning for any procurement or acquisition is to determine what you want to buy and why you want it. ICTs come in a myriad of forms and options and therefore this is a critical step. The choice of ICT products and services should be driven primarily by the educational objectives to be achieved. As such, it is critically important to determine which educational objectives will be achieved at the onset and to ensure that the ICTs purchased will enable you to meet with your desired educational objectives. GeSCI has developed a comprehensive report on the selection of technology options for education[1]. This report presents a series of steps that decision makers can take to arrive at a choice of ICT products and services that will meet their desired educational objectives. It is strongly recommended that users of this buyers' guide read the report on selection of technology options first. For purposes of this buyers' guide, it is important to revisit a few key concepts.

Defining your educational objectives

[1] GeSCI Assessing Technology Options for Schools - Report on framework and tools - http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

ICTs offer a wide range of potential benefits for teachers and for students. The range of possible objectives falls under four broad categories: administration, teacher development, student learning resources, and ICT skills training as a subject in its own right. All these broad categories have several objectives, some of which are summarized in the table below.

Category	**Objectives**
Administration	Enhancing School productivity
	Enhancing data flow for policy making
Teacher Development	Developing teacher skills and knowledge
	Assisting effective lesson planning
Student learning resources	Accessing information (by students)
	Improving conceptual understanding
	Developing constructivist skills
	Facilitating collaboration
	Providing testing and feedback
ICT skills training	Developing basic ICT skills
	Developing advanced ICT skills

Table 1- summary of possible education and related objectives

The System-Wide approach

When it comes to procuring ICTs for education, many decision-makers focus on hardware and software. However, if the deployment of ICTs is to have meaningful impact, there are several other vital elements that must accompany the hardware and software. GeSCI has identified several key elements (see Figure 1) that must be considered if the deployment of ICTs is to have meaningful impact. These components must co-exist; none are optional. Together they conform to a system-wide/sector-wide approach. This approach has to be comprehensive, demand-driven, efficient and well coordinated.

Figure 1- GeSCI system-wide approach

Defining the ICT Platform

The ICT platform is defined as a combination of the access devices; the operating system and applications; the display devices; the peripheral devices; networks; and connectivity (*See Figure 2*).

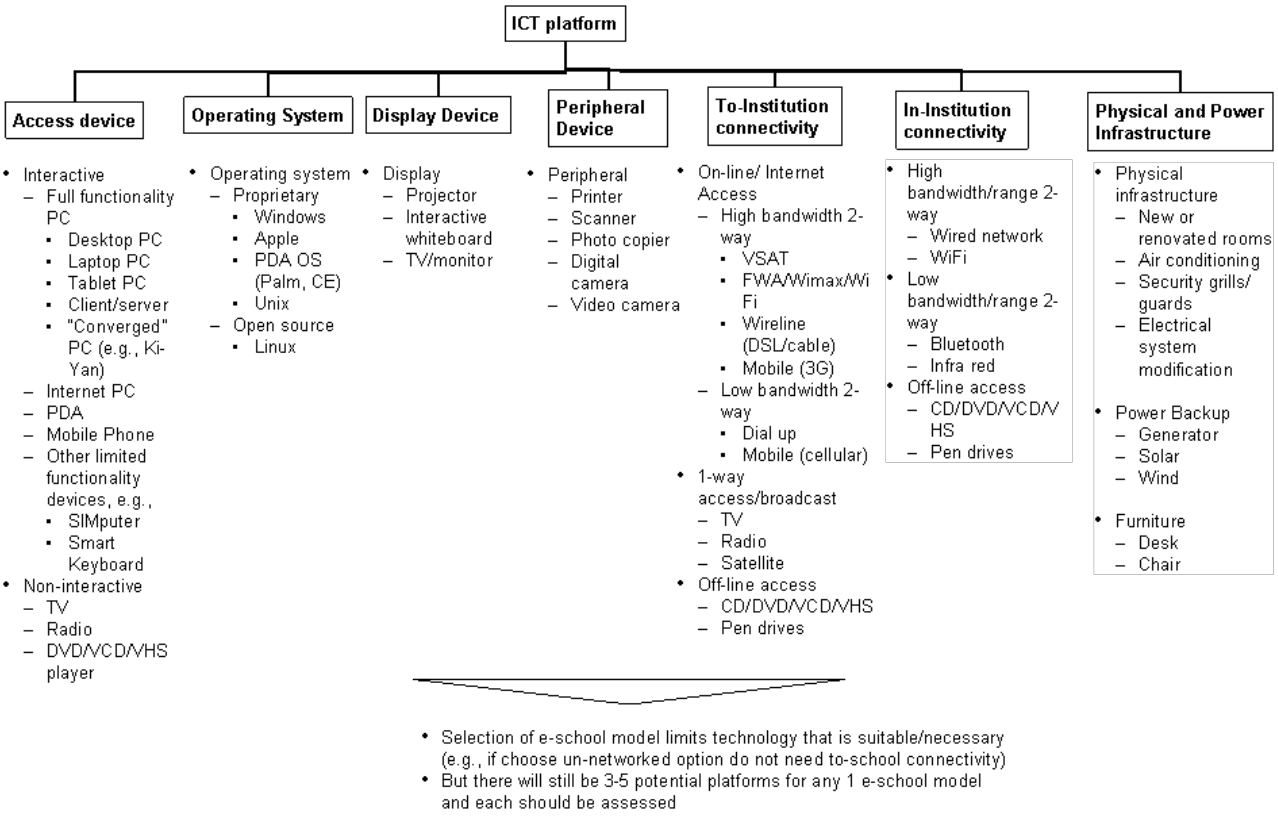

Figure 2- Cost Components of ICT platform

All these should be supported by new or modified physical infrastructure and power backup systems. It is important to realize that each of these components of the ICT platform has several options and decision makers should think about and consider all the options. Decision makers should not rush into arbitrary selection of the most interesting or latest options, but specific choices have to be made based on some practical considerations and related to specific educational objectives. Selecting the specific ICT components required to meet the educational objectives involves assessing each components' benefits, feasibility and Total Cost

of Ownership (TCO). This selection process is fully explored in the GeSCI Report on the selection of Technology Options for Education[2].

In summary, and based on the above key concepts, the acquisition of ICTs for education might include some or all of the following products and services:

- Provision of PC hardware (or other type of access devices like thin clients, laptops, PDAs, low cost devices, netbooks, etc)
- Provision of peripherals like printers, scanners, networking equipment, external storage, cameras, projectors, etc.
- Preparation of the classrooms and schools for the equipment, including civil works, furniture, lighting, electrical setup, Local area network (LAN) cabling, etc.
- Provision of other IT infrastructure like servers, external storage, backup equipment, security software and related services.
- Provision of software licenses (operating system, applications, educational tools, security)
- Provision of networking and connectivity services (ADSL, broadband, wireless, radio, etc) which might include hardware, software and services.
- Installation and configuration of the operating system on equipment and servers. Installation of other applications as needed (commercial/educational/free licensing schemes)
- Logistics, inventory and transportation of the equipment to its final destination (including insurance).
- Installation and configuration of the equipment at schools and local area network. Testing of the installation.
- Provision of technical support and maintenance, including preventive maintenance.
- Renewal of software licenses, if necessary
- Provision of teacher and student training and support.

Note: If you consider the system-wide approach and then determine that the bid is only partially going to include the required products and services, please take into account that soon you will have to find ways to provide for the rest them, either by using some government structure, the school's resources or through other external contractors. One of the biggest mistakes governments make is thinking only about the current needs (buying and installing equipment) and not planning a comprehensive solution that will also include operating, maintaining, training and upgrading. Without considering a system-wide approach the project is not going to be sustainable as time goes by and the equipment needs maintenance and starts to malfunction.

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Deployment Models

Aside from the many ICT options available for use in an educational setting, there are also various deployment models possible. Some of the more common deployment models in education settings include:

- One-to-one models, such as the increasingly popular One Laptop per Child (OLPC) model or the One Laptop per Teacher (OLPT) model. In this model each student and /or teacher owns a portable device and uses it both at school and at home[3].
- Computer Labs (fixed and mobile), where a pool of machines and peripherals is available for students for periodic use, depending on availability.
- Computers in classrooms, where a few machines are connected and available in the classroom.
- School Based Tele-centers (SBT), where the computer lab is also open to the community outside of school hours.

The type of deployment model selected is determined chiefly by the educational objective(s) to be achieved and local constrains. For additional information please refer the GeSCI report on selection of technology options for education[4], which details the relationships between deployment models and educational objectives. The choice of deployment models will influence the number and types of devices to be purchased, the cost of installation and the type of training to be offered. Also, the "Hot topics 2008"[5] documentation lists the debate of computers in labs vs. computers in classrooms and how to determine the rate of students per machine, other two interesting considerations.

Connectivity Models

[3] Suggested read: "1:1 Technologies/Computing in the Developing World - Challenging the Digital Divide" by M. Hooker, GeSCI , http://www.gesci.org/integration-of-icts-into-teaching-and-learning.html

[4] GeSCI Assessing Technology Options for Schools - Report on framework and tools - http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

[5] "ICT Hot topics 2008" can be downloaded from http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

As more computers are deployed in schools, it has become obvious that the students and teachers perform better, making better use of ICTs when they have access to the Internet and can network amongst themselves. Over the years the demand for connectivity has increased, and those schools already connected, now need access to broadband (faster online access).

In many cases schools can not afford such access, and all too often, cannot even afford the cheapest dial-up options, and so government assumes the responsibility of providing solutions that reduce these costs or subsidize the existing cost. There are several options to providing the service and leveraging the costs: though e-rates, the creation of purchasing consortia, the creation of educational ISPs and the telecommunications market deregulation. You can obtain additional information about connectivity models by accessing GeSCIs “School Connectivity options matrix”[6].

Local environment and constraints

The feasibility of any technology deployment model and ICT platform option is determined by a set of local conditions of the environment under consideration and most often these local conditions impose constraints on the type of ICT that can be deployed. Some technology options will simply not be locally available, for example, or may have to be scaled back to reflect constraints of different kinds. Four of the local constraints frequently encountered in developing countries are described below.

1. Telecommunication infrastructure

The type of existing telecommunication infrastructure, its reach and coverage will determine the most appropriate connectivity solution to deploy for educational institutions. If for example, the country lacks a high-speed telecommunications network, then broadband-type connections for schools will not be possible.

2. Electricity

Almost all ICTs require a power source and therefore the availability of electricity is a key requirement. If the national electricity grid is unreliable or does not cover many areas, then it is necessary to plan for alternative power sources or power backup systems such as generators or solar systems. In these cases it would be critical for the alternative power sources to be adequately sized for the demand and cared for.

3. Physical school infrastructure

Computer labs require a permanent structure or room in which they will be installed. The room must also be of the right size and shape for the type of deployment approach required. Schools under trees or without a free room to

[6] “School Connectivity options matrix” http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

install say a computer lab will have to have new rooms constructed. Adequate tables, chairs, lighting and security measures will also be needed.

4. **Access to developed local ICT industry**

   Distance from services; capability of local ICT service industry; ease of procurement, technical centre close enough for repairs and replacements

It is important for decision makers to carefully review their local conditions and to determine if these will impose constraints to render a particular technology option unfeasible, and then search for solutions that can help in overcoming these constraints.

Baseline Studies

As base data from schools is most of the time outdated or missing, it is often necessary to conduct a baseline study prior to purchasing ICTs. Baseline information is important for several reasons:

- it provides information to estimate the components and costs of the bid more accurately
- It helps in determining selection criteria: which schools need solutions urgently and which can wait
- it can help in refining the exact number of schools / institutions, including determining whether to phase the deployment

A typical baseline study will involve a survey of existing ICT platforms at schools, availability of supporting infrastructure (rooms, electricity) at schools and availability of trained or trainable personnel at schools.

Baseline studies will determine:

- The exact number of schools and their precise location, contact information, number of staff and students

- Local conditions and constraints faced by a school e.g. lack of electricity or lack of adequate rooms
- Which schools have some ICTs and which schools do not have any ICTs - this can be used to prioritize deployments
- Which teachers have received ICT training or whether a school has a teacher who could be trained.

Baseline studies are statistical analysis performed in general on a selected representative sample of schools, and not necessarily on all schools. Baseline studies can be conducted by sending questionnaires to the schools or physically visiting the schools to ascertain existing conditions and infrastructure. The downside of baselines is that they will normally require a lot of time and can cost quite a lot if you will have to send people to visit the schools in person.

Budgeting

It is important to understand the cost implications of various technology options and to prepare a comprehensive budget prior to commencing bidding. Decision makers must determine whether they can afford to purchase and support the necessary ICTs and whether they have the funds available or how much funds they should request from the government or donor agencies.

The recommended approach to determining costs and budgets is to use the Total Cost of Ownership. Total Cost of Ownership or TCO is the cost of a complete end-to-end system over the useful life of the system. A True Total Cost of Ownership or TCO must take into account all the end-to-end system components—deployment of ICT platform, content, user training, technical support and monitoring and reporting. The sum of each of these over a selected timeframe, usually the useful life of the ICT platform, becomes the TCO value of the ICT deployment. All ICT platforms usually involve initial capital expenditure and then ongoing operating expenditure as depicted in Figure 3.

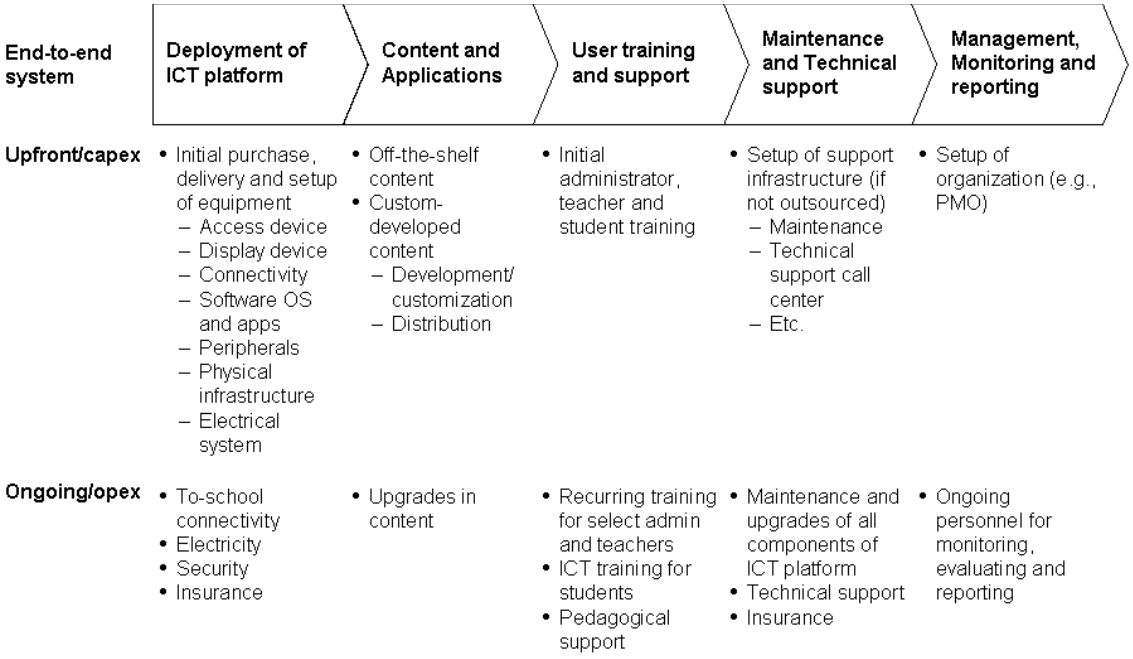

Figure 3- Initial and Ongoing costs

GeSCI has developed a comprehensive electronic tool[7] that can assist decision makers in calculating the TCO for ICTs in education projects.

Note: Some of the TCO studies GeSCI has undertaken have found that equipment (hardware) accounts for only about 30% of deployment costs with 70% of the costs are attributable to shipment and delivery, installation and configuration, software and applications, maintenance and warranty contracts, educational content and training and user support. Training and support alone usually accounts for about 30% of the TCO while software and content and configuration, maintenance and warranty can also take a significant chunk of the TCO. So don't make the mistake of only concentrating on the cost of hardware!

[7] GeSCI TCO tool and manuals can be found at http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

ICT Standards

Some governments decide to work from the beginning with a document defining a set of standards that all its equipment, software and installations have to comply with. One good example of this is the "ICT Standards for the Education Sector[8]" of Namibia.

Once created, ICT Standards have many advantages including to:

- ⇒ Guide the evaluation of all ICT devices during procurement to ensure that the right ICTs are being acquired
- ⇒ Ensure that ICTs acquired are of the right quality, perform as required and are fit for use to achieve the particular educational objective under consideration
- ⇒ Lower total cost of ownership (TCO) through economies of scale resulting in competitive sourcing. TCO is defined as the total cost of a good or service throughout the life of utilizing the good or service and includes both initial or acquisition costs as well as recurring costs.
- ⇒ Ensure uniformity of ICTs across all educational institutions making it easier and more cost effective to offer quality technical support and maintenance as well as upgrades and end of life disposal
- ⇒ Ensure that ICTs acquired are robust and scalable
- ⇒ Ensure that ICTs acquired can be easily deployed (ease of installation)
- ⇒ Ensure that ICTs obtained can be easily sustained in terms of operating costs, maintenance, and support by local services industry (both procurement and maintenance).

However, the standards have to be enforced by the government, as standards which are voluntary or not enforceable defeat the very essence of enacting standards and the associated gains of standardisation. Additionally, outdated Standards are not useful in the fast changing ICT industry. To ensure that the education sector benefits from the introduction of ICT technical standards, effective oversight and management is required. Also, an effective mechanism to implement these Standards and ensure conformity, without creating significant overheads or undue complexity, must be developed.

[8] ICT Standards, Namibia - http://www.tech.na/documents/ICTTechnicalStandards.pdf

Hot Topics

In the selection of ICT options for education, there are a number of options that often generate heated debate and are controversial to a certain extent- we call these **hot topics**. Decision makers often have to make a choice between one or more competing options that can meet given educational objectives. Some of these key hot topics are briefly discussed in this section. For a thorough treatment of the hot topics, please see GeSCI paper on hot topics[9].

- New vs. Refurbished PCs: schools could use refurbished (used) equipment to install their labs, saving some money on the acquisition costs but probably spending more on maintenance. Refurbished PCs can also have some limitations for executing new generation software.
- Thin Clients vs. Fat Clients: Thin clients are a technical solution that might prove to be more cost-effective for schools, but also presents some limitations regarding speed and executing multimedia applications.
- Open Source software vs. Proprietary software: The issue is whether Free and Open Source Software or FOSS is cheaper than proprietary software and comes with more or unique benefits for education and social development. The pro FOSS camp claims that FOSS is much cheaper than proprietary software, does not lock schools into vendors and schools can customize the software for their own individual needs. Other debates revolve around the fact that somehow open source is good for general development (in this knowledge age, freedom and sharing of knowledge are key to development), hinders monopolistic tendencies and increases competition. However, all the claims above have counter arguments and in some cases are unproved. The debate seems to be more philosophical and lacking in tangible substance. The conclusion nowadays seems to be that it is not about FOSS or Proprietary, but both, according to the educational needs.

[9]"ICT Hot topics 2008" can be downloaded from http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

Defining the technical specifications

One of the most critical issues of writing the bids is the technical specifications of the products and services to be acquired. Since in most cases you will not be able to request a specific brand or product model, what you have to do instead is carefully describe the minimum requirements that you want to be met. As we will see in more detail later on, during the evaluation process additional points could be granted to desirable, but not mandatory, characteristics. The more detailed these requirements are, the more chances of providing a transparent selection process and obtaining the best value for money.

We will now describe some general guidelines or the more relevant parameters to consider when describing the technical attributes of some standard equipment.

Equipment	Parameters to consider in the bid
PCs / Workstations / low cost devices /	Processor: choose the one that offers the best performance/price ratio. This of course varies from one market to another, but generally it is best not to go for the latest processors, and instead buy the ones that are 1-2 years old. Stick with proven, reliable specs but not necessarily the lowest end. Remember that this equipment will probably have to operate in harsh environments with a lot of heat and dust and with little maintenance available. Similarly, some of the cheap technology will not work in these harsh environments Detail processor type and speed (MHz). Related to the selected processor type and speed, define the desired Bus speed and processor Cache. Memory: it is best to ask for as much as possible. Buy according to the recommendations for the processor and the operating system to be used. Make sure that if possible the memory is occupying only one memory bank, leaving space for growth. Also remember to determine desired memory speed. Hard Disk size: as large as possible. Add specifications for bus speed and type of interface needed (i.e. SCSI, ATA).

Equipment	Parameters to consider in the bid
	Include other storage media: DVD/CD ROM reader or reader/ writer. Specify interface and speed. Include if you want diskette drive, though lately most machines are coming without. USB ports: 2 to 4 is standard now. Communications: network card, usually 10/100 RJ-45, or wireless 802.11b/g. Some machines might also require a modem for dial-up Internet connection. Multimedia: video card specifications. Sound card specifications. External jacks for speakers and microphone. External or internal speakers. Keyboard: keyboard type (symbols, letters) and connector type (i.e. serial) Mouse: mouse type and connector type Form factor: describe if vertical or horizontal tower, and dimensions. This has to do with the space available where it is going to be installed. Electrical requirements: ask for models that have low energy consumption, ask for the needed cables and the right voltage and connectors used in your country. Compliance with technical standards as required.
Laptops and netbooks, low cost devices	Similar to PCs but you can also specify: • required weight and size • screen type, definition and if it has to be rotational • type of pointing device • Battery type and electrical specifications, battery lifetime and duration, charging methods • integrated security for data protection and user authentication • Ports, type of pointing device (touchpad, mouse, etc) • If other items like extra batteries, carrying case and separated pointing device can also be included
Printers	You have to consider the TCO (total cost of ownership) of the printer and not only the initial cost. Remember that schools will have to pay for ink cartridges and maintenance.

Equipment	Parameters to consider in the bid
	As general advise: - dot matrix are low quality, low maintenance and fast - laser are high maintenance, high quality and fast - ink jet are slow, cheap and medium maintenance Some other parameters to specify are: printing speed (ppm), resolution (dpi), type of interface, black/color, cost of cartridges, type of paper feed, if cable has to be included, if it has to include a network card. Check out some additional recommendations at http://www.pcguide.com/buy/des/compPrinter-c.html
Monitor	Define type (technology for example CRT, plasma). Define screen size and resolutions wanted. Remember that CRT monitors consume significant power, are heavy thus adding to shipping and delivery costs, and take up too much space which is a critical factor for schools with small classrooms and/or small desks or furniture for the PCs. Flat screen is lighter, smaller, consumes less energy, but is more expensive and delicate. A careful cost- benefit analysis for specs should be undertaken.
Scanners	Define size and type (i.e. flatbed). Include resolution (dpi) Define interface type and required software Define scanning speed.
Digital Cameras	Define size, weight, connector type Focus and lens type Define maximum image definition, storage memory size and type
Wireless Network Access points	Define technology to be used (i.e. IEEE 802.11a, 802.11b and 802.11g). Data rates. Transmission power. Sensibility. Compliance with standards.

Equipment	Parameters to consider in the bid
	Number and type of ports. Type of antennas. Functionality and protocols (i.e. HTTP. NAT, DHCP, Firewall). Security features.
Multimedia Projectors	Resolution, lumens, weight, size, video compatibility, ports. Average lifespan of the lamp. Note: Please consider that the cost of the lamp can be very high, so sometimes it is worth getting extra spares included in the bid.

Note: We recommend that some of the technical characteristics (i.e. the processor speed of the PC, the definition of a printer) are defined as minimum or desirable. If the bidder decides to offer a higher speed/quality product for a competitive price, this could count as additional points in the technical evaluation of the offer (please refer to page 29 for more information).

Defining the software to be included

The access equipment (PCs, laptops, servers) will require software to operate, including the operating systems, applications and educational tools. You have to determine which ones you want to be included in the acquisition bid and which ones you will determine to be acquired and installed by the Ministry or the schools later on.

Some of these considerations include:

- Operating system: do you want it to be pre-installed? Pre-installed software licenses (OEM) are generally cheaper, though more expensive than high-volume educational rates that can be obtained through the Ministries. The same for other educational or commercial software licenses
- Are there any free applications that you'd like to have installed? i.e. Internet browser, email software, document readers, file compressors, etc
- Will you need Antivirus, antispam or content filtering tools?
- Equipment configuration: who will configure software, define users, profiles, security, etc?

You also have to consider the licensing scheme for each software that has to be installed. Unless you use open source free software, commercial software has a renewal cost per year, per user, per school, or just an initial amount. You have to carefully consider the licensing scheme of every software that you acquire and also provision funds to renew them if necessary. Be extra careful about describing the exact needs regarding software, and to ask for details about license limitations (i.e. licenses that are free with limitations, have to be renewed every year, reinstalled etc).

If you obtain and use educational rate licensing, which can be very convenient, you normally have to negotiate with each software company directly, obtaining from them a signed agreement and installation disks or license codes. This information can then be passed over to the installer, who will then install the software but not provide it. If this is the case be sure to provide detailed information in the bid specifications.

Providing the software is one of the items, but the software has also to be installed and configured. Related to software installation and configuration, there are three ways to do it:

a) Installation at the suppliers own premises with Ministry specifics

b) installation at a “half-way” staging point e.g. at the ministry where the supplier delivers all PCs and other equipment and they are installed, configured, integrated, tested, staged and then dispatched to the final destinations and

c) Installation, configuration and integration at the final destination.

Also, another alternative is to ask all bidders to propose an installation, configuration and integration plan and evaluate each bidders proposed plan on its own merit.

In order to optimize the installation process we recommend that you provide the bidders with an installation manual that lists all your standard requirements (i.e. software, particular configurations, user rights, passwords, etc). In this way you will have a standardized installation that will be much easier to maintain over time. If this installation manual will be given to the supplier after the contract is signed please note that this can cause problems with suppliers arguing over the installation method and related costs prescribed after contract signing.

Estimating the costs: if you want to have an estimate of the costs and time involved in doing the software installation you can follow this plan:

1) obtain a sample copy of all the software that you want installed
2) do a few standard installations and configurations, calculating the average time it might take a technician to do one of them.
3) Multiply the time invested in each machine per the number of machines and the standard cost of an hour of a technician's work in order to have an idea of the cost. Divide the amount of hours by eight working hours/day in order to know the man-days needed.

Please note that massive installations to similar equipment can be configured in CDs (images) and can be done almost automatically in a much faster way.

Defining the logistics

Once the equipment has been received, inventoried, verified, and software installed and configured, it will be ready to be distributed to schools or other educational centers. In many countries the issue of logistics can become a headache unless planned very carefully. Normally, you will have to consider transportation of the equipment to the final destination, (sometimes very inaccessible places) with the risk of the equipment being stolen or damaged on the way. That is why it might be easier to allocate responsibility for transportation to the bidder.

But remember that if the equipment is to be delivered by the bidder you have to provide the precise location of every destination school in the content of the bid, so that the bidders can estimate the transportation costs from their distribution center/s. The best way is to provide a digital file with the GPS coordinates of each spot.

As a general rule, it is simpler to have the hardware delivered by the bidder. Having the bidders insure and transport the equipment can be costly, but simplifies the deployment a lot. If this is the case make sure the bidder provides you with a complete inventory with each product's serial number and destination, as well as signed documentation certifying the delivery and installation of the devices.

Estimating the costs: if you want to have an idea of the costs involved in transporting and insuring the equipment you can do the following calculations:

1) estimate the kilometers from the distribution center to each school (even approximately will do)

2) get the standard market price for transportation (per km) and calculate the time it takes to load and unload the truck

3) Estimate the cost of the equipment to be delivered to each school and get a quotation for transportation insurance

The total cost per school would then be the sum of the cost of insurance + cost of loading/unloading (time) + cost of transportation (km).

Defining the on-site installation

Once delivered, the equipment has probably to installed and tested at its final destination. You can have the bidder do this as part of the contract, or you can have on-site personnel from the Ministry or from another organization to do it.

But before the equipment arrives at the educational centers it is useful to make sure that all the needed infrastructure requirements are in place. This includes, in this case for example, a computer lab, the physical space of the classroom, adequate floor and ceiling, furniture like benches and chairs, server space, a good door, curtains on the windows, room security, electric installation, Internet connectivity, etc.

The installation will include steps like: unpacking, setting up the machines, configuring according to pre-defined standards, connecting and testing them, configuring local area network, basic training, etc.

To finalize the receptions process we recommend that you define a reception protocol that includes the items to be verified before accepting the equipment, so that personnel from the Ministry or the school can verify the correct installation of the equipment and become formally responsible for them.

Estimating the costs: if you want to have an idea of the costs and time involved you can try by doing a few on-site standard installations and configurations and then calculating the time it might take a technician to do one of them. Multiply the time invested in each machine per the number of machines and the standard cost of an hour of a technician's work in order to have an idea of the cost. Divide the amount of hours by eight working hours/day in order to know the man-days needed. Include travel expenses if necessary.

Warranty, maintenance and technical support

Once the equipment is operational you will have to consider a way to maintain it in working order, extend its life-span by doing preventive maintenance and provide some type of technical support.

Warranty

The warranty provided for the equipment is a very critical component of the bid. There are numerous types of warranties and all of them differ in their scope and coverage and the specific terms and conditions as set by the ICT manufacturer. The warranty terms must be very specific and describe in detail what the responsibilities are in case of failure (total/partial/accidental), type of support, location of local support offices and contact means (emails? Fax? Toll free telephone?), and who bears the cost of transportation to the repair center. It also has to define the expected timeframe to resolve different types of problems.

For example a 3 year warranty on parts and labor involving Carriage and Return (C&R) i.e. supplier incurs all costs of shipping to repair center, repair and return shipping costs can cost a lot of money and is usually considered as extended warranty. Also one has to be careful with this—if say one part of the PC e.g. hard disk is broken and you open up the PC to remove and ship hard disk to supplier, the PC automatically loses its warranty unless you have express written permission from the warranty provider to open up the PC. And if the schools are not sensitized and/or ministry doesn't follow up can be impossible to actually benefit from this.

In most cases a one year guarantee will cover most of the problems due to the fabrication process. Alternatively, you can ask bidders to provide cost of standard 12 months warranty and 3 years extended warranty and also specify whether you want Onsite, C&R or Return to Base (RTB) warranty.

In any case, remember that you have to consider what to do with the equipment once the warranty is over.

Maintenance

Regular preventive maintenance can help in reducing failure rate and increasing the life expectancy of the equipment. Normally it is enough to do maintenance to the equipment twice a year to clean it up, install updates and upgrades, check hard disks, clean the printers, re-install software, etc.

There are several options to provide this service to schools:

a) By the IT teacher and advanced students
b) by a technician available at each school, supported by teachers and students
c) by a technician that covers a region, traveling among schools
d) by an external contractor
e) by an university or technical school in the area

Note: Only seldom is this service included in the same bid where the equipment is bought.

Technical support and user support

Educational institutions will also need some type of technical support. This includes all types of problem solving, both remote and on-site on issues like configuration, installation, reinstallation, connectivity issues, virus, backup, software installation, software usage, etc.

There are several ways to provide user support, for example:

1) by a centralized, private or public organization
2) by local service providers
3) by local technical colleges or similar institutions

Define user training

Last but not least, users will also have to be trained in the use of the solution. There will probably be several types of users to be trained:

- Students
- Teachers
- IT teachers
- Administrative personnel at schools
- Technical Support personnel

Also, training can be delivered on-site, at a central office, remotely via the Internet or by self-training manuals, and is usually done by a combination of various methods.

If you plan to include the training process for one or more user types in the bid text, you have to include at least the following:

- Expected audience: number of people that will assist the training in each of the locations and where is it going to take place
- Contents of the training: detailed contents and expected duration of the course
- Training material: who is going to provide it and in which media (paper, CDs, online)
- Training space and infrastructure: who will provide the equipment and software where the training is going to take place
- Profile of teachers: define minimum requirements
- Define who will bear the cost of transportation of the people to the course and related expenses
- Define if a certificate or other type of certification is going to be provided to the assistants

Procurement strategies and models

"Large-scale procurement of ICT hardware, software, and services presents substantial challenges to organizations of all kinds. Among Caribbean MOEs, lack of experience on the part of responsible parties has led on some occasions to over-reliance on vendor sales representatives, and has resulted in contracts that lack flexibility, foresight, or protection for the purchasing organizations. Respondents

identified situations within the last decade in which: hardware was purchased without a service contract; software

licenses—outside the United States only—had to be renewed every two years; EMIS software was inappropriate for the networking and connectivity situations of schools; contracts did not include "update" clauses, so delays in project implementation resulted in delivery of out-of-date hardware and software"[10]

Going back to defining the type of products and services needed, there are several options when it comes to the strategy behind the bid. How many components of the system-wide approach will you include on the bid, and how many will you have to provide through the Ministry or other organizations (like universities, etc)?

The following table compares the pros and cons of some biding options:

Bidding model	Pros	Cons
Supply only: **the bidder only provides the products (hardware, software)**	⇒ Since this is easier, many companies can compete ⇒ Allows for the best prices to be obtained ⇒ Bid is easier to write and evaluate, concentrating on technical aspects	⇒ Responsibility of the bidders is limited in time ⇒ Leaves out a lot of things to be done (installation, training). Make sure they are planned appropriately! ⇒ Requires more coordination
Supply and install: **the bidder provides the hardware and does the delivery and installation at its final destination**	⇒ Less hassle and easier to coordinate ⇒ Only one organization is responsible if there are any problems. Much easier to control.	⇒ Related services like transport and logistics can increase the prices quite a bit, make sure they are clearly defined on the bid ⇒ Requires more initial planning
Services only:	⇒ Bidders are specialized on	⇒ More coordination among

[10] Excerpt from "Survey of ICT and Education in the Caribbean: Regional Trends and Analysis (Volume 1)" Infodev, http://www.infodev.org/en/Publication.441.html

Bidding model	Pros	Cons
bidder provides hardware maintenance, technical support and/or user training	their field and so the service level will be higher	players required ⇒ Responsibilities are less clear when many players are involved
Turn-key: **bidder provides all products and related services: supply, install, train, maintain. One example is the BOOT model of India.**	⇒ A single vendor solution simplifies control and management from the point of view of the contractor. If there is any problem at any school with connectivity, hardware, software, training, updates, electricity, operations, etc the ministry has only to contact one vendor. ⇒ All components of the system-wide approach are considered, so the school has really no additional cost and no problems in trying to operate the equipment every day. ⇒ Both for the school and for the government it is a very simple and effective solution.	⇒ Since no company can do everything, bidder is likely to subcontract, so service level will be variable. ⇒ Costs will be quite high, ore than the individual cost of the components or of doing several bids. ⇒ The complexity of the contents of the bid mean that the evaluation of the bidders is also very complex and that the offers have to be analyzed very carefully. This requires a very qualified (and honest!) team of evaluators.

Procurement examples

- Comprehensive example of a Request For Proposal for Establishment and Maintenance of Computer labs in India http://haryana.gov.in/tenders/RFP-213.pdf

The Technical evaluation

Writing down the precise technical specifications of the bid is about half of the work needed in order to ensure a transparent selection process. The other half consists in defining the evaluation parameters (or criteria) and in carrying out the selection process to obtain the winner.

The technical evaluation parameters

One of the most delicate components of a bid is the criteria to be determined in order to compare the different offers. Defining these parameters and including them as part of the text of the bid is the best way of providing the bidders with the possibility of being aware of exactly how their proposals will be scored. At the same time, having a common scoring method allows the team of evaluators to have some tangible, precise and agreed method of measuring their professional analysis of the documents being evaluated. Each member of the team might have a different point of view, experience and awarding criteria, so defining a common ground for the analysis will help in ensuring a neutral result.

It is generally recommended that you use an evaluation with scored criteria with criteria and sub-criteria scoring matrix. It will be up to the independent evaluators to award marks within the established maximum for each proposal. An example would be to award a total of, let's say, 100 point for the technical evaluation.

Technical Evaluation	A total of 100 points

You can then assign sub-criteria like:

Technical Evaluation	A total of 100 points of which:
Product specifications	50 points
Warranty and technical support	30 points
Deployment plan	20 points

And you can even specify more detail for each category:

Product specifications	50 points of which:
Offering better specifications than requested for same price	10 points
Complying with XX and ZZ standards	10 points
Offering locally assembled products	20 points
Providing user manuals in local languages	10 points

Some comments on the scoring criteria:

- You should not awards marks for mandatory criteria, since all bidders should comply with them and it will not add up any information. Mandatory criteria should be used to distinguish the bids that comply with the minimum requirements and so can be evaluated, from the ones that don't and should be rejected.
- You can add more points if the bidder offers solutions that exceed the minimum requirements for a similar price (i.e. a faster processor or a longer period of warranty).
- If you divide the bid into several lots (by region or by products/services), the idea of awarding more points for bidders who take on more than one lot is a good one as indeed it will lead to associations and possibly more regions being covered or better prices obtained.

Technical specs vs. economic criteria: the evaluated bid score

Normally the winner would be selected by calculating an **Evaluated Bid Score**, which is a combination of the points awarded for the technical criteria and another component related to the proposed prices, of course having considered first that all the administrative requirements (pre-requisites) are met.

How much the technical and the price parameters weight in the final decision depends on the type of products being requested and also on local regulations and customs. For example, you

can say that technical parameters are 50% of the points awarded, and price another 50%. If the technology is very specific then you are more interested in the weight of the technical parameters, and if you don't mind paying some more for better products and services, it could be 60%-40%. If on the other hand you are talking about commodities where the technical parameters are well known and there isn't much room for improvement except in the price, it can be 30%-70%.

In order to assign the price points you can use a pro-rate method of scoring rather than a fixed sliding score which can be negative in some cases. We will illustrate this with an example. Let's consider the following situation where you have defined that the lowest price will get 300 points, the second cheapest 280 and so on

Bidder	Technical score	Price	Price score	Total points awarded
Company A	650	$ 1,000	280	930 ****WINNER****
Company B	620	$ 400	300	920

Please note that while the two companies have little variance in technical score i.e. how good the technical solution is, by assigning price score this way you would end up choosing the company whose price is more than double that of the other!!

In order to avoid these type of situations it might be better to use pro-rata score with a formula such as Price Score=Lowest price / evaluated price of other bids X Weight for price, with lowest price getting full marks. A more comprehensive formula one could use is that the World Bank recommends[11] for complex procurements:

> An Evaluated Bid Score (B) will be calculated for each responsive bid using the following formula, which permits a comprehensive assessment of the bid price and the

[11] World Bank, "Standard Bid Evaluation Form for Supply and Installation of Information Systems" http://siteresources.worldbank.org/INTPROCUREMENT/Resources/IS1STG-BER-Oct2004-Final.doc#_Toc62375728

technical merits of each bid:

$$B \equiv \frac{C_{low}}{C} X + \frac{T}{T_{high}} (1 - X)$$

where

C = Evaluated Bid Price

C_{low} = the lowest of all Evaluated Bid Prices among responsive bids

T = the total Technical Score awarded to the bid

T_{high} = the Technical Score achieved by the bid that was scored highest among all responsive bids

X = weight for the Price as specified

$(1-X)$ = weight for the Technical Score

The bid with the highest Evaluated Bid Score (B) among responsive bids shall be termed the Lowest Evaluated Bid and is eligible for Contract award, provided the Bidder was pre-qualified

We can analyze an example using the evaluated bid score. We are assuming the weight for price is 0.5 and for technical criteria 0.5. In this case T high is 650 (out of 800) and C low is $ 300.

Bidder	Tech score (T)	Price (C)	C low	T high	Total points awarded (B)
Company A	**650**	$ 800	$ 300	650	0,69
Company B	620	$ 400	$ 300	650	**0,85**
Company C	400	**$ 300**	$ 300	650	0,81
Company D	500	$ 600	$ 300	650	0,63

As you can see the Evaluated Bid Score has the advantage of producing a result that balances the price and technical scores taking into account the lowest price and highest technical score values. In this example, the best result is the bid that offers not the lowest price, but the second lowest, with a much higher technical score, offering good value for money.

In any case, the evaluation criteria has to be carefully analyzed in order to provide a clear analysis of the variables that you want to highlight, at the same time that it brings transparency to the biding process.

The evaluation Process

Once the bid has been published and the offers have been received, it will be the time to perform the evaluation processes. This process will vary form country to country, but in this section we suggest a few minimum steps.

Note about Standards: If you have created a standard ICT manual (see page 16), then vendors of ICT products, systems, and services will be required to declare, in writing, that the supplied products, services and systems meet these ICT Technical Standards. This declaration will provide a basis for challenging and handling non-conformity if, for example, the ICTs have to be returned.

- Conform the evaluation committee: Define the profiles and then select or hire the people required to evaluate the different areas: administrative, legal, procurement personnel and accountants for the company information. Select technical experts with the adequate knowledge and experience for the technical part. Evaluations will normally require a lot of time, a single bid can take days to evaluate. Make sure that the timelines are well known and people have the required availability.
- Develop technical evaluation templates according to the scoring/ weighting method. As discussed in the previous sections, this will both ensure a common criterion for the evaluators and guarantee transparency.

When the offers have been received:

- Follow the administrative procedures determined by your legal department.
- Check proposals to see which proposals meet mandatory criteria. Separate those that don't in order to notify the bidders, either that their bid has not been accepted or that they have to send additional information in order to compete.

- Send proposals that meet mandatory criteria as well as evaluation template to evaluation committee (only proposals that meet mandatory criteria are to be evaluated).
- Evaluation committee members will then undertake individual evaluations of each bid —Technical evaluation ONLY. Define a precise schedule for this and consider that each evaluation can take several days of work! Set up a meeting of the evaluation committee in order to discuss the individual technical evaluation score, and to harmonize any scores. During this meeting the final scores are agreed upon and a report is done.
- The Financial team has to do the price evaluation of the bids that have met the minimum technical scores, in order to determine the economic scores.
- Both teams (technical and administrative) prepare an evaluation report with winner and evaluation results and their recommendations, and submit to management.
- Upon approval and after the bureaucratic bidding procedures of your country, you should invite winning bidder for negotiations
- Once negotiations complete, you should inform all unsuccessful bidders of outcome and carry out post procurement review with them if necessary, according to local laws and procedures.

After the bid…

Once the bid is complete your work, however, has to continue. One of the main mistakes of governments is to consider that their work ends when the winner has been selected and starts to deploy his products and services.

After the bid the government should start the process of monitoring the suppliers / contractors to make sure that the products and services meet the required criteria, comply with what was detailed in the bid documents and that if anything goes wrong, the corresponding measures are taken (for example, economic penalties).

Some countries set up a separate agency or office to supervise the bidders and act as a focal point for schools when they cannot get the answer they deserve from the contractors. This is especially important for on-going services like satellite connectivity, where the school can be disconnected for a long time if the vendor feels no urgency to solve the problem and dedicates its resources to more prioritary clients instead.

Conclusions

This document has provided you with some guidelines on how to compile and evaluate a bid for ICT equipment from the technical point of view.

Recently governments in developing countries have begun to pay more attention to how bids and elaborated and evaluated, mainly because a transparent and organized process is demanded by citizens and international donors.

We hope that this guide can help you in your work and we welcome any comments and suggestions that you might have.

Examples and References

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5. GeSCI Connectivity Options matrix: This document is intended to serve as a guide when advising Ministries of Education (MoE) on the connectivity options available for schools. It compares several variables of four simplified models: e-rates, purchasing consortia, educational ISP and market deregulation. http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

6. GeSCIs TCO Tool and related documentation http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

7. ICT Technical Standards for the Education Sector – Namibia (2006) http://www.tech.na/documents/ICTTechnicalStandards.pdf