This is a resource toolbox. It offers a framework and resources to assist planners and strategists in:

- Designing mechanisms to evaluate the degree of implementation, effectiveness, and impact of the different elements of the ICT Program formulated in **Tool 2.2**
- Strategizing about subsequent actions to be taken in light of the results of evaluation

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<td>2. Adjustment &amp; Scaling Up</td>
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# Tool 6.1: Evaluation of ICT Interventions

## Overview

### Classes of Evaluation

1. **Class 1**: Degree of Implementation
   - Class 2: Degree of Proper Use
   - Class 3: Degree of User Satisfaction
   - Class 4: Degree of Effectiveness
   - Class 5: Degree of Subsequent Application
   - Class 6: Degree of National Effect
2. **Designs of Evaluation**
3. **Modes of Measurement of Evaluation**
4. **Management and Oversight of Evaluation**

## Toolbox 6: Assessment and Subsequent Actions

1. Evaluation of ICT Interventions
2. Adjustment & Scaling Up
6.1: Evaluation of ICT Interventions

This Tool provides policy makers and planners with a framework and resources for evaluating the ICT Intervention Program decided upon after using Tool 2.2, and its implementation in accordance with the implementation plans of toolboxes 3–5 (see Master Implementation Plan [Tool 5.2]). The evaluation results can be used to refine the ICT intervention, improve its management and implementation, decide whether to expand or terminate it, and inform the introduction and planning of other ICT interventions.

This is a resource Tool. It is intended to help policy makers and planners anticipate the several classes of evaluation that could be helpful over the life of an ICT intervention, consider the various evaluation questions that might be addressed, and gain an awareness of the need to plan desired evaluations before actually implementing the ICT intervention.

This Tool, therefore, is NOT an evaluation instrument in itself. It is not intended to guide the design and conduct of the evaluations, which should be done by professionals with advanced training and experience in such work.

The Tool focuses on four areas:

1. Classes of Evaluation

The various classes of evaluations that can be conducted to determine the degree of performance and success of the ICT Intervention are:

Class 1—**Implementation** (as intended)
Class 2—**Proper Use** (as intended)
Class 3—**User Satisfaction**
Class 4—**Effectiveness** (fulfilling educational objectives)
Class 5—**Subsequent Application** (preparing people to apply the outputs)
Class 6—**National Effect** (contributing to national developmental goals)

These evaluations are to be conducted at different points in the life of an ICT intervention. Generally, each ascending class level is initiated later than the one that precedes it and is more complicated to conduct. The following table indicates the comparative complexity and indicative timing of the different classes:

<table>
<thead>
<tr>
<th>Complexity</th>
<th>Classes of Evaluation</th>
<th>Year of ICT Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy</td>
<td>Class 1 – Degree of Implementation</td>
<td>May be repeatedperiodically</td>
</tr>
<tr>
<td></td>
<td>Class 2 – Degree of Proper Use</td>
<td>May be repeatedperiodically</td>
</tr>
<tr>
<td></td>
<td>Class 3 – Degree of User Satisfaction</td>
<td>May be repeatedperiodically</td>
</tr>
<tr>
<td></td>
<td>Class 4 – Degree of Effectiveness</td>
<td>May be repeatedperiodically</td>
</tr>
<tr>
<td></td>
<td>Class 5 – Degree of Subsequent Application</td>
<td>May be repeatedperiodically</td>
</tr>
<tr>
<td></td>
<td>Class 6 – Degree of National Effect</td>
<td>May be repeatedperiodically</td>
</tr>
</tbody>
</table>

The schematic diagram below illustrates the role and place of the different classes of evaluation and how the feedback from these evaluations can be used.
2. Designs of the Different Classes of Evaluation

3. Modes of Measurement of Evaluation

4. Management and Oversight of ICT-Intervention Evaluation
   - Staff qualifications for evaluation work
   - Time needed for the evaluation
   - Budgeting the evaluation
   - Ethical considerations
   - Monitoring of the evaluation

The Tool also provides a selected and annotated list of references relevant to evaluation of ICT interventions.
This class of evaluation seeks to determine the extent to which the ICT intervention is being implemented as intended.

Education innovations are often not fully implemented as intended. This could be due to the planners' unreasonable expectations, infrastructure not performing as represented, contentware developers not producing as promised, funding not being adequately disbursed, educators not being satisfactorily trained in using the ICT intervention, or unexpected external factors interfering with implementation.

Early detection of incomplete implementation permits corrective actions. Large disparities may call for new management, review of implementation plans, and consideration of whether the project is so far off course that it should be reset. In addition, if implementation is far from desirable, it is often wasteful to conduct higher-level classes of evaluation, because poorly implemented innovations rarely prove to be particularly effective.

Implementation can begin to be evaluated as the ICT intervention elements are in place, assessing whether they meet the planned specifications. Evaluation throughout the implementation rollout in schools or the community can provide early warnings of shortcomings and maximum opportunity to correct them. Evaluation after several years can indicate whether there has been decay in the implementation after the initial rollout.

The evaluation of implementation can focus on many different questions, each of which may be answered with multiple sources of data (see Section 3). A list of important questions that may be addressed appears below (Box 6.1). The Evaluation Team may select from them as appropriate and add its own.

**Box 6.1 - Questions to Determine Degree of Implementation**

1. To what extent is the planned regulatory framework in place and adhered to?
2. To what extent is the planned infrastructure established and fully operational?
3. To what extent is the planned hardware installed and fully operational?
4. To what extent are the necessary changes in school administration adopted?
5. To what extent are the planned broadcast tapes, instructional software, Web-based materials, and other media completed to the original specifications?
6. To what extent did the ICT technologies perform as planned (access speed, down time, etc)?
7. To what extent are other planned supports established and fully functional?
8. To what extent have the personnel involved in the Project been oriented?
9. To what extent are the teachers or facilitators trained and performing as planned?
   - To what extent are the teachers or facilitators proficient in the ICT technology?
   - To what extent are the teachers or facilitators proficient in the planned pedagogy?
   - To what extent are the teachers or facilitators integrating the ICT technology and planned pedagogy into their teaching and guidance?
10. To what extent were users prepared as intended to use the ICT Intervention?
11. To what extent has implementation cost been more or less than expected?
12. To what extent have funds been provided as necessary?
13. What are the reasons for whatever large failures in implementation have been found?
   - What contributed to them?
• Were they due to opposition to the intervention, insufficient guidance, deficient skills, inadequate incentives, or other factors?

14. Which implementation failures must be corrected and which are of minor consequences or even functional?

15. What are the best ways to correct the important implementation failures?
This class of evaluation seeks to determine the extent to which the ICT intervention is being used as intended.

A reference point for this evaluation is the element of the **ICT Program Report** in **Tool 2.2** dealing with "Advancing Learning Objectives" and "Fostering Teaching Objectives" These learning and instructional objectives are set in terms of the following taxonomies:

<table>
<thead>
<tr>
<th>Learning Objectives Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Storage or display of information</td>
<td>This level involves the passive hearing or viewing of stored information, individually or as a group.</td>
</tr>
<tr>
<td>2 Foster exploration of materials and ideas</td>
<td>At this level the learner is engaged in the conscious pursuit of information that will lead to a better understanding of an existent issue, question or concept.</td>
</tr>
<tr>
<td>3 Enable the application of understanding</td>
<td>At this level ICTs can provide a powerful tool for applying a concept or understanding to a new situation.</td>
</tr>
<tr>
<td>4 Organize materials or ideas to foster analysis</td>
<td>Here ICT tools allow individuals to analyze materials or ideas by organizing and manipulating them as a means of understanding their relationship.</td>
</tr>
<tr>
<td>5 Support evaluation and problem solving</td>
<td>This level represents the use of ICTs to support the learners' process of evaluation. This can be done by compiling information and resources into a digital repository; developing simulations that immerse students in an environment that will help them evaluate relevant dimensions and solve the problems that are posed; and collaborative Web-based environments that support or foster evaluation and problem solving.</td>
</tr>
<tr>
<td>6 Facilitate constructing or designing projects</td>
<td>At the highest level ICTs are used to foster the design or construction of integrating projects, whereby students must explore a wide range of ideas and resources, analyze and evaluate them, and synthesize them in a project. ICTs can fully utilize the multimedia environment to support this process.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Teaching Objectives Menu</th>
<th>Additional Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation</td>
<td>of a piece of information</td>
</tr>
<tr>
<td>Demonstration</td>
<td>of a concept, idea, phenomenon, law, or theory</td>
</tr>
<tr>
<td>Drill and practice</td>
<td>to achieve student competence in the application of knowledge</td>
</tr>
</tbody>
</table>
Animation and simulation | to abstract reality and offer an efficient and inexpensive environment to reach generalizations or to draw implications from a law or theory

Research | for professional development and preparation of lessons

Collaboration/communication | on projects with other teachers in the school or in other schools in the country or elsewhere, or with scientists in the field

Management of Student Learning

Another reference is the modality options selected for the Program:

<table>
<thead>
<tr>
<th>Usage Modality Menu</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated into Curriculum</td>
<td>Used as an integral part of the teaching/learning process</td>
</tr>
<tr>
<td>Enrichment</td>
<td>Used as a resource outside regular classroom</td>
</tr>
<tr>
<td>Stand-alone</td>
<td>Used for distance education, virtual schooling, online courses, etc.</td>
</tr>
</tbody>
</table>

ICT interventions can be implemented well but still not be used as intended by users (teachers, facilitators, learners, administrators, etc.). They might not be used at all, used considerably less than intended, or used frequently for unintended purposes. That may be because the users:

- misunderstood the guidance or instructions given;
- cannot make the intervention work as they were directed;
- are bored by the intended use and found alternative uses;
- are not convinced in the value of the ICT intervention; or
- were satisfied with the intended use, which led them to find supplemental uses. For instance, a telecenter intended to facilitate communication and develop literacy skills might be used to market local crafts or e-mail fraud schemes.

Early detection of low and mistaken use might allow modifications that save the ICT intervention from failure. Early identification of unintended positive uses may allow modifications that enhance those uses. Quick responses to potential abuses may avert adverse publicity and prevent ending the intervention. In addition, if an ICT intervention is not being used much, it is wasteful to conduct higher class evaluations, and if it is being used largely for unintended purposes, that would be important to know when planning the higher class evaluations.

Use of the ICT intervention should be evaluated as different project components are put in place, including the contentware. Further evaluation throughout the phase-in of implementation allows early alerts to shortcomings and unforeseen opportunities. Class 2 evaluation is sometimes repeated several years after an intervention has been implemented fully to examine whether use has evolved over time as a result of experience, training, comfort with ICT, new types of users, changing social contexts, or access to new types of resources.

Evaluation of the degree to which the ICT intervention was used as intended can focus on many different questions, each of which may be answered with multiple sources of data (see Section 3). A list of important questions that may be addressed appears below (Box 6.2). The Evaluation Team may select from them as appropriate and add its own.
Box 6.2 Questions to Determine Degree of Proper Use

1. To what extent is the ICT intervention used in the intended modality:
   - Integrated into the curriculum
   - Enrichment
   - Stand-alone

1. What portion of class or school time are learners using the ICT-Intervention?
2. For how many hours per week are the learners using it outside of class or school?
3. To what extent are the hardware, software and media used for the intended learning purposes?
4. To what extent are the hardware, software and media used for the intended instructional purposes?
5. To what extent are the hardware, software and media used for the intended communication and linkage purposes?
6. To what extent are the learners using the hardware, media, and software as intended?
   - Using them to: Memorize information, retrieve and store information, exploration, application, evaluation, and constructing or designing?
   - Using them to enhance communication skills: reading, writing, listening, and speaking?
   - Using them to develop technology skills?

1. In what unintended ways and to what extent are they using the hardware and software? Why?
   - To what extent are the learners using the teachers or facilitators as intended?

1. In what unintended ways and to what extent are they using the teachers or facilitators? Why?

10. To what extent are the learners using the other supports as intended?
    - In what unintended ways and to what extent are they using the supports? Why?

11. To what extent and in what ways are the learners perhaps abusing the intervention resources, such as by: stealing the hardware, damaging the hardware, erasing media, using the hardware and software for non-educational purposes?

12. To what extent do the answers to the above Class 2 questions vary by geographic region, by socio-economic characteristics of the schools and communities, by gender, and by other characteristics that might influence use?
6.1.1.3: Class 3 Evaluation: Degree of User Satisfaction

This class of evaluation seeks to determine the extent to which the ICT intervention is pleasing or disappointing to users.

The subjective reactions of administrators, teachers, learners and other users to the ICT-Intervention are important indicators of their motivation to use the system and their likely persistence in using it. If many users are generally displeased with the intervention, the chances of it achieving its planned objectives are slim. Dissatisfaction may be caused by poor implementation or incorrect use of the ICT intervention, but it may also be inherent in the intervention itself.

Early assessment of dissatisfaction can help identify implementation failures that can be corrected, confusing guidelines or instructions that can be clarified, or aspects of the intervention that might benefit from improvement. Those aspects might pervade most of the ICT intervention or may be limited to just a few components.

Evaluation of users' degree of satisfaction with the ICT intervention may begin soon after implementation starts, or it may be delayed for a year or so to allow for the intervention to be implemented and used as intended. Satisfaction is sometimes evaluated again after several years to see if it has changed as a result of experience, training, comfort with ICT, new types of learners, or changing social contexts.

Evaluation of the degree of user satisfaction can focus on many different questions, each of which may be answered with multiple sources of data (see Section 3 below). A list of important questions that may be addressed appears below (Box 6.3). The Evaluation Team may select from them as appropriate and add its own.

**Box 6.3 Questions to Determine Degree of User satisfaction**

- To what extent is the intervention convenient to use?
- How easy is it to use?
- How trouble-free is it to use?
- When troubles are encountered, how quickly are they resolved?
- To what extent is the intervention interesting and enjoyable?
- [Teachers only] To what extent does the intervention reduce or increase the time spent on preparation, classroom management, discipline, and grading assignments?
- To what extent does the intervention appear to boost or reduce attitudes and skills with respect to the following learning objectives: memorizing information, retrieving and storing information, exploration, application, analysis, evaluation, and constructing or designing?
- To what extent does the intervention appear to boost or reduce attitudes and skills with respect to communication skills: reading, writing, listening, and speaking?
- To what extent does the intervention appear to boost or reduce attitudes and skills with respect to facilitating the learning of technology skills?
- To what extent does the intervention appear to boost or reduce learners’ eagerness to attend school and their satisfaction with school?
- To what extent does the intervention appear to boost or reduce learning beyond what is required by school?
- To what extent do the answers to the above Class 3 questions vary by geographic region, socioeconomic characteristics of the learners, gender, and other characteristics that might influence satisfaction?

Note that Class 3 evaluations only assess teachers’ and students' subjective assessment of the ICT's effect on student learning.
This class of evaluation seeks to determine the extent to which the ICT intervention is effectively fulfilling the educational objectives set for it. The reference point here is the set of educational objectives explicitly stated in ICT Policy Program Decision Document in Tool 2.2. They are expressed in one or more of the following:

- Expanding educational opportunities
- Increasing efficiency
- Enhancing quality of learning
- Enriching quality of teaching
- Facilitating skill formation
- Establishing and sustaining lifelong learning
- Improving policy planning and management
- Advancing community linkages (including community centers)

Details of these objectives are described in ICT for Education: Analytical Review, Section 5.

A major subset of these objectives is developing the intended knowledge, attitudes, and skills of the learners. Here a learner may be a school student, a worker, an adult lifelong learner, or a teacher—if the ICT intervention is to improve teaching; an administrator—if the ICT intervention includes improvement of policy planning and management; or a member of a community in a community learning center.

Perfect implementation, widespread use as intended, and high user satisfaction do not assure that the ICT intervention has been effective in fostering the intended educational objectives. Judging effectiveness requires a Class 4 evaluation, which is often referred to as an "impact evaluation," "output evaluation," "outcome evaluation," or "summative evaluation." A Class 4 evaluation addresses the first bottom line: effectiveness. It examines whether the ICT intervention met targeted educational objectives, including enhancing the quality of participants’ learning. It may also broadly address whether the participants learned other things that had not been targeted. Finally, it may examine whether the added costs of the ICT intervention are justified by the extent and nature of fulfillment of these objectives.

While the first three classes of evaluation are directed at helping the ICT-intervention developers and practitioners—as a means of refining the implementation of the intervention—the Class 4 evaluation is usually of more interest to policy makers and planners. The results of Class 4 evaluations can be used to help decide whether to

- modify the ICT intervention in hopes of making it more effective;
- expand the intervention to other geographic areas, grade levels, subjects, or target groups;
- or
- abandon the intervention as unsatisfactory.

The public, and even policy makers, often think that proof of effectiveness only requires objective measures showing that the targeted educational objectives have been achieved, and conversely, proof of ineffectiveness only requires objective measures showing that the objectives have not been achieved. That is mistaken for several reasons. The central focus of Class 4 evaluations is to examine whether the ICT intervention caused gains or losses with respect to the educational objectives. The evaluators must know how beneficiaries not exposed to the intervention perform with respect to those objectives if they are to have a basis for determining whether the intervention caused gains (or losses). For instance, learners may make progress on the learning objectives from their normal school instruction, from out-of-school learning, and sometimes even from natural maturation. In addition, some shortcomings in evaluation procedures may bias the results upward or downward, such as administering a pretest that inadvertently prepares learners to do better on the post-test because they have been "sensitized" to the focus and procedures of the test. On the other hand, evaluation procedures themselves can sometimes be disruptive and adversely affect learning.

Consequently, Class 4 evaluations usually use both a "treatment group" and a "control group," composed or selected to be as similar as possible, and then compare the learning outcomes of the two groups. Each group might be composed of multiple schools, many classes, and hundreds of
learners. Class 4 evaluations also usually take "premeasures" of the learning objectives administered before the learners begin participating in the intervention, and then take "post-measures" after the learners have completed specified parts or all of the intervention, with identical measures administered at the same points to the control group. A "premeasure," taken just before learners begin an ICT intervention that is being evaluated, indicates baseline knowledge, attitudes, and skills. A "post-measure" is taken just as learners complete the intervention. The best assessment of an intervention’s effects is to compare the difference in the post-measures and premeasures of the intervention group with the difference in the post-measures and premeasures of a comparable control group subject that has been measured at the same times as the intervention group.

These arrangements require that Class 4 evaluations be planned well before the ICT intervention begins, or at least before the studied treatment beneficiaries begin participating in the intervention. Because educational interventions are often not well implemented in their first year and have some early operational problems, it is usually desirable to plan on a two-year period of Class 1–3 evaluations and program refinement, before starting a Class 4 evaluation. The program should be operating as expected before this type of evaluation is started. A Class 4 evaluation, however, always should start with a treatment group of beneficiaries who have not yet been exposed to the intervention and, simultaneously, with a control group. Then it must follow both groups until the treatment group completes participation in the intervention. In addition, it may revisit both groups a few years later to determine whether participants retain any initial gains from the intervention after completing the intervention.

Evaluation of the degree of effectiveness can focus on many different questions, each of which may be answered with multiple sources of data (see Section 3 below). A list of important questions that may be addressed appears below (Box 6.4). The Evaluation Team may select from them as appropriate, depending on the stated educational objectives of the ICT Project, and add its own. Evaluation of effectiveness with respect to knowledge, attitudes, and skills may also include questions about the learners’ characteristics that might affect their performance as well.
Box 6.4 Questions to Determine Degree of Effectiveness

1. To what extent has the ICT intervention extended educational opportunities to groups that were not well served?
2. To what extent has the ICT intervention increased efficiency of educational offerings in different geographic areas of the project?
3. To what extent did the learners using the ICT intervention gain or lose more than they would have otherwise in each of the subject areas enhanced by the intervention?
4. To what extent did the learners using the ICT intervention gain more than they would have otherwise in: memorization of information, retrieval and storage of information, exploration, application, analysis, evaluation, and constructing or designing?
5. To what extent did the learners using the ICT intervention gain more than they would have otherwise in communication skills: reading, writing, listening, and speaking?
6. To what extent did the learners using the ICT intervention gain more than they would have otherwise in technology utilization?
7. To what extent did the learners using the ICT intervention gain more than they would have otherwise with respect to learning beyond what is required by school?
8. To what extent did the learners using the ICT intervention gain more than they would have otherwise with respect to eagerness to attend school and satisfaction with school?
9. To what extent do the answers to the above Class 4 questions vary by geographic region, socioeconomic characteristics of the learners, gender, and other characteristics that might influence effectiveness?
10. To what extent has the ICT intervention enriched or harmed the teaching process?
11. To what extent has the ICT intervention facilitated or impaired skill formation?
12. To what extent has the ICT intervention expended opportunities for lifelong learning?
13. To what extent has the ICT intervention improved or eroded educational planning and management?
14. To what extent has the ICT intervention advanced community linkages in the areas served by the Project compared to other areas?
This class of evaluation seeks to determine the extent to which the ICT intervention is effective in preparing learners who subsequently apply the learned knowledge, attitudes, and skills in their later schooling, jobs, and social lives. If the ICT intervention is a pilot that is intended to test the implementability of the intervention, or if it is limited to a specific technology, there may not be time to apply Class 5 before the pilot is modified and extended to a larger scale. However, if the pilot seeks to change learners’ subsequent application of knowledge, attitudes, or skill, then a Class 5 Evaluation should be used as part of the evaluation of the pilot.

One of the claimed potential of ICTs is their ability to facilitate in learners the high-level cognitive skills of application, problem solving, and learning how to learn. Learners may acquire considerable new capabilities as the result of an education or training intervention and yet not apply them later. That can be attributed to many reasons:

- The intervention had not trained the learners in how to make the applications and ultimately learn on their own.
- The knowledge, attitudes, and skills learned are not relevant to the learners' subsequent lives.
- Circumstances in the learners' subsequent lives make application of the knowledge, attitudes, and skills difficult or unrewarding.

An example of the last would be when learners increase their creative problem-solving abilities but subsequently work for companies that are run autocratically by top managers who discourage creative problem solving.

Class 5 evaluations address the hard question: Has the enhanced learning made a difference in the subsequent thinking and behavior of the learners? Class 5 evaluation is even more complex and difficult to conduct that Class 4 evaluation, because it seeks to discover whether the intervention caused changes in how the learners think and behave in their lives several years after completing participation in the intervention. That is difficult to determine because the extent of application will be affected not only by the capabilities developed during participation in the ICT intervention, but also by the capabilities acquired over the learners' entire schooling and by the circumstances of their subsequent lives. In addition, Class 5 evaluation requires keeping track of the intervention group learners and the control group learners through their subsequent lives and securing their cooperation for additional data collection, both of which can be difficult. Once the evaluators lose track of 30 percent of the learners in either group, it is hard to know how representative the learners they were able to locate are of the initial groups.

Class 5 evaluations are rare for several reasons. It is presumed that if people learn something, they will subsequently apply it, a presumption that is frequently incorrect. Class 5 evaluations are difficult and expensive to conduct. Policy makers who supported (or opposed) a new ICT intervention rarely remain in office long enough to request such evaluations, and even when they do, their attention is often focused on other matters. Nevertheless, Class 5 evaluations can be valuable. They go beyond the objectives set for the intervention to its intermediate-level goals. In other words, Class 4 evaluation addresses outputs, and Class 5 addresses intermediate outcomes. In essence, Class 4 assesses "merit" and Class 5 assesses "value." The ultimate goals or outcomes are addressed in Class 6 evaluations.

Class 5 evaluations usually do not begin until one to ten years after participants have completed an ICT intervention. Normally, these evaluations are a follow-up to Class 4 evaluations, using the same treatment and control groups as those used for that evaluation.

Evaluation of the application can focus on many different questions, each of which may be answered with multiple sources of data (see Section 3 below). A list of important questions that may be addressed appears below (Box 6.5). The Evaluation Team may select from them as appropriate and add its own. Evaluation of application of knowledge, attitudes, and skills may also include questions about the learners' characteristics that might affect learning application as well.

**Box 6.5 - Questions to Determine Degree of Effectiveness**

1. To what extent did the learners using the ICT intervention apply more or less than they would have otherwise in each of the subject-areas enhanced by the intervention?
2. To what extent did the learners using the ICT intervention apply more or less than they would have otherwise in: memorization of information, retrieval and storage of information, exploration, application, analysis, evaluation, and constructing or designing?
3. To what extent did the learners apply more or less than they would have otherwise the ICT Intervention in communication skills: reading, writing, listening, and speaking?

4. To what extent did the learners using the ICT intervention apply more or less than they would have otherwise the cognitive skills of critical thinking, problem solving, applying knowledge and skills to new situations, and learning on their own.

5. To what extent did the learners using the ICT intervention apply more or less than they would have otherwise in technology utilization?

6. To what extent did the learners using the ICT intervention apply more or less than they would have otherwise with respect to lifelong learning?

7. To what extent do the answers to the above Class 5 questions vary by geographic region, socio-economic characteristics of the learners, gender of the learners, and the family, job, and community contexts of the learners?
This class of evaluation seeks to determine the extent to which the ICT intervention is effective in contributing to the nation’s developmental goals. If the ICT intervention is a pilot that is intended to test implementability of the intervention, or if it is limited to a specific technology, there may not be time to apply Class 6 before the pilot is modified and extended to a larger scale. Moreover, it is hard to expect a noticeable effect on the nation’s development goals generated by ICT interventions that are of short life or small in scale.

In developing countries, large investments in ICT interventions are usually undertaken with the hope that they will contribute to the country’s development. Even when a Class 4 evaluation shows that all of the educational objectives have been fulfilled, and a Class 5 evaluation indicates that an intervention has substantially increased the application of learned knowledge, attitudes, and skills, these results do not ensure contributions to national development. It may be that the educational objectives fulfilled and the applied capabilities were not the ones the country needed, or it may be that other factors countered these effects. A Class 6 evaluation seeks to determine whether the ICT intervention ultimately contributed to national development, including economic and human resource development, poverty alleviation, and gender equity.

This is the most complex level of evaluation to conduct, because it necessarily must cover a long time span over which many other factors will affect national development, both boosting and depressing it. Thus it is very difficult to determine the unique effects of the ICT intervention. Usually these evaluations are based on case study methods that examine many types of information from many sources, including longitudinal national indicator data, documentary records, and expert opinion.

Class 6 evaluations are rare because of the long time that must pass and their complexity, and because interest in a given intervention fades with time. They are important, however, because they examine whether an ICT intervention has contributed to its ultimate goals.

The evaluation of national effect can focus on many different questions, each of which may be answered with multiple sources of data (see Section 3 below). A list of important questions that may be addressed appears below (Box 6.6). The Evaluation Team may select from them as appropriate and add its own.

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**Box 6.6 - Questions to Determine Degree of Effectiveness**

1. To what extent did the ICT intervention boost or reduce economic development? How?
2. To what extent did the ICT intervention boost or reduce human resource development? How?
3. To what extent did the ICT intervention boost or hinder poverty alleviation? How?
4. To what extent did the ICT intervention boost or hinder gender equity? How?
5. To what extent do the answers to the above Class 6 questions vary by geographic region and by the socio-economic characteristics of the learners?
- **Class 1, 2, and 3** evaluations require data collection at only one point and only from the ICT intervention sites and participants. This is often called a cross-sectional design.

- **Class 4** evaluations usually require data collection at two or more points, and from both intervention participants and a comparable control group. These are called "randomized experiments" if learners, classrooms, or schools are randomly assigned to either the intervention or control group. They are called "quasi-experiments" if there is no random assignment, but other means are used to match those in the intervention group and in the control group. Occasionally there is more than one intervention group, for instance, when two levels of intensity or intervention duration are to be evaluated.

- **Class 5** evaluations usually follow up several years later with the same groups used in a Class 4 evaluation, but they collect follow-up data on the later life application of the taught knowledge, attitudes, and skills only once.

- **Class 6 evaluations** usually rely heavily on developmental indicators collected by a country for a decade or more before the intervention and for a decade or more after the first several cohorts of participants have completed the intervention.
Many modes of data collection can be used in evaluating ICT interventions. The most likely ones are the following:

- **Records**: School or community center records that might be reviewed include staff employment records, procurement records, learner and instructor attendance records, repair records, and learners' files.
- **Journals/diaries**: Instructors, learners, or graduates may be asked to keep journals or diaries of their activities, thoughts, or feelings. Evaluators would then review this information.
- **E-mail archives**: E-mail messages can be archived, and evaluators can review them periodically.
- **Computer Web server logs**: During Web-based instruction, Web server logs can keep track of which Web links the learners go to, how long they stay at each, and whether they return. The logs can do that for individual learners, the entire group of learners using the intervention, and the entire control group.
- **Surveys**: Surveys are a relatively efficient way of collecting information and opinions from large numbers of administrators, instructors, or learners, but they don't allow probing of particularly interesting or perplexing responses. They may be distributed and returned by mail or electronically.
- **Interviews**: Structured interviews are the same as surveys, but they are administered by someone who reads the questions, making them well suited for collecting from individuals who would be unlikely to return a survey and from those with limited literacy skills. Semi-structured interviews—which ask a series of specific questions and have the interviewer probe some of the answers—permit exploring of well-formulated issues while also examining unexpected responses. Unstructured interviews, which are essentially conversations about a few broad topics, are a good way to explore general themes of interest to the evaluators.
- **Focus groups**: Focus groups bring a small number of people together to discuss sensitive matters in a supportive environment. If these are done well, people often will provide more revealing information than they would in one-on-one interviews. If done poorly, some of the people will bias their responses to please the other people in the focus group.
- **Observations**: Observations guided by protocols or coding systems allow evaluators to determine the actual behavior of the administrators, instructors, and learners, which, during periods of change, is often perceived and self-reported by the actors with considerable bias.
- **Video recordings**: This is a substitute for live observations. Now videos in learning centers can be transmitted over the Internet to evaluators located hundreds or thousands of miles away.
- **Teacher tests**: These are the most common way of assessing learning over short periods, but teachers vary considerably in the tests they construct and how they grade them.
- **Embedded quizzes in computerized instruction**: These allow learners to be quizzed at the optimum points during instruction. They can be scored automatically, providing immediate feedback to the students and a detailed record for the instructor. Looking at which items learners miss most often helps the ICT-intervention developers and instructors identify where the learning system needs improvement. Such quizzes cannot be used for questions that require written responses.
- **National or standardized tests**: These tests are commonly used to assess academic knowledge and skills after a year or more of instruction. They focus on knowledge and skills considered widely important throughout a country, and thus do not cover new objectives that may be targeted by an intervention. "Normed" tests are designed to rank order people according to given capabilities. "Criterion-based" tests are designed to determine whether a given person has mastered a certain body of knowledge or skills.
- **Psychometric affective instruments**: These instruments, which measure values, attitudes, and predispositions, are developed by sophisticated procedures similar to those used to develop standardized achievement tests.
- **Performance assessments**: These judge complex skills by having learners demonstrate their capabilities in real-world or simulated real-world situations. For instance, to assess students' abilities to design and conduct scientific experiments, learners might be asked to do that for a given hypothesis with the equipment provided at a workbench.

Not all of these modes of data collection are likely to be appropriate for all six classes of evaluation described in this Tool. The following table shows the classes for which each mode is most likely to be appropriate.
<table>
<thead>
<tr>
<th>Form of Data Collection</th>
<th>Class 1</th>
<th>Class 2</th>
<th>Class 3</th>
<th>Class 4</th>
<th>Class 5</th>
<th>Class 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Records</td>
<td>Y</td>
<td>Y</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Journals/diaries</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>E-mail archives</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>Y</td>
</tr>
<tr>
<td>Computer Web server logs</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Surveys</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
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<tr>
<td>Interviews</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Focus groups</td>
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<tr>
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<tr>
<td>Video recordings</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>Teacher tests</td>
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<td>Embedded quizzes in computerized instruction</td>
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<td>Y</td>
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<tr>
<td>National or standardized tests</td>
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<td>Y</td>
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<tr>
<td>Psychometric affective instruments</td>
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<td></td>
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<tr>
<td>Performance assessments</td>
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<td>Y</td>
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</tbody>
</table>
While policy makers and planners do not need to know the details of how to conduct ICT-intervention evaluations, they may need to know the following:

- How to identify a competent coordinator of evaluation
- Time needed to conduct various classes of evaluation
- How to estimate the costs of various evaluations
- Key ethical considerations involved in evaluations
- Oversight they might exercise over the evaluations

Selecting an Evaluation Director

The coordinator of any substantial evaluation requires both strong technical skills in evaluation and strong administrative skills. Usually the technical skills requires a master's—if not a doctoral—degree in the social sciences, such as psychology, sociology, public policy, education research, or program evaluation. Economists usually have little training in data collection procedures, but they do have advanced data analysis techniques. The technical skills developed during graduate training should have been developed further with progressively more responsible experience working on evaluations. The administrative skills seldom are taught in the above cited graduate programs, but they may be acquired from other training in business administration or public administration or from practical experience. The skill level needed by the evaluation coordinator becomes progressively higher with the ascending classes of evaluation described above. The following characteristics should be considered when appointing or selecting a coordinator of the evaluation:

- Candidate’s undergraduate and graduate degrees and grades
- Level of responsibilities the candidate held when previously doing evaluation work, and the quality of his or her performance
- Other evaluation experts' judgments of the quality of earlier evaluations the candidate directed or worked on
- Candidate’s record of completing evaluation work on time and within budget
- Probability that the candidate will remain with the evaluation(s) from the planning phase through completion

Time Needed for the Evaluation

- **Class 1, 2, and 3** evaluations usually can be completed in one to six months, providing they do not require development of new psychometric affective instruments, a small Evaluation Team will not have to travel to many distant communities and schools, and the needed data analysis is fairly straightforward.

- **Class 4** evaluations usually require several months of advance planning, then administration of "premeasures" just before participants begin the ICT intervention and "post-measures" as they complete it, with simultaneous administration in the control group. After that, the evaluators usually need several months to check the data, analyze them, prepare a report draft, and revise it following review and feedback by others. Thus, if the intervention will take place during just one school year, a Class 4 evaluation will take about two years to complete. It will take longer if sophisticated data collection instruments have to be developed, a small Evaluation Team will have to travel widely to collect the data, or the data analysis is complex. Sometimes an evaluation can be hastened by contracting out sophisticated instrument development and hiring temporary staff to assist with extensive data collection. If the intervention extends for two or more school years, the Evaluation Team will have some downtime between administration of the premeasures and the post-measures, unless the evaluation plan calls for interim measures at the end of each year or for following several cohorts of learners beginning the intervention each successive year.

- **Class 5** evaluations are usually follow-ups of Class 4 evaluations initiated several years after the Class 4 evaluation is completed. In that case, they may require only about one year to complete. They will take longer if sophisticated data collection instruments have to be developed, the participants in the treatment group and control group have dispersed widely, a small Evaluation Team will have to travel extensively to collect the data, or the data analysis is complex.

- **Class 6** evaluations may take as little as a year or as long as several years.

Budgeting the Evaluation
The following seven factors have the biggest impact in determining the costs of an evaluation:

1. **Class of the evaluation**: As indicated briefly above, Class 4, 5, and 6 evaluations are more complex to conduct than the lower class evaluations. Classes 4 and 5 generally use control groups, and Class 6 requires intensive case studies, trying to control for the effect of the many other factors that could boost or suppress the development goals during the years over which the ICT intervention was expected to contribute to those goals. These complexities add to the cost of the evaluation.

2. **Number of evaluation questions**: Under each class of evaluation described above are listed several potential evaluation questions. In some cases all of the questions may be important to the ICT intervention stakeholders, but in other cases just a few might be targeted. The cost of the evaluation increases with the number of evaluation questions.

3. **Number, length, and sophistication of instruments developed**: Some evaluations may require only administration of currently used national examinations, whereas others may require newly developed achievement tests and psychometric affective instruments. Such differences dramatically affect the costs of an evaluation. Tests that measure academic or occupational skills, particularly higher-order skills such as analysis, evaluation, and design skills, tend to be the most complex and time-consuming to develop. Similarly, performance assessments of these skills are complex to develop as well. Psychometric affective measures usually require two or more rounds of development, field-testing, and data analysis.

4. **Expertise needed to administer instruments**: Many instruments are simple to administer and can be mailed to schools or community centers where teachers or facilitators administer them. Others are more complex and require specially trained personnel. This is the case of semistructured interview guides, focus group scripts, most observational coding forms, and performance assessments. To administer these types of instruments, staff or temporary employees have to be trained, have to travel to the intervention sites (except for interviews might be conducted by phone), and have to receive have supervision and monitoring of their work to assure quality control. In addition, in high-stakes evaluations, it may be desirable to send staff or temporary employees into the field, even when easily administered instruments are conducted, to prevent cheating and fraud.

5. **Number and distance of data collection sites**: Even when mailing instruments to teachers or facilitators who will administer them, costs rise with the number of sites and their distance from the evaluation headquarters. If specially trained staff or temporary employees have to administer the instruments, costs will rise much more rapidly because of travel expenses.

6. **Number of people from whom data is collected**: For a given set of data collection sites, costs will increase in proportion to the number of people from whom data is collected. When instruments can be administered by teachers or facilitators, the incremental costs result primarily from the cost of printing and mailing additional copies of the instrument. When the instruments have to be administered by a specially trained person, either individually (such as with interviews or performance assessments) or in small groups (such as with focus groups), the incremental costs will be high, including a pro rata share of the person’s salary and benefits as well as hotel and meal expenses.

7. **Complexity of the data analysis**: The complexity of the data analysis is partly a function of the class of the evaluation, the number of evaluation questions addressed, the number of instruments administered, and the number of items on each. But it is also a function of whether the contexts of the intervention implementation are to be assessed, the number of subgroups of learners for whom the results are to be computed and compared, and the types of statistical controls for exogenous forces that might be applied.

The following categories should be considered when budgeting for an evaluation:

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**Box 6.7 Evaluation Budget categories**

**Staffing (salaries and benefits)**

- Evaluation coordinator
- Regular evaluation staff
- Temporary data collection and data entry employees
- Consultants

**Office Space and Equipment (rental and purchases)**

- Office space
- Furniture
- Telephones (phones, installation fees, local service fees, long distance charges)
- Fax machine (machine, installation fees, monthly fee)
- Computers
- Computer software
- Internet connection (installation fee and monthly fees)
- Copy machines
- Scanner for inputting data from instruments

**Travel (transit, lodging, and meals)**
- For data collection
- For reporting to government officials
- For reporting at professional and scholarly meetings

**Data Collection Instruments**
- Purchase of commercially distributed instruments: necessary copies of instruction manuals, booklets, and response sheets
- Layout and graphics for instruments developed by the Evaluation Team
- Copying, collating, and stapling instruments developed by the Evaluation Team

**Other**
- Miscellaneous office supplies
- Postage
- Paper (if instruments are copied in-house)

**Reserve for Contingencies (5–10 percent)**

**Ethical Considerations**

Policy makers and planners have a role to play in assuring ethical conduct during an evaluation. They should take measures to assure the following:

1. **Protect evaluators from outside pressures:** The policy makers, planners, and developers responsible for an ICT intervention are often eager for positive evaluation findings, but incorrect evaluation results will not serve the national interest. Arrangements should be made to protect the evaluators from pressures to bias the evaluation.

2. **Preclude conflicts of interest on the part of the evaluators:** The proposed evaluation staff might have conflicts of interest because of family or business ties to the most powerful proponents of the ICT intervention or the developers. Proposed staff should complete conflict of interest disclosures, which should be reviewed before final decisions on staffing.

3. **Assure needed competence and resources:** If the evaluation coordinator and key staff do not have the needed competence, or do not have needed resources (time, access to schools or community centers, and funding) for the evaluation, the results are likely to be invalid and misleading.

4. **Require protection of human subjects:** It should be mandated that evaluation staff do not use procedures that might pose harm to the educators and learners participating in the evaluation. Assurance of confidentiality and anonymity for teachers’ and learners’ self-reports about implementation, proper use, and user satisfaction is likely to improve the accuracy of the data. Once those assurances are made, the evaluators should take steps to protect the confidentiality and anonymity of the data. Policy makers and planners should refrain from doing anything to compromise those efforts as well.

5. **Permit acknowledgement of the evaluations’ shortcomings:** All evaluations have some shortcomings. Permitting evaluation staff to acknowledge them in the report is in the best interest of any fully informed decisions that might be based on the report.

6. **Arrange for limited outside review of the draft report:** Many people will have been involved in any substantial ICT intervention, and they will have different perspectives about the intervention. A draft evaluation report should be reviewed by a few policy makers or planners, a few administrators of schools or community centers where the intervention was implemented, a few teachers using the intervention, and a few outside evaluators. Their suggestions should be given serious consideration, but the evaluation coordinator should make final decisions about revisions.

7. **Require public dissemination of the final report:** Government-sponsored ICT interventions are a public investment, and the public should have access to them (usually Class 4 and above).
Monitoring of the Evaluation

There should always be some higher-level oversight of important ICT-intervention evaluations. On the other hand, that oversight should not overrule on technical matters. The following are critical decisions and junctures that the oversight might address:

- Class of the evaluation to be conducted and the evaluation questions
- Qualifications of the person selected to coordinate the evaluation
- A draft of the evaluation plan
- A draft of the instruments to be used
- Results of the field-tests of new instruments
- Whether preparation for the initial data collection is on schedule
- A draft of the final report, and its release to the public
Monitoring and Evaluation of ICT in Education Projects: A Handbook for Developing Countries


This volume is intended as an introduction and guide for busy policy makers and practitioners grappling with how to understand and assess the ICT-related investments underway in the education sector. It includes the following chapters:

- Monitoring and Evaluation of ICT for Education: An Introduction.
- Monitoring and Evaluation of ICT for Education Impact: A Review Core Indicators for Monitoring and Evaluation Studies for ICT in Education
- Developing a Monitoring and Evaluation Plan for ICT in Education
- Pro-Equity Approaches to Monitoring and Evaluation: Gender, Marginalized Groups and Special Needs Populations
- Dos and Don'ts in Monitoring and Evaluation

ICT Indicators—UNESCO-Bangkok

www.unescobkk.org/education/ict/v2/info.asp?id=10937

This portal links to a wide array of resources that can be of help when planning evaluations of ICT interventions. There are detailed examples of country indicators of ICT use and impact in education, examples of national standards for evaluation, and tools for measuring the impact of ICT in education.

Development Gateway

www.developmentgateway.org

Click on "Advanced Search" near the upper left. In the "Search For" window, type "evaluation," and beside "Select Topics," scroll to and click on "E-Learning." This will provide an annotated list of Web-based resources related to evaluation of computer-mediated education and training, with links to each resource.

PLUM

http://iet.open.ac.uk/plum/evaluation/plum.html

This site, developed by the British Open University and the University of Hull, is intended to help nonevaluators plan and conduct simple evaluations of ICT interventions. Click on the "Contents Page" to reach the links.

GEM: Gender Evaluation Methodology for Internet and ICTs

www.apcwomen.org/gem

This Website provides guidance on incorporating gender analysis into evaluations of ICT interventions.

Evaluating Computer and Web Instruction

Gregg B. Jackson


This short article identifies new opportunities within Web technologies for evaluating Web-based instruction. These include Web server logs that can keep track of each learners' use of given Web resources, video recording of networked classroom activities, Web-based surveys, automatically scored quizzes, and simulations used for performance assessments.


This framework for evaluating telecenters is intended to answer the following evaluation questions:

- Does access to ICTs in rural areas contribute to social, economic, and cultural development, and, if so, how and what are the benefits?
- Are there any adverse effects, and, if so, what are they?
- Are the multipurpose community centers (MCCs) a sustainable means of providing universal access to ICTs, and what conditions must be met to make them economically viable and replicable?
- What are the best practices for organizing, managing, and operating MCCs?

The Annexes include a long list of indicators of community contexts, and three questionnaires that might be given to users, including one that asks about their perceptions of impact.

**An Educator's Guide to Evaluating the Use of Technology in Schools and Classrooms**


This is a simple step-by-step guide to help educators who lack professional training in evaluation to conduct evaluations of ICT interventions in schools. It could allow them do acceptable Class 1, 2, and 3 evaluations, but is not likely to result in competent Class 4, 5, or 6 evaluations.

**Sun Associates: Evaluating the Impact of Technology on Teaching and Learning**


This Website is offered by a private U.S. company that conducts evaluations of ICT interventions. The company makes some of its Web-based resources available through this site.

**Distance Education: Guidelines for Good Practice**

American Federation of Teachers


This document proposes and explains 14 standards for college and university use of Web-based distance education, which could be used as some of the criteria by which such instruction could be evaluated. The document also includes the survey form distributed to faculty members to solicit their opinions about the use of Web-based distance instruction in higher education.

**Formative Evaluation for Educational Technologies**


"Formative evaluation" includes Class 1, 2, and 3 evaluations, as described in this Tool. This book provides a good general introduction to the methods of such evaluations, along with five case studies describing specific evaluations used for large ICT interventions.

**Evaluating Educational Technology: Effective Research Designs for Improving Learning**


This book focuses on designs to determine the impact of ICT interventions—designs that could be used for the Class 4 and 5 evaluations described in this Tool. There are nine chapters, with several written by internationally known evaluators.

**Usability Evaluation of Online Learning Programs**


This book describes evaluations undertaken during prototype development of computer learning systems as well as those that correspond to Class 1, 2, 3, and 4, as described in this Tool. A few of the articles are theoretical, but most describe the evaluation of a specific ICT intervention. The authors are predominantly European.
### Tool 6.2: Adjustment & Scaling Up

**OVERVIEW**

1. Monitoring of Implementation
2. Evaluation of Effectiveness
3. Broader Application/Scaling Up

### Toolbox 6: Assessment and Subsequent Actions

1. Evaluation of ICT Interventions
2. Adjustment & Scaling Up
The purpose of this Tool is to assist decision makers and planners in taking the necessary actions emanating from implementation of the ICT intervention and from the classes of the intervention evaluation as described in Tool 6. Such actions include:

- Adjustments in implementation
- Modification of elements of the implementation plan
- Modifications in ICT-intervention policies and program
- Full or partial redesign of the ICT Program
- Broader application of the ICT Program—replication and/or scaling up

This resource Tool is intended to help policy makers and planners anticipate the need for implementation adjustments and policy modifications, consider the necessary decision paths to reach these adjustments and modifications, and take into account the necessary conditions for successful expansion of ICT interventions.
6.2.1: Monitoring of Implementation

No matter how well ICT interventions are designed, and no matter how precisely implementation plans were drawn, in most cases there will be problems and surprises during implementation. It is essential, therefore, to put in place as early as possible mechanisms to monitor the process of implementation. Tool 6.1 recommends three classes of monitoring and evaluation:

- **Class 1 - Degree of Implementation** (as intended)
- **Class 2 - Degree of Proper Use** (as intended)
- **Class 3 - Degree of User Satisfaction**

These classes of evaluation should help identify issues faced during implementation. The flow chart below summarizes the process of monitoring and modification of implementation.

Monitoring of implementation may identify two types of issues:

- **Implementation Issues**
  - Faulty implementation of some aspects of the Project. For instance, certain prerequisites or corequisites may not be in place; hardware is there, but there is lack of software or trained personnel.
  - Improper use of the ICT interventions. Some components of the Project are not used as was intended in the Project scenario.
  - Inadequate satisfaction with the way the Project is implemented. For instance, users have not been oriented or trained adequately.

  The response to this type of issue should focus on improving the implementation process. After improvements, the same type of monitoring instruments should be applied to ensure that these implementation issues have been addressed.

- **Planning Issues**
  - Sometimes implementation problems are from the result of weaknesses in implementation plans. Monitoring of implementation may reveal faults in areas such as the kind of selected hardware, type of contentware, modality of personnel training, timing of introducing different interventions, degree of synergy among the different components, or level of risk associated with different plans.

  The response to this type of issue requires modifications in implementation plans to remedy their weakness and faults. Then implementation can proceed on the basis of the modified plans, and the whole reiterative process of implementation monitoring, improvement, and modification is applied until implementation reaches an adequate and intended level.
Once the implementation processes have been debugged and the ICT intervention is adequately in place long enough to produce results, evaluation of its effectiveness (Tool 6.1, Class 4) should be applied to determine the extent to which the ICT intervention is fulfilling the educational objectives set for it.

Effectiveness evaluation may produce favorable results, but it may indicate that the degree of effectiveness is inadequate as well.

Assuming adequate implementation, the response to inadequate effectiveness and impact should trigger a reexamination of the design and content of the ICT intervention itself. This exercise may unearth some of the following problems and weaknesses in the ICT-intervention structure:

- ICT potential was erroneously applied to some components.
- Comparative added value of technologies was not used properly.
- The educational, learning, or instructional objectives were not appropriate.
- The internal prerequisites and corequisites were not identified and designed.
- The external prerequisites, corequisites, and constraints were not adequately recognized and considered.

The response to these issues may range from limited modifications of specific components (if effectiveness is partially unsatisfactory) to total redesign of the ICT Policy intervention (see chart below).
If an ICT intervention is deemed implementable and effective on a limited scale (pilot or small scale), this may lead to one of three decisions:

- Continuing the ICT Program under the same conditions
- Replicating the ICT Program in specific institutions or geographic areas
- Scaling up the program in terms of more coverage, educational objectives, more grade levels, more curricular subjects, etc.

**Replication Design**

Replication may not require any significant modifications in the design of the ICT interventions. What will be necessary is a reformulation of the implementation plan (see below).

**Scaling-Up Design**

Scaling up is not a mere expansion or multiple duplication of the pilot or small-scale project. The difference is not limited to size and scope; structural considerations must be incorporated into the design and implementation plans:

- What may not have been efficient at a small-scale level may prove to be efficient now, such as online courses or educational TV.
- There should be attempts to achieve economies of scale by reaching levels of critical mass of users to lower unit costs.
- Trade-offs between ICT interventions and other educational inputs and measures should be explored. For instance, would a broad application of an ICT-enhancing learning model lead to changes in classroom organization, resulting in a change in time-on-task and teacher-student ratios?
- Does the country have adequate managerial, technical, and financial capacity to support the broad project? Are the national power and ICT infrastructures satisfactory?

Thus scaling up the ICT intervention cannot be an expansion of the ICT Program formulated in Tool 2.2 for a pilot or small-scale project. Scaling up requires going back to the drawing board and starting once again by applying the Tools in the Toolkit that focus on preparation for and formulation of ICT Policy interventions.

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### Toolbox 1: Mapping of Present Situation

- Tool 1.1 Mapping of National Vision, Goals and Plans
- Tool 1.2 Mapping of Educational Context
- Tool 1.3 Mapping of ICTs in Education
- Tool 1.4 Analysis of Dynamics for Change

### Toolbox 2: Development of an ICT-Enhanced Program

- Tool 2.1 Identification of Educational Areas for ICT Interventions
- Tool 2.2 Formation of ICT Policy Interventions

In light of the considerations cited above, the applying these Tools should be done with more caution and diligence because the stakes are higher and the investments are riskier.

**Planning for Broad Application**

Planning for broad application of ICT Interventions – whether duplication or scaling up – requires a reaplication of the appropriate planning tools in Toolboxes 3-5.
Large-scale planning involves unique issues as well as advantages—for instance,

- Infrastructure may involve regulatory reform, special deals with providers, and preferential treatment because of extent of use.
- For hardware provision, it may be advantageous to consider local production or adaptation.
- For contentware, the country may be able to get better licensing deals and produce contentware at reasonable unit costs.
- Because of the size of personnel training, efficient and unconventional models may be applied, such as a combination of e-training and face-to-face instruction.

On the other hand, more attention needs to be paid to implementation structures and mechanisms, including risk assessment and management of change strategies and mechanisms.

**Evaluation of Broadly Applied ICT Intervention**

Planning for evaluation of large-scale interventions will require more elaborate designs and measures, through application of Tool 6.1.

Additionally, Evaluation Class 5 and 6 (Tool 6.1), which may not work well in pilot or small-scale projects, may work well here. If one of the claimed objectives of the ICT Project is to facilitate in the learners high-level cognitive skills of application, problem solving, and learning how to learn, then Tool 6.1, Class 5, should be applied after a sufficient maturation period. Finally, depending on the objective, scope, and design of the ICT Project, it may be necessary to apply Class 6 of Tool 6.1 to determine the extent to which the ICT intervention is effective in contributing to the nation's developmental goals.

The results of these evaluations may lead to a number of responses:

- Lowering expectations that the ICT intervention will meet either or both objectives
- Modifying the design of the large-scale intervention
- Making adjustments in the way the ICT intervention is applied