Practical guide to Pilot Projects and Large Scale Deployment of ICTs in the Education Sector

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

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Introduction

Ministries of Education (MoEs) are increasingly deploying ICT solutions and projects to educational institutions at regional and national levels. MoEs in general have little experience of nationwide deployments of technology and how to ensure that they are executed effectively. Such large-scale projects require careful analysis and planning, and sometimes include one or more "pilot" deployments. Pilots are generally considered a helpful learning tool before committing to larger scale deployment. However, GeSCI has found that most pilots are considered as the first phase of a progressive deployment and not as an opportunity to learn and improve the design of the Programme.

This document offers a series of recommendations concerning the planning and executing of pilot ICT projects in schools. It also provides guidance on how to interpret the information gathered from pilot experiences, to aid in the decision making process (whether to execute a larger-scale deployment or not) and the planning process. This document is based on GeSCI's experiences and observations in its partner countries and we welcome your feedback and suggestions.

This manual is organized into two main sections:

- The first section covers planning and execution of **pilot projects**.
- The second concerns **large-scale deployments of region or nation-wide projects**.

At the end there is a recommended list of additional resources of information.

Audience

The intended audiences for this document are Government officials from various Ministries planning nationwide deployment of hardware, software and/or IT solutions for the education sector.

The system–wide approach

The effective deployment of ICTs in schools and indeed in any setting is a complex affair that goes beyond purchasing 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 approach. This approach has to be comprehensive, demand-driven, efficient and well coordinated.

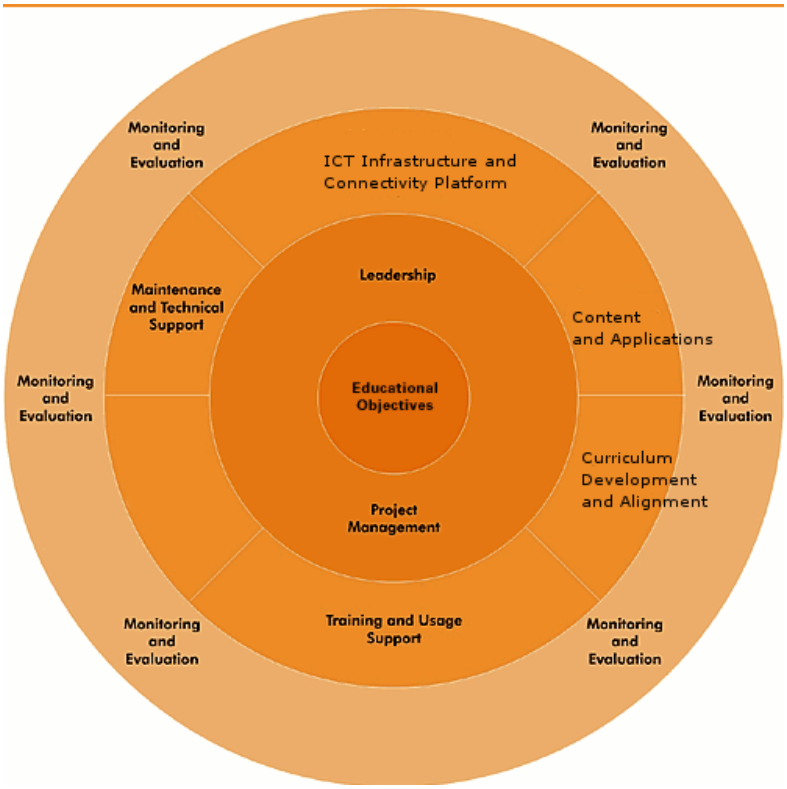

Figure 1- GeSCI system-wide approach

For both the pilot, but especially for a nationwide-deployment, all components of the system-wide approach have to be considered. This lends to a careful analysis of the required resources and

costs. For more information please refer to GeSCI's "Assessing Technology options for schools Report"[1].

What exactly is a pilot?

'Piloting' of an ICT project is defined as the implementation of an ICT technology, software, or related project on a small controlled scale to allow for its full impact, benefits and weaknesses to be evaluated before implementation on a regional or nationwide basis.

For example, before equipping all schools in a country or region with computer labs, a few school labs can be configured and tested. The testing can measure their performance over a limited period of time. This allows stakeholders and specialists to learn from the experience and refine the requirements for a larger-scale deployment. Alternatively, before deploying a new ICT curricula supported by educational software, the software tools can be installed in a few computers in some classrooms to test how the children and teachers react to it and interact with it.

Ministries around the world are currently running pilot projects to test:

- **Hardware implementations,** i.e. thin vs. thick clients, computer labs in schools, computers in classrooms, alternative electrical sources like solar and wind, communication servers.
- **Software implementations**: open-source operating systems, educational tools, digital classroom environments, multimedia development tools (i.e. images and audio created by students), programming tools.
- **New educational ICT-supported applications**: e.g. cameras and multimedia used in classrooms, one-computer-per-student (1:1) models like OLPC, Internet access for curricula support, distance education and e-learning, educational and community telecenters, creative collaborative content development (e.g. blogs, wikis).

[1] "Assessing Technology options for schools – Report on framework and tools" by GeSCI – http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

Note: In this manual we will refer to the ICT project as a "solution", analyzing its implications in general and providing examples based on some real-based situations.

Piloting consists in the setting-up of the desired technical environment (hardware, software, content, training, furniture, support material, etc) in a "controlled" space where its performance can be measured. Piloting allows a select group of intended users to interact with the technical environment and find potential problems. What are of significance are the results and the problems that are found in a real world situation, often referred-to as "the field".

One cannot determine beforehand what the results of a pilot will be. However, a series of variables (or indicators) can be pre-determined and these will enable essential criteria (as defined by those leading the ICT strategy) to be tested and measured. There is more on indicators in the Appendix.

It is important to make a clear distinction between **piloting** and **progressive or phased deployment. It is a mistake to think of them as one and the same.** Pilots are executed for learning purpose, so that initial assumptions can be adjusted and an informed decision can be taken regarding the execution of the project on a larger scale. Pilots are NOT the first phase of the deployment itself, since the deployment per se will start once the final project documentation is completed. However, the same factors must be considered during planning and execution of a pilot, but factors such as costing and logistics need not be considered as stringently. This is addressed in greater detail further on in the document.

Why are pilots important?

- Before investing in a large-scale project, testing its assumptions on a smaller scale can leave us better equipped to plan and execute for the larger scale deployment.
- We can reduce the risk of propagating mistakes by detecting errors at the pilot stage. For example, we can test if the ratio of 1:3 computers-to-children in a classroom is an appropriate ratio based on student and teacher response.
- Pilots can be used to assess the impact of the technology on the schools, the people, the community, and whether equipment is used effectively by students and teachers, etc.
- It is easier to secure funding for a pilot than a large-scale deployment. The pilot can provide the evidence needed to secure more funding or to justify greater expenditure on specific areas such as personnel or baseline studies.
- The project team members can gain more experience before engaging in a more demanding project.

- Pilots can be used to compare two or more similar solutions in order to find out which one works best in the field. For example, they can be used to test two similar computer devices or educational software packages at the same time and in similar environments.

Part I: Pilot projects

A pilot is a way of testing a theoretical model on a small-scale level, in order to discover potential problems that otherwise would not be detected until full-scale deployment. If these potential problems are not detected on time, it can cost a lot of money and time to introduce changes once the solution has been deployed to more schools.

Pilots' are very different from the first stage of a progressive deployment and demand a specific type of planning.

*A pilot will be a success if **executed correctly and providing results that are reliable** (whether 'positive' or 'negative'). Positive results prove a theory is correct. Negative results are only so because they disprove the initial theory. However this 'negativity' can save us from engaging in disastrous implementation on a large scale).*

***A reflection**: How do we define 'success' or 'making a difference' of an ICT4E project?*

*The **potential** of ICTs in Education is to create change in three areas: a) increasing access b) Improving the quality of teaching and learning c) improving educational management. Then there are two other dimensions one can consider: improving efficiency (management, outcome/ educational) and reducing costs. But we also know that technology needs to be situated within the context of a country's educational objectives. So it would follow that the 'success' of an intervention would depend on the degree to which the integration of a tool enables the attainment of educational objectives – and thus justify the investment choice of one particular tool over another.*

In this section we will discuss the steps for planning and executing a pilot project.

Planning for a pilot

A pilot project requires the same degree of planning as any ICT project in order to ensure success. As with any other ICT project, the pilot's objectives; scope; tools; implementation details; logistics; funding sources; installation; support; maintenance; replacement plan; team members profiles and responsibilities; budget and timeline all have to be documented. But in some respects

*The pilot document has to be very clear about the objectives of the pilot, the monitoring and evaluation plan and how the indicators will be measured. This document has to be fully developed **before** executing the pilot and will constitute the basis for the evaluation of the pilot, as well as the basis for the future evaluation plan of a large scale deployment.*

a pilot can be a little more flexible than a real large-scale deployment and we can leave some issues like exact costing or nationwide logistics undefined, since some of the variables we will obtain from the experience itself.

In this section we will discuss some key components of a Pilot's Plan.

Monitoring and Evaluation Plan

One of the key tasks that has to be planed for is the development of the Monitoring and Evaluation Plan, or M&E Plan. M&E is the way of measuring the outcomes of the pilot in order to match them to the educational goals. This Plan should define the data to be collected and how is it going to be collected. The variables that will be analyzed are called "indicators". Some of the indicators will have numeric values (quantitative) and will be easier to measure (i.e. number of computer hours per student in a week, numbers of equipment that failed in a given period), while other qualitative indicators will be much harder to measure (i.e. teacher satisfaction with the tool, or how the learning process was improved by the use of the new software). Please see some examples of indicators in the Appendix (page **Error! Bookmark not defined.**).

A pilot is set-up to test for some hypothesis. The M&E Plan is the way of verifying how well theory adapts to school's reality.

"*Bias is a very real issue in most of the monitoring and evaluation work done of ICT in education issues across the board. Such biases are often introduced at the monitoring and evaluation design stage, and include a lack of relevant and appropriate control groups, biases on the part of 'independent evaluators' (who often have a stake in seeing positive outcomes), and biases on the part of those evaluated (who may understandably seek to show that they have made good use of investments in ICTs to benefit education). The opportunity for such biases (which are usually positive biases) are especially acute where there is a great reliance on self-reported data*". "Knowledge Maps: ICTs in Education" (Infodev, 2005) http://www.infodev.org/en/Publication.8.html

An excellent resource on the subject is Infodev's "Framework For The Assessment OF ICT Pilot Projects[2]"

[2] http://www.infodev.org/en/Publication.4.html

The document layout

In this Planning document the following must be defined:

- Objectives or thesis: the initial supporting theories to be tested, for example, that the software improves the learning process or that less children leave school. This is of course associated with the educational objectives that the ICT project has to support.
- Timeframe: Define the timeframe for the pilot. The period should be of significant duration for results to be produced and measured. Normally a pilot will run for one or two school terms.
- Selected sample schools/grades/students: A sample size of schools/grades/students must be selected in accordance with the type and purpose of the pilot project and the initial theories that are to be. It should be a representative sample, that is, a sample that reflects a realistic representation of the variations within the relevant school system, e.g. rural and urban schools, private and public schools, male and female students etc. We suggest that the schools are selected based on their real scientific value and not on a political basis, as this might influence the results. There is no specific recommendation relating to the number of samples needed for the results to be relevant. This is determined according to what needs to be measured, local conditions and the number of team members available to oversee the pilot. However, there exist specific statistical techniques to select a number of samples for the results to be representative.
- Team: determine the team members that will execute the pilot, and the roles and responsibilities of each of them.
- Budget: estimate and allocate sufficient funds for the pilot to be executed effectively. A pilot can turn out to be more expensive per school or test site than a large scale deployment would finally be, since a large amount of money has to be invested in planning and monitoring. A 15%-20% of the total amount has to be allocated for extras that are normally very difficult to estimate at the beginning of the project.
- Monitoring and Evaluation plan: including the indicators that are going to be used to measure the results of the pilot. This is usually quite difficult to define, since we will not only have to find the indicators but also determine the way to collect and process the information as accurately as possible. Please see some examples of indicators in the Appendix (page 32).

For more detail an example of the outline of a pilot planning document can be found in the Appendix on page 31.

Executing the pilot

Once the pilot planning document is ready, the resources are in place, and some candidate schools/classes have been selected, it is time to actually run the pilot.

The execution will usually include these stages:

- Pre-analysis: final selection of the sample schools where the pilot will run. Analysis of the school infrastructure that is in place and execution of required adaptations if necessary (i.e. buildings, classroom infrastructure, specific furniture, electricity provision).
- Set-up: acquisition, transportation, installation and configuration of the equipment and/or software.
- Project presentation: several informative talks with people directly and indirectly involved like teachers, headmasters, parents, community members and students about the objectives of the pilot, how long it will last and how to record the experience, etc. It is particularly important to explain carefully the objectives and how crucial it is for those involved to record the failures and problems they might experience, as well as the successes. It is also important to clarify the time-frame and the implications for the end of the pilot as well as the responsibilities of the stakeholders.
- User training: Training users to use the specific tools. Normally the teachers are trained first, and they in turn, train the students if needed. It is best if teachers are provided with training materials also.
- Execution: Once the pilot is running, the monitoring plan is activated and the indicators have to be measured and data recollected and analyzed. The team will have to provide support for teachers, students, parents and the community. Early adjustments can be required to the project Plan if some major issues turn out that require it.
- End of pilot: by the end of the determined period, if the data gathered is considered sufficient for analysis then the pilot is terminated. At this point the equipment is removed, with due regard for careful explanation to teachers, students and the community as to the rationale behind this.

Note: the stages listed above do not necessarily follow this order, and some of these tasks can run in parallel.

How to collect and measure data

As we mentioned before it is critical to design a proper Monitoring and Evaluation Plan and use the pilot for the collection of relevant data that will allow for the verification and validation of the original ideas proposed by the project.

To start on the right footing it is critical that the schools, grades, students and/or teachers selected for the pilot are representative of the general school population in the country or region. They must also be willing to participate in the pilot, and must be well informed of the objectives of the pilot and what their role is.

How the findings are recorded and measured depends on the particularities of the pilot and of the indicators being measured. Indicators can be measured daily (i.e. daily usage of computer devices), weekly, or per case results (i.e. total % of equipment that failed).

Below various collection methods are outlined:

- **Automatic**: it is possible to have automatic tools that will collect some numeric data like number of hours a system was used, exactly when and by whom (if each student is given a username for example). This way data does not have to be collected from users directly.
- **External**: One or several observers from the team can be present during teaching hours or at the students' homes. This can be done with or without interfering with the normal teaching process.
- **Subjective**: Participants can document their impressions, experiences and ideas through several tools like journals or diaries, questionnaires, tables or forms. The frequency of documenting must be pre-defined. This type of feedback gathering is useful for quality metrics. In addition to free-text comments that could enrich the conclusions, this type of feedback can be tabulated and analyzed as well.
- **Environmental**: Data can also be gathered by questioning teachers, students, headmasters and also the parents and the community about the pilot results and their perceptions.

Other critical tasks to undertake as part of a pilot

While the pilot is running and being supervised, there are other things the team can be doing as well, in order to provide additional information about the products to be tested.

Here are some suggestions:

- **Technical testing**: If new hardware is involved, perform technical testing of the equipment: install a lab or hire another organization to test the equipment for errors and problems. Try to find the limits of the electronics by doing a stress test (can be destructive in some cases). Test for extreme environment situations (dust, heat, water) and rough handling. Test the electric consumption and battery life. Try to estimate the useful lifespan of the devices and that of its component parts. Try to work on tentative repair and replacement procedures and related costs.
- **Software testing:** If software is involved, test for hardware requierements and optimal hardware setup, installation/reinstallation processes, possible errors and bugs, execution under different hardware and operating systems, weaknesses in the design and security, and language translation mistakes or needed adaptations. Work on initial versions of training manuals, FAQ and online help. Universities and online user communities can be invited to help with these tasks.
- **Research**: perform an online research on similar experiences with this product in other countries. Ask the hardware/software provider for contact data from other customers and contact them. Try to extract what can be learned from previous experiences.
- **Nationwide costs estimate**: Undertake a tentative analysis of the estimated logistics and costs for nationwide deployment, taking into consideration what is being learned from the pilot. This analysis should include the initial investment as well as running costs like electricity, continuous training, software licensing and support and maintenance. A variation of +/- 50% in the amounts estimated nationwide is normal at this stage.[3]

Note: This does not imply that the technology tested proved to be successful or not. The pilot might prove it to be inadequate or in need of adjustments, even though the pilot test itself can be deemed a success.

[3] GesCI provides a nationwide TCO tool available for download from http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

How to ensure the success of a pilot project

"Success" of a pilot can be defined as the smooth running of the pilot as planned in an adequately selected sample of schools/students, producing results that can be trusted for the variables/indicators selected in the Monitoring Plan.

Some of the things that can be done to ensure that the pilot runs smoothly and yields valid results are:

- **Carefully select the sample schools, classes and/or students** in such a way that it represents different situations found in the field.
- **The monitoring plan is in place and the indicators to be measured have to be properly defined,** and the pilot team has to be thorough and honest in collecting required data to measure the indicators. Have observers from the team in place to verify the collected data. (Please find some examples of indicators in the Appendix on page **Error! Bookmark not defined.**.)
- **Do not disregard the importance of the human factor**: one common mistake is to unconsciously convey to participants that the only results desired are positive ones. This might result in participants hiding problems, producing might hide the problems that they find and this can produce an artificially "successful" pilots with disastrous large-scale consequences! Explain carefully to all participants the objectives of the pilot. Talk to teachers, children, parents and the community. Describe the steps to be taken when they find errors or problems. Make it clear that it is not their fault, and make sure they have the tools to report both positive and negative results.
- **Do not rush:** give pilots the time that they deserve. Normally relevant results cannot be produced in three weeks (such as the use of software). Give pilots enough time (one or two school terms or semesters) to find significant results and detect potential problems.
- **Involve the community:** of course it depends on the type of solution, but it is usually critical that the community gets involved in the pilots as well. In this way, the support of parents and stakeholders can be secured.

An important finding by Infodev: The 'pilot effect' can be an important driver for positive impact: Dedicated ICT-related interventions in education that introduce a new tool for teaching and learning may show improvements merely because the efforts surrounding such interventions lead teachers and students to do 'more' (potentially diverting energies and resources from other activities). "Knowledge Maps: ICTs in Education" (Infodev, 2005) http://www.infodev.org/en/Publication.8.html

What a pilot is not and how it should NOT be used

- **A pilot must be carefully planned for**: doing a pilot does not mean that you don't plan at all and do the pilot in order to see how the real project should be planned. Planning will save you lots of time and reduce the problems, letting you concentrate on the user's experiences.
- **A pilot is NOT the first phase of a large scale deployment:** one of the most frequent mistakes is to believe a pilot is just the start of the large scale project. It is not, as we are testing for the **feasibility** of the implementation. Be sure to adjust expectations to the fact that the pilot might show the proposed solution to be inadequate for local conditions.
- **A pilot must not be used for a certain technology company to support the sales pitch for their products**. Do not allow the company providing the hardware, software or solution to interfere with the pilot, or the results can be biased. Do not necessarily trust their pilot documentation, as it might be biased to show fantastic results for their products. Remember that in the end they are trying to promote their product. Ask instead for direct contact with some of their clients who would be willing to share their experiences.

For example, if we want to test for a computer lab to be used by schools, then we have to test it in rural schools as well as urban. We need to test it in schools where there is electricity from the grid and where there are other forms of electricity available. We also need to test in public and private schools, in girls only and in mixed schools, etc. The sample (schools, grades, students or teachers) should NOT be selected on political grounds, a common occurrence in many countries, as this will most likely yield biased results. It should also be noted that the sample cannot be too small, since in this case the data collected might be too partial, nor should it be too large and difficult to supervise.

The Pilot's final report and follow-up

Once the pilot's testing period has come to an end, the team should write a detailed report with the collected findings. The report should include the most relevant data gathered from the test sites, as well as the results from the technical tests and additional information obtained from other sources.

The document will normally suggest adjustments to the original project plan according to what has been found, and include recommendations about the hardware software/solution, training, deployment, execution, etc, if it should be deployed or not, and how to avoid common problems.

Since this type of document is also generally used to obtain the allocation of funds, it should also include information about estimated nationwide deployment logistics and costs. Even though not all data will be collected during the pilot, it is critical to consider TCO (Total Cost of Ownership) when describing the costs of a deployment. Do not forget to take into account initial costs like: school infrastructure, electrical provision, equipment, taxes, transport, insurance, logistics, consumables, connectivity, monthly costs, licensing costs, maintenance, repairs, replacements, and training. Please refer to the TCO section on page 24 for more information on how to estimate these costs.

After the pilot

By the close of the pilot project several scenarios can present themselves:

- ⇒ Lack of information/data gathered: the pilot's testing period can be extended, and sometimes the sample schools group can be widened or changed in order to obtain additional results.
- ⇒ Positive results and available funds: the team can adjust the initial project's document and have the final project ready. Once the funds are guaranteed they might start a nationwide deployment or a larger scale (i.e. departmental) progressive deployment of the solution. In this case the pilot has been useful in proving the initial theories. This has allowed the team to correct errors before large-scale deployment.
- ⇒ The results are negative: the pilot will provide the evidence of the cause of the negative results. It may be the choice of hardware/software/solution or the selected school sample or in the implementation. Once discovered adjustments can be made and another round of pilots can be run to further test the solution.
- ⇒ Competing technologies were tested: the pilot can provide evidence of which technologies were better in different real-life situations. Or how a single solution can

be obtained by combining elements from several solutions. Sometimes in these cases the pilot is used as an additional element in a technical analysis of a bidding process.

Piloting the ICT project has allowed the solution to be tested in a real educational environment. Users have been observed, and conclusions drawn by analyzing invaluable data. If a large-scale project is to be executed, then the pilot has provided the basic data to do an accurate cost analysis and to adjust the premises for a large logistics planning, saving a lot of money by avoiding future errors. In the next section we will discuss how to conduct a large scale deployment after a Pilot.

Part II: Large-scale deployment

If the pilot yields positive results and there are resources to implement the IT solution regional or nationwide, then planning for a phased large scale deployment must begin. Whether telecenters are being installed, computer labs, servers, solar panels, Internet connectivity, educational software or a new operating system, the steps for the phased deployments are similar. This section presents some of the issues involved in planning for and executing a large-scale deployment after a piloting stage.

*Note: Each of the individual places where the solution is to be installed is called a **site**.*

Replicability and feasibility

A successful pilot does not necessarily mean that the same solution can be easily replicated. Feasibility and Replicability play a very important role.

The *feasibility* of any given project determines whether that particular set of technologies are applicable in a given context irrespective of the inherent benefits. Feasibility is usually influenced by local conditions. For example, the lack of wired telecommunications infrastructure at a remote village may mean that the only connectivity options are satellite or none at all. Or the lack of electricity or adequately equipped classrooms can make deployment very costly or difficult. Before commencing with large-scale deployment the entire target educational institutions must meet the required basic criteria for the ICT solution to be feasible in that location. Feasibility might include for example: adequate infrastructure in the classrooms (roofs, benches, windows), sufficient electric installation, trained teachers, a supporting community, an adequate legal environment, etc.

Replicability means that the project was tested in a representative sample of the schools and thus, that the solution can be more or less standardized to fit most of the situations that are found in all schools. Planning and deploying to a few schools close to a capital city or schools that the project team is familiar with is far simpler than deploying to hundreds or even thousands of unfamiliar locations. Standardizing means designing one or more “model” procedure of the solution that will fit most of the requirements found in reality. A good way to ensure replicability is by designing flexible but standard installation options, so that each can fit a different situation in reality. But most of all standardizing saves a lot of time and money because:

- standard solutions can be contracted through bids, obtaining better value for money

- standard solutions save time on each deployment because you only need to determine which standard applies to each school
- a standardized deployment can be executed by personnel with less experience
- it is easier (and thus cheaper) to maintain standard installations

Both Replicability and feasibility have to be analyzed before starting to deploy on a large-scale. In the following sections we offer some advice on how to tackle them both.

Learning from experience

The previous stage of piloting will provide you with a series of documents that would be very useful for a large scale deployment. Many documents you have already elaborated have now to be revisited for a larger scale, taking into consideration Replicability and feasibility. An example of some of these documents is listed below:

⇒ The pilot plan, now considering the total sites to be deployed to and adding logistic consideration turns into the **National Deployment Plan**. It is critical that this new document carefully includes the lessons learned during the pilot and the ways each of these issues was addressed.

⇒ The initial cost analysis of the pilot, now taking into account the Total Cost of Ownership or TCO, considering every stage of the system-wide approach, turns into the complete budget (TCO) for the nationwide deployment and maintenance

⇒ The standards developed during the piloting stage (if any), now revised and including nationwide legislation and particular situation, become the standards for the nationwide deployment

⇒ Monitoring and Evaluation techniques and plans used during the pilot become the complex Monitoring and Evaluation Plan for the project.

> "*A general lack of formal monitoring and evaluation activities inhibits the collection and dissemination of lessons learned from pilot projects and the useful formation of necessary feedback loops for such lessons learned to become an input into educational policy. Where such activities have occurred, they focus largely on program delivery, and are often specific to the project itself*" "Knowledge Maps: ICTs in Education" (Infodev, 2005) http://www.infodev.org/en/Publication.8.html

Key elements of large-scale deployment

Large scale deployment plans vary from country to country and depend on the situation and the solution as well. Though we cannot suggest a standard format for a large scale deployment plan, we know for certain that some key elements have to be considered, as they play a very important role. These elements are described below:

1. Have a good inventory

In order to execute an effective large-scale installation a good **updated** inventory of the **required data** for all the destination sites is needed (normally, educational institutions or towns). Much of the required information is general (type of school, number of students and teachers, number of classrooms), location information (precise school location), contact data (schoolmaster, teachers, emails and phones), infrastructure data (electricity, roads, security) and other ICT information if available (existing equipment and software, etc). This data has to be gathered so that the solution can be feasible, but sometimes it is not easily obtained. Old databases need to be updated, either in person, by telephone, email, through another persons or organizations, or by postal letter. Without a reliable database it will be very difficult to plan the deployment, and could incur in expensive mistakes.

In some cases it might be worth undertaking a **baseline study**, which consists of basic research done on every one of the schools (or a portion of them) in order to have freshly collected information. This will provide the project with updated information that can be trusted. 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 lack any ICT which can be used to prioritize deployments
- Which teachers have received ICT training or whether a school has a teacher who could be trained.

The drawback is that it will certainly consume time and resources. Remember that this database will not be static: it will become the main information source as it is updated and maintained as the project progresses and information is captured.

2. Have standards..and apply them!

As we already discussed before, a unified standardized installation is more efficient and cheaper to deploy on a large-scale.

For example, imagine that you have to provide schools with electrical installations. But some schools already have something, others none, and others have a very good installation. In this case five solutions can be designed ranging from a school without electricity to a school with good provision needing only minor installations in the classrooms. All local schools can be accommodated by any of the pre-defined solutions, so that planning and costing are easier to manage. Or for school computer labs, there can be four or five standard room designs or models that can then be slightly adapted to local conditions. In this way it will be much easier to organise labor, costs and tasks to be done. Once the costing and composing elements for a standard room have been determined, each school can be assigned one of the pre-defined solutions.

It is also worth taking the time and investing the money to develop standard guidelines and manuals that will then be used when adopting the installations at every site. Experience and feedback from the computer industry, user groups and experts can be used to compile the documents. Some example of standards are National IT standards, school guidelines, training guides, technical documentation (how to resolve basic technical problems), etc.

But remember that standards are a powerful tool but are not static: they should be revised and updated with new information and experiences at least once every year.

So standardizing is a key element, but at the same time having enough flexibility to know that no solution can fit all realities!

3. Organise your team

Carefully select the team that will oversee the project. If there is a large territory to be covered it is better to have local, decentralised units than a single unit that travels all the time (and allows for a faster deployment too!). In order to organise the team better it is a good idea to have a clear manual on Policies and Procedures that creates a common ground for the work to be done. Also ensure that all team members receive common training.

4. Consider Logistics

Logistics can be a big headache for a large-scale deployment. If the territory to be covered is large or inaccessible, the costs of moving around resources and personnel can be very high. Plan the required logistics carefully in order to optimise the resources and be ready for unplanned situations. Some governments use the assistance of local organisations with good capillarity into the regions to help, like telecommunications companies, local municipalities or the armed forces.

5. Plan for a deployment in stages

Considering the system-wide approach mentioned at the introduction of this document, the project implementation will have several stages that each site has to go through. For example these can be: planning, transport, set-up, testing, training, and support. Deployment can be planned for in batches and can start overlapping the individual stages of different sites in order to better organise the workload as the project evolves.

Without a large team and almost unlimited resources it will not be possible to cover the territory of a large-scale deployment in a short period of time. Thus deployment will be carried out in stages. There are several criteria to group the sites in stages, depending on local conditions: by region, by those who are more in need first, first urban then rural, by the model #1 first, grade 4&5 first, public then private, etc. Regardless of how the criteria are selected and grouped, it is important to manage expectations at a local level, since some people might be upset by being “relegated” to the last position.

6. Support is key

Never forget that the installation and training in the use of the solution are just the initial stages of the implementation process. Shortly after the installation the sites will need support, probably a lot initially and less as they get more used to handling problems themselves locally. Some ways to provide support are:

- **Self-assisted guides**: generate manuals that explain the maintenance and solutions to common problems like how to connect/reconnect equipment, how to reinstall or do backups, etc. These easy-to-understand and do-it-yourself guides are very useful and can be used to solve 90% of the most common problems. They also support the training of users at the same time, reducing the load on a centralised support center. They can be complemented with a toolkit and some spare parts..
- **Local or regional support**: have local or regional offices with trained technicians that can solve problems and repair and replace parts. Train them locally, on-line or through manuals. Make sure they can either travel to the site or have the parts sent to them, according to priorities.
- **Through a toll-free central support number:** expensive but efficient, set up a call center that centralises the problems and can help users to solve them themselves, send a technician or have the part sent for repairs.

Please take into consideration that proper technical support is one of the main pillars to ensure sustainability, and that providing this support will probably cost a lot of money.

In this section we have discussed 6 key points of any large-scale deployment planning. In the next sections we will discuss ways to ensure that our project, once deployed, survives.

Total cost of ownership (TCO)

Many times we have talked about budgeting. But the Total Cost of Ownership or TCO is a concept that captures all the costs of a particular purchase from “cradle to grave” i.e. from making the decision to purchase, through the useful life of the purchase to retirement or end of life.

TCO differs from a regular budget because the budget usually focuses on the immediate (or initial) costs, encompassing one time purchases and the more obvious operating costs. TCO is therefore vital to understanding the full implications of any purchase one makes.

As we will see in the next section, a careful TCO analysis is critical in order to guarantee the sustainability, that is, the survival, of the Project. But in a large-scale deployment it is also needed because projects of this size normally require funds from different sources: public, private, national, regional and local, and these organizations need to know how much money they need to start the project and also to maintain it in operations over time.

At GeSCI we have developed a series of tools to assist in planning and deploying ICT projects taking TCO into account. These are available in the Resource Toolkit of the Appendix on page ***Error!***

For example, if you can evaluate the cost of 5 standard electrical installations and then with the baseline you can estimate which % of schools will need each of them, plus logistic costs of traveling and transportation, you will have an estimate of the solution costs.

To develop the TCO start by considering the two more external circles of the system-wide approach on page 5. These are all categories of expenses, some initial, some required over time for as long as the project is in execution, like training, support and maintenance. For your budget you will need to estimate the money needed for each one of expenses, in hundreds or even thousands of places all over the country or region.

This is not an easy task and a +10-15% error rate is normal. But anyway estimating these large numbers can be very difficult. This is where the baseline study or a good database of the sites (page 21) will help in your estimates, paired with having standardized installation.

Also, as we already mentioned probably several institutions might be investing money on this projects, so you will need a detailed budget. If you are not going to cover all the costs but some of

the, for example in the case of computer labs you but and install the equipment but the school has to pay the electricity and maintenance fees, it is helpful that you anyway provide schools with basic estimated budget and some guidelines on managing expenses, so that these do not come as surprises to the school management.

GeSCI has developed a specific TCO tool[4] that to support the costing analysis of large scale regional or nation-wide deployments, with examples based on 1:1 solutions.

[4] GeSCI's TCO page with manuals and tool http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html

Attaining Sustainability

> *"It's one thing to plant a tree, it's another to make it survive" Wangari Mathai, Kenyan 2004 Nobel Peace Prize laureate.*

As mentioned before, the installation of the solution and initial training is just the start of the life of the project. *Sustainability* of ICT projects can be defined as planning that ensures the continuation of projects over time, even if the central government does not allocate more funds to it, support and/or subsidizes it, a concept that is mostly forgotten when large national ICT for education Programmes are deployed. Most of the time other pressing priorities and the short-term focus of politicians that only think about the present, combined with the shortage of funds, create the environment where little or no effort is invested in assuring the survival of projects over time.

One of the most critical points is that in order for the project to survive it has to be made clear from the outset what the operational costs will be and who will pay for each of them over the years. Please consider the system-wide approach mentioned in the opening of this document. Sometimes national governments will assign some kind of subsidy (i.e. universal access funds) to pay for some of the regular expenses, at other times regional, local government or the schools themselves have to pay for other costs. Local private companies and NGOs can also be responsible for maintaining some structures like telecenters.

Another issue to consider is that large-scale national projects are difficult to control by central government, and much is left to regional and local authorities. What can be done at a local level to try to ensure sustainability? This section presents some practical advice.

Types of sustainability

There are several types of sustainability for a project:

- **Operational**: means that the required conditions for the project to continue in execution are in place and maintained, i.e. security for the computer lab, a trained teacher to teach certain software, the computer room is adequately furnished, there is electricity, etc.
- **Economic/Financial**: means that there are funds available to cover the expenses of maintaining the project over time, considering the TCO (Total Cost of Ownership) of a system-wide approach. This will include money for consumables, money to pay for local technical support, connectivity costs, etc.
- **Technical**: means that the technical conditions for the project are in place. This includes electricity, working machines, software licenses, spare parts, technical support etc.

- **Institutional/Social**: implying that there exists the institutional structure to support the projects: the school, the community, the city council, the local government. It can be achieved when prevailing structures, authorities and processes have the capacity to continue to perform their functions over the long term.

Sustainability risks and how to avoid them

Here are some typical sustainability risks that large-scale projects face and that can be avoided by doing some planning and having enough resources allocated.

Sustainability risk	Ways to avoid
Lack of enough funding once the project is in operation: it can happen when the project is deployed and some time after that there are no funds for connectivity, maintenance, upgrades, training, and the project is abandoned or misused.	Plan the project from the beginning considering the TCO. Make clear where the national government will take responsibility for costs and where local governments, the school or the community will. Sustainability may be at risk if the end-users continue to depend on heavily subsidised activities and inputs. Inform people at school level about recurrent costs, basic accounting practices and how much they will be expected to collect.
Training outdated: the project is deployed and teachers assist only during initial round of training. There are no new training sessions afterwards. Software changes and the teachers don't know how to use it.	Involve the teachers from the very beginning of the project! Plan for continuous training. Deliver material so that teachers can self-train. Build up capacity development Programmes and on-going systems for support through champion teachers/ communities of practice/ school clusters/ resource centers/ district ICT Units/ regional and national INSET.
The equipment fails and breaks and no one repairs it.	Be sure to include maintenance and support from the very beginning of project design

Sustainability risk	Ways to avoid
There are software updates and new versions, but no one installs them.	If these costs are not already covered inform schools about the estimated costs, failure rates, alternative solutions, etc. so that the school can proactively work on this

In brief, the ways to ensure the sustainability of the projects include :

- The designing and planning for the TCO of goods and services that support the project. If the local government or school is going to support some of the costs, make them aware of the estimated monthly amount and support them when buying equipment or repairs.
- Search for adequate institutional support at all levels (national support, local support, community support) for the project. In this way it will be more protected over time as priorities change or the budget is reduced.

If the sustainability of the projects is not planned for the very beginning, then the ICT project becomes a heavy load for schools and governments and the chances of it being discontinued are very high.

Lessons from the field: the failure of telecenters in Argentina[5]

In 1998 Argentina, a pioneer in the Latin-American region, invested in installing 1350 public access telecenters. Each telecenter consisted of a computer room with workstations, printers, scanner, etc, connected to the Internet. However, the project was mostly seen as a political move that showed politicians “giving away” computers and there was no planning for any sustainability. Each community was supposed to pay for operational costs, but no support was provided for them to do so. Three years after deployment more than 50% of the telecenters could not be located. Today the project is considered a failure[6].

[5] "Centros Tecnológicos Comunitarios: La experiencia argentina" (2002, in spanish) by Silvia F. Rabadan and Roxana Bassi

[6] **"Centros Tecnológicos Comunitarios: La experiencia argentina" (2002)** Silvia F. Rabadan and Roxana Bassi (in spanish) http://www.links.org.ar/infoteca/ctc-peru.pdf

Conclusion

Executing a large-scale deployment of ICT solutions can be very challenging, but at the same time can yield impressive results for any country by affecting positive change in education nationwide in a very short period of time.

Most of the mistakes made at the planning stage of these large-scale deployments can be avoided by first gathering real-world information from a Pilot. But in order to do so, the pilot has to be planned and the information gathering has to be organized and validated with a string M&E Plan.

We sincerely hope that this practical guide can help you in planning for both the pilot and the large-scale deployment. We welcome your feedback.

Appendix

A. Outline of the structure of a Pilot Planning document

- Projects name
- Introduction
    - Project History: how this Pilot originated
    - Project's objective/s: Normally educational objectives and mention of how the project specific objectives will support them.
    - Scope: number of institutions, location, classes involved, number of teachers and students involved.
- Planning
    - Detailed description of the IT solution characteristics
    - Detailed deployment plan
    - Team members profiles, roles and responsibilities
    - Budget and funding sources
    - Timeline (preferably using some planning technique like GANTT)
- Execution
    - Installation procedure and standards
    - Support and maintenance, replacement plan
    - Implementation details
    - Training Plan
    - Logistics
- Monitoring and Evaluation Plan
- Appendix

B. Monitoring and Evaluation of ICT projects

Examples of indicators

This is a list of some example categories of indicators that can be used to measure the success of a pilot.

Note: this list is only an orientation since the indicators vary greatly according to each specific project and have to de adapted accordingly.

	Indicator groups	Description	From whom to collect	How to collect
Policy	Policy and project management	Presence of a national policy for ICT in Education (formal and non-formal)	Ministry of Education	Quantitative, automatic or manual
		Presence of a master plan with a timeframe		
		Presence of a budget plan		
		Presence of a body responsible for implementing the master plan		
		Percentage of a national education budget allocated for ICT		
		Mechanism for monitoring and evaluating the implementation of the programme		
		Does ICT in education policy refer to equity of access for remote schools, minorities, girls, children with special needs?	Ministry of Education, schools	
Technology Infrastructure and Access	Infrastructure	Was the infrastructure at schools or existing equipment adequate (furniture, electrical, security, access)?	Ministry of Education, School Heads ICT Coordinators	Quantitative, qualitative, manual or automatic
		If it had to be modified, adapted or installed, what were the associated costs?		
	Internet connectivity	No of computers connected to the internet		
		Hours a month the school uses the internet		
		Number of schools with websites produced by students		
	Equipment/software usage	Hours each item of equipment has been used in a given period of time		
		Hours each piece of software has been used in a given period of time		
		Number of consumables (i.e. paper, ink cartridges, CDs, pen drives)		
	Equipment failure rate	% of equipment that failed in a given period of time	School Heads ICT Coordinators	
		% of equipment that was repaired		
		Cost of repairs		
		% of equipment that had to be replaced		
		Times software had to be reinstalled		
		Times software hung-up		
		How were technical problems solved		
		% time connectivity was down		
		% time without electricity		
		Number of equipment items stolen		

	Indicator groups	Description	From whom to collect	How to collect
ICT Curriculum	Curriculum Development and Alignment	Existence of curriculum that incorporates ICT: • Compulsory • Optional	MoE National Curriculum Development Centre Regional or local Education Centres Research and Teacher Training Institutions School Heads Teachers Students	Document analysis and review Expert opinion Curriculum statements Content analysis Evidence from additional instructional materials
		Existence of ICT as a separate subject • in primary education • in secondary education		
		Number of schools using ICT as a separate subject		
		The extent of ICT integration in the curriculum (none, some, much)		
		The extent of ICT integration in teaching and learning programmes		
		No of schools incorporating ICT (low, medium, high)		
Teaching and Learning	Training and usage support	Percentage of teaching professionals who acquired pre-service training	Ministries, Teacher Training Institutions, Non-formal Education Centres, School Heads Teachers Students	Quantitative, automatic, manual qualitative
		Percentage of teaching professionals who received training in ICT in the last three years		
		Type of ICT Training • Basic • Advanced		
		Length of training • Less than 10 hours • 10 to 30 hours • 31 to 70 • More than 70 hours		
		Was the initial training adequate and relevant?		
		How must we modify the training?		
		How many hours were needed for the users to become proficient?		
		Was the training material adequate?		
		Existence of professional development plan at different levels		
		Increase in the number of teachers obtaining certification		
		Increase in the number of teachers participating in professional development activities.		
		Increase in the percentage of incoming teachers who meet basic competencies.		
		Percentage of teaching professionals who use computers for teaching purposes • Rarely • Sometimes • Regularly • Always		
	Learning process and outcomes	Numbers of hours of ICT access per learner per school year	Teachers and students Existing documents and secondary	Quantitative and qualitative
		Number of learners with ICT access outside school		
		Number of learners who demonstrate only basic ICT skills		

	Indicator groups	Description	From whom to collect	How to collect
		Number of learners who demonstrate advanced ICT skills	sources	
		Purposes for which learners use ICT ▪ Informative ▪ Functional ▪ Creating ▪ Communication		
	Learning process and outcomes	Increase in the percentage of students mastering reading, writing and mathematics	Teachers and students Existing documents and secondary sources	Quantitative
		Increase in the number of students being promoted		
		Increase in the percentage of high school graduates		
		Increase in student performance		
		Increase in the percentage of graduates in the adult education programs.		
		Increase in the number of students with disabilities who are educated through the general education curriculum.		
		Increase in student attendance in classes.		
		Increase in student participation in the meal programs		
		Decrease in the student use of alcohol tobacco & drugs.		
		Decrease in the number of suspensions because of student violence		
		Decrease in the amount of use of deadly weapons		
		Decrease in the amount of vandalism cases.		
		Decrease in the amount of reported theft.		
	User Attitudes	How do the teachers/students feel using the solution?	School Heads Teachers Students	Qualitative, manual
		Did their relationship change?		
		Did the learning process change?		
		Are the children more interested in learning?		
Community	Community involvement / parents	Increase in parent and teacher attendance at meetings and school activities.	School Councils Parent Teacher Associations (PTAs) Community Leaders Parents Public Private Partnerships (PPPs)	Quantitative, Qualitative, manual
		Increase in the number of volunteers in public schools.		
		Increase in business partnerships.		
		Increase in participation in school sponsored activities.		
TCO	Costing	Cost of the installation	Ministry of Education Schools PPPs National, Regional and Local Teacher Education Institutions and Centres	Quantitative and Qualitative, manual and automatic
		Operational costs		
		Electricity costs		
		Connectivity costs		
		Maintenance costs		
		Training costs		
		Other costs		

Indicator groups		Description	From whom to collect	How to collect

Data Collection Tools[7]

Methods	Tools	Description
Quantitative -numerical data compiled arithmetically and analyzed by statistical processes	Pre-and post tests	Tests administered to teachers and students before and after the intervention to determine differences in knowledge and skills
	Surveys	Series of questions that generate information or opinions to be analyzed
	Classroom observations	Quantitatively focused observations that involve "scoring" or coding classroom interactions
	Exams	Scores on national or standards-based exams aligned to project outcomes
	Cost-benefit analysis	Analyses of cost-benefit relationships, input-output relationships, programme audits, etc.
	Performance-based assessments	Measures of student or teacher competencies through performance of particular tasks as opposed to a test or exam
	Other data	Student completion rates, teacher retention rates, demographic data, etc.
Qualitative - data gathering from interviews, writing samples and other sources that require analysis through interpretation and inference	Interviews	Structured/ unstructured questioning, typically with one person
	Focus groups	Group interviews or guided discussions
	Case studies	In-depth studies of an individual example – a teacher, a school, a project – that enable rich analysis and description of a particular situation
	Authentic assessments	Portfolios of student work, teacher lesson plans, etc.
	Other data	Observations, holistic examinations of student work, classroom walkthroughs, etc.

[7] Source: *Info*Dev [Online]. "Using Technology to Train Teachers". Available from: http://www.infodev.org/en/Publication.150.html

Situating indicators on the basis of ICT development at national level

It is recognized that countries participating in deployment projects or programmes may be at different stages of ICT development. Indicators to measure ICT use and impact may not necessarily be standard or uniformly applicable to all countries. One country may already be advanced as far as teacher training or access indicators are concerned, but may not have developed an official ICT in Education policy. Another country may have developed an official policy but may not have begun integrating ICT in the national curriculum.

To address this concern, the following classification of ICT development in education is proposed. The matrix is adapted from the Applied Morel's matrix, which originated from the UNESCO IITE High-Level Decision-Makers in ICT Educational Policy in 2001. It should be noted here that these different stages can also apply within a country specifically within a country's different regions/sectors.

1. Emerging 2. Applying 3. Integrating 4. Transforming

Examples of Indicator areas	Emerging	Applying	Integrating	Transforming
Policy				
Technology Infrastructure				
Curriculum Development and Alignment				
Content and Applications				
Training and Usage				
Maintenance and Technical Support				

Definitions of the Stages[8]:

EMERGING – this is the stage in which the country has come to the awareness of the benefits of ICT in education. Thus, a national policy has just been set, budget has been allocated and guidelines for the implementations have been prepared. This is also the stage in which the country in general is undertaking infrastructure development in preparation for the nationwide access to ICT. Thus, the country may embark on infrastructure project such as providing electricity and communication facilities to areas without these infrastructures. At this stage, the schools, in particular may be in the process of hardware build-up in terms of purchasing computers and other ICT facilities. Indicators most useful for assessing ICT introduction in such countries will focus on infrastructure build-up and ICT availability, penetration and connectivity. Indicators that determine existence of a national policy, master plan and budget allocation will also be useful to test commitment and support of the governments. It will also be useful to know

[8] Source: UNESCO Bangkok [Online]. Available from: http://www.unescobkk.org/index.php?id=1013 [Accessed 26 September 2008]

whether the ICT policy in education is linked to the goals and strategies of the national ICT policy of the country.

APPLYING – At this stage, the ministries of education are testing out and piloting the use of ICT in selected schools and subjects and have not integrated ICT as part of the curriculum. The schools in particular have started to benefit from the conveniences of using/applying ICT in the management and administration of education. Schools are not yet adequately equipped and teacher/student and computer ratio is still low. Internet connection is only beginning to appear on a selected basis and for limited use. The schools at this stage may be offering computer courses as a subject and most computers are set up as stand-alone units. Teachers are being trained mostly in computer literacy rather than the use of ICT in teaching/learning. ICT-based materials for teaching subjects are being developed and teachers are using ICT in the classroom mostly for preparing presentations, entering grades and assignments, making handouts, for text processing and classroom management. Indicators which are more likely to be of help here would revolve around availability/penetration and accessibility of ICT; teacher/student-computer ratio; Internet connection; teacher training outcomes; use of ICT by teachers and students or how ICT is used in schools.

INTEGRATING – At this stage, the ministries of education have integrated the use of ICT into the standard curriculum and developed standards and competencies for both teachers and students in the use of ICT. The schools have computer laboratories, mostly with computers set up in a network, have a working local area network and have access to the Internet which are available to students, and teaching and administrative staff. Most students and staff have e-mails. The use of ICT in the teaching-learning process is more of a tool rather than just a curricular subject offering. The teachers are naturally and routinely using ICT and various educational software in teaching subjects and students employ them in classroom activities and in completing their assignments. Telecollaboration and communication between students and teachers and other schools can occur in this stage. The most useful indicators which can be used here deal with assessment of teaching and learning process/outcomes as well as efficiency of ICT in communication, networking and providing easy access to online educational resources.

TRANSFORMING - At this stage, the systematic and widespread use of ICT in the education ministries and in their programmes throughout the country has become routine. Schools have been transformed into a level where ICT has become an integral part and important facility in the management and administration of education and has become an efficient and effective way of teaching and learning; solving problems; communicating and collaborating. Traditional learning has been replaced with e-learning and online learning. Students and staff have personalized websites, and students have full grasp of ICT facilities in their schooling. More advanced type of indicators are required in this instance. These can include availability of larger bandwidth, countrywide penetration of ICT including the marginalized areas and easy access to online resources as far as infrastructure is concerned. Use of ICT in terms of e-learning, tele-collaboration or collaborative work; use of online professional development; extent of teacher training coverage and training of teachers in advance use of ICT; and how ICT is being used to develop learners' creativity, critical thinking and problem solving capacity. It is also important to know how new graduates/work force are being integrated into the knowledge society and workplace.

Situating indicators on the basis of ICT Integration at institutional level – National Educational Institutions, Teacher Education Centres, Schools, Libraries, Museums

International research indicates that institutions often greet the arrival of computers with a mixture of trepidation and enthusiasm as they grapple with the exciting task of mastering and integrating the new technologies into their educational programmes. Initially the focus will be on acquiring additional hardware and software, perhaps without much thought as to how these resources can be used effectively in a teaching and learning context. Institutions need to start planning from a curriculum perspective, and to ask how the available technology will enhance the teaching and learning environment for both teachers and students.

e-Learning Planning Matrix

The following e-Learning Planning Matrix was developed by the Irish National Centre for Technology in Education for the purposes of school planning. It was presented in the African Knowledge Exchange workshop held in Kigali, Rwanda in June 2008. Participants representing 10 African Ministries of Education adapted the matrix for use in an African e-Learning context. The matrix (see following pages) highlights a wide range of issues in the development of a school's or and educational institution's e-Learning Plan. These issues are grouped into five categories:

- Management and planning
- ICT and the curriculum
- Staff professional development
- School ICT culture
- ICT resources and infrastructure

Within these categories, issues are discussed in terms of key indicators or progress markers and these are graded according to five stages identified as a roadmap to an institution's e-Learning development – pre-initial, initial, enable, e-confident and e-mature. As a result the e-Learning planning matrix offers a clear means of assessing an educational institution's current status. Institutions may find that they are primarily in the advanced stage in terms of the ICT resources and infrastructures but they are in the initial stage when it comes to ICT and the curriculum.

The roadmap planning towards e-Learning maturity is not simply a linear process, with a clear beginning, middle and end. Every institution needs to analyse their current position in terms of ICT integration and to develop a plan that will allow their institution to progress to the next stage. It is recommended that each institution works through the e-Learning planning matrix to identify their strengths and weaknesses. Having established these, they should then prioritise their weaknesses under each of the five categories and devise a realistic plan to progress to the next level. Such a process should be monitored on a regular basis to ensure progress is being made.

e-Learning Planning Matrix[9]

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
Leadership & Planning	**Vision**	There is no clearly defined and/or shared vision inside the school	Vision focuses mainly on ICT equipment.	e-Learning vision is developed by e-Learning Team	e-Learning vision is fully integrated into the whole school vision.	e-Learning vision is wide ranging and shared by all stakeholders. It is actively tested through the student learning experience.
	Plan	There is no plan in place	Basic ICT Plan is in place.	e-Learning Plan has been developed by e-Learning team. One teacher or a group of teachers has assumed leadership for ICT planning in the school.	Comprehensive e-Learning Plan is integral to the whole school plan. The development of the plan is led by principal/ICT co-ordinating teacher/e-Learning team with all staff contributing and whole school acceptance. There is a designated ICT co-ordinating teacher with clearly defined duties and responsibilities.	Teachers implement the e-Learning Plan in their daily work. Staff & students are actively engaged in innovative and exemplary practice.
	Integration	Focus is on using computers somehow, but there is no clear or organized way	Focus is mainly on ICT equipment and the acquisition of basic ICT skills.	Focus is mainly on supporting the integration of ICT usage throughout the school.	Focus is mainly on supporting more comprehensive integration of ICT and the exploration of new and more effective approaches to ICT	Focus is mainly on supporting and facilitating personalised and self-directed learning.

[9]Adapted by the AKE Community of Practice from the matrix developed by the National Centre for Technology in Education, Ireland

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
					integration.	
	Acceptable Use Policy	School staff does not realize a policy is needed	School has developed an Acceptable Use Policy for the Internet.	School has developed an AUP following consultation with staff, students, parents/guardians, board of management/trustees, NGOs and other schools.	School has developed and ratified an AUP for Internet and ICT use following consultations with staff, students, and parents. All stakeholders are familiar with its contents and the plan is fully implemented. AUP is shared with other schools.	The AUP accommodates innovative use of new technologies, and facilitates the development of an ethical and responsible approach to the use of these technologies.
	Special Educational Needs	There is no support for ICTs for special education	Support of ICT as a tool for learning in Special Educational Needs exists but is uncoordinated.	Use of ICT is focused on the areas of learning support and resource teaching.	School supports and encourages the use of a wide range of ICT resources and assistive technologies throughout the school to facilitate the inclusion of students with special educational needs in line with the EPSEN Act.	School includes the use of ICT and assistive technologies in the development of all Individual Educational Plans (IEP) for students with special educational needs and uses ICT in all aspects of special educational needs assessment.

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
ICT in the Curriculum	**Teacher Understanding**	Teachers have just some vague idea about e-learning.	Teachers have a general understanding of how e-Learning can improve teaching and learning.	A number of teachers understand methodologies to integrate ICT into the curriculum.	Most teachers understand how e-Learning can be used in the curriculum to improve student learning.	Teachers have determined their own methodologies for integrating ICT into the curriculum.
	Planning	There is no planning for ICT integration, none or few teachers use ICTs.	There is little planning for ICT integration, with ICT activities focused on students' acquisition of ICT skills, eg word processing.	There is some planning for ICT integration, with the focus mainly on teacher preparation, whole class teaching, group and individual work.	Teachers plan in a structured way for ICT integration in their lessons and classroom activities.	The school devotes time to exploring new approaches to using e-Learning to improve student learning.
	Teacher Use	Teachers don't use computers.	Teachers use computers primarily in isolation from regular classroom learning activity.	Teachers use ICT for lesson planning and as a teaching tool.	Teachers use ICT to provide learning opportunities that support cross-curricular, subject-based and constructivist learning approaches.	Teachers have embedded ICT into their practice to facilitate student directed learning. There is consistent evidence of collaborative, discovery-based and authentic e-Learning activities throughout the school
	Student Experience	Students have none or few contact with ICTs.	Students occasionally use ICT as part of the learning process.	Students experience e-Learning activities regularly.	Students experience e-Learning activities regularly and use ICT to collaborate on curriculum activities both within the school and with	Students are facilitated to use ICT to support and assess their learning, eg creating digital content and eportfolios.

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
					other schools.	
	SEN	School staff have not realized the value of ICTS for special education	Teachers are aware that ICT can enhance the learning opportunities of students with special educational needs.	Teachers use of ICT focuses on the development of literacy and numeracy for students with special educational needs .	Teachers use ICT diagnostic tools, assistive technologies and ICT resources to address curriculum objectives with students with special educational needs.	ICT is integral to all aspects of SEN teaching and learning as well as in the development of IEPs. ICT resources and assistive technologies are incorporated into all levels of school planning.
Professional Development	**Teacher Awareness & Participation**	Almost no teacher has been formally trained in ICTs.	Some teachers have availed of NCTE professional development in ICT.	Teachers are aware of and many have participated in NCTE or other ICT professional development programmes.	The majority of staff have availed of individual or whole school ICT professional development opportunities.	Teachers meet their professional development needs through active participation in communities of practice, peer-to-peer networks and accredited practice-based research.
	Planning	Teachers have not realized that they need to plan their professional developments on ICTs.	Interested individuals identify their own ICT professional development needs.	An individual teacher or the e-Learning Team identify the whole staff professional development needs in relation to ICT integration.	The ICT co-ordinating teacher or the e-Learning Team facilitates the identification of overall e-Learning needs of staff. Programme for CPD is	Teachers engage in ongoing self-evaluation and reflective practice in progressing the schools CPD programme.

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
					developed.	
	Focus	There is no professional development, with the exception of some basic ICT classes for some teachers.	Professional development is focused on acquiring basic ICT skills.	Some staff are participating in NCTE CPD which focuses on the integration of ICT into the curriculum.	The majority of staff have engaged in NCTE and other relevant professional development focused on the integration of ICT into the curriculum.	Schools identify and design whole school professional development programmes based on their specific needs, delivered in their own school with support from NCTE and other agencies.
	Teacher Confidence	Teachers have very basic ICT skills, if any.	Teachers have basic skills but lack the confidence to apply these in the classroom.	There is growing confidence among staff in the integration of ICT in the curriculum.	The majority of staff are confident in the integration of ICT in their daily teaching.	Teachers confidently share their experiences and innovative practice within their own school and with other schools.
	SEN	No teacher is trained in ICTs & special education.	Some staff have completed ICT & Special Needs professional development, eg NCTE's ICT & SEN - The Basics course.	All teachers in Learning Support and Resource Teaching have completed professional development in ICT and SEN.	Teachers have acquired the skills to use some assistive technologies and other technologies to support students with SEN and are adapting their teaching methodologies to use ICT with special educational needs. Teachers have attended professional development on	Teachers are confident and have acquired the skills to use a wide range of technologies to facilitate the inclusion of students with special educational needs.

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
					specific areas, eg autism.	
	Informal Learning	There is none or little idea about e-Learning.	There is little sharing of e-Learning ideas and good practice among staff.	Sharing of e-Learning ideas and good practice among staff takes place in an informal manner.	Teachers regularly share new e-Learning ideas and good practice with each othe,r eg via staff meeting or e-mail.	School supports and facilitates peer-to-peer learning in ICT, using a VLE and other formal and informal approaches.

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
e-Learning Culture	**Access**	There is no access to e-Learning resources. If there is, it is to off-line tools.	Teachers and students have limited access to e-Learning resources, or only to off-line resources.	Teachers and students have regular access to e-Learning resources.	e-Learning resources are readily available to staff and all students throughout the school.	e-Learning resources are available to staff, students and the wider school community outside of school time.
	Evidence of Use	No evidence of e-Learning.	There is little visible evidence of e-Learning.	There is visible evidence of use of e-Learning, eg displays of project work.	Evidence of e-Learning is visible in all areas throughout the school.	The school disseminates and shares examples of good practice beyond their own school community.
	Website/Online Presence	School has not realized the value of having an online presence.	School has or is actively planning an online presence, eg a blog or basic website.	School has an active and up-to-date website.	The school website contains content developed by teachers and students.	Schools uses a Content Management System (CMS) to create a communicative space where the school community publishes content and which conforms to accessibilty guidelines.
	Projects	No ICT projects.	Some teachers engage in school-based ICT project work.	School is involved in projects that integrate e-Learning (national and/or international), eg e-Twinning.	School has experience of integrating e-Learning in interdisciplinary and large scale project work, eg FíS.	Students and teachers regularly develop small-scale projects for external collaboration, eg through the use of a Virtual Learning Environment or wikis.

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
	Organisation & Communication	Some teachers and some students have individual (personal) e-mail addresses.	School has an e-mail address, and uses this for basic levels of correspondence and communication.	There is some communication between school, home and the Department of Education & Science via e-mail or text messaging.	School makes regular use of ICT to communicate with teachers, parents, Board of Management and the wider community. School has an e-mail newsletter.	School encourages parents and the wider community to use ICT to communicate with the school. Teachers, students and parents have online access to student records and timetable.

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
ICT Infrastructure	**Planning for Acquisition of Resources**	School buys equipment and receives donation without any plan.	Basic level of planning for ICT purchasing exists.	Some level of ICT purchase planning takes place, including standardisation of ICT equipment, use of shared peripherals , and purchasing with warranty.	Procurement planning and standardisation of ICT equipment takes place. Older computers are disposed of environmentally.	There is an integrated approach to procurement which takes into account full operating costs of ICT equipment and technical support provision.
	LAN & Broadband Access	No broadband access. Some sporadic dial-up access.	A local area network exists in some areas of the school. School is connected to the Schools Broadband Programme. Internet access is distributed through the Local Area Network.	Most rooms and computers are connected to the school network, facilitating access to online and network resources.	A high speed and reliable network extends to all areas of the school. All computers are connected to the network facilitating access to online and locally based server resources.	Resources are accessible from a central server. All teachers and students have secure access to server space, and their e-portfolio, from within the school and remotely.

		Pre-initial	Initial	Enabled	e-Confident	e-Mature
	Technical Support	No organized technical support.	Technical support is carried out using mainly the ICT teachers, advanced students and voluntary assistance. Occasionally a technician is paid to carry out urgent work.	Technical Support is provided by an external company on a call-out basis as required, or provided by a University/technical institution. No technical support contract is in place.	Technical support is factored into procurement planning, all equipment is procured with an appropriate warranty. Formal technical support contract with Service Level Agreement (SLA) is in place with an external provider.	Technical support is planned and integrated with ICT procurement planning and takes into account full ICT operating costs.
	Software and Digital Content	No e-Learning resources.	Limited e-Learning resources are available. Scoilnet is used regularly. Central licensing agreements are availed of.	The school has a range of appropriate e-Learning resources to support learning at all levels.	There is easy access to appropriate digital content that teachers have catalogued by subject/curriculum area.	The school creates its own customised digital content which is accessible from home and school.
	ICT Equipment	There is a computer lab with some equipment.	Some classrooms have desktop computers. A laptop and portable projector, printer and digital camera are available as shared resources.	Some rooms have digital projectors and computers. Peripherals, such as digital cameras and scanners are used for e-Learning activities.	All learning areas have access to a range of ICT equipment including digital projectors and wirelessly-enabled tablet PC's. Laptop trollies are used to improve access to resources.	All learning areas have access to a range of ICT equipment. Provision is made for the incorporation of students' mobile devices.
	Licensing	The origin of the software is unknown. Software is not standardized.	It is unclear whether all software in use in the school is properly licensed.	The school is developing a software licensing programme for the applications installed on the school's equipment.	The school has a log of all licenses for software and applications in use throughout the school.	The school ensures that all new installations of hardware and software meet the required licensing standards.

Resources Toolkit

This section provides links to some tools and resources that can be useful when planning for a pilot project and a large scale deployment.

- TCO: “Assessing Technology options for schools – Report on framework and tools” by GeSCI – http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html
- GeSCI TCO tools: these tools provide elements to make an informed decision about technology options and its costs, through an interactive Excel spreadsheet. http://www.gesci.org/ict-infrastructure-connectivity-and-accessibility.html
- Schools Online – “Planning for Sustainability: How to Keep Your ICT Project Running” http://schoolsonline.org/resources/sustainability/index.htm
- UNESCO’s ICT in Education Toolkit http://www.ictinedtoolkit.org/usere/login.php
- UNESCO Bangkok Indicators for Assessing ICT Impact for Education [Online]. Available from: http://www.unescobkk.org/index.php?id=662
- Handbook on Monitoring and Evaluation of ICT in Education Projects - A Handbook for Developing Countries (2005) http://www.comminit.com/en/node/270156
- “Knowledge Maps: ICTs in Education” (Infodev, 2005) http://www.infodev.org/en/Publication.8.html
- Example of Pilot planning: Plan of Operations IADB for Haiti OLPC pilot, http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=1364380 (march 2008)
- Infodev’s “Quick guide: Monitoring and evaluation of ICT in education initiatives” http://www.infodev.org/en/Publication.150.html