VI.

DEVELOPING
THE STRATEGIC TECHNOLOGY PLAN

This section describes the technology planning process and provides strategies and resources for developing the components of plans for integrating ICTs into teacher education programmes. The development of the technology plan involves three phases, including:

**Organizational Phase:** The Technology Planning Team is formed with representatives from key stakeholder groups. The scope of work is determined and the planning tasks to be accomplished are identified.

**Assessment and Analysis Phase:** An analysis is made of the present situation including the present level of technology knowledge and skills of teacher educators, the teacher education curriculum and performance results, national teacher technology standards, condition of teacher education facilities, and the current technology resources and infrastructure within teacher education programmes or institutions. A powerful vision for ICTs in teacher education is developed focused on improving teaching and learning. Specific goals and objectives are developed to achieve the vision.

**Formulation Phase:** Based on the vision, goals and objectives, a technology plan is developed including standards and models for technology and learning, hardware and software requirements, staff development plans, technology support services to be provided, facility improvement requirements, project timelines, areas of responsibility, and a detailed budget. These items are integrated into a comprehensive technology plan that is submitted for review and approval.

The sequence and relationship of the tasks involved in developing the technology strategic plan are shown in Figure 6.1.
Figure 6.1 Phases of Technology Planning Process
ORGANIZATIONAL PHASE

The organizational phase of the development of the technology plan involves the following activities: selecting the team leader, forming the planning team, determining the scope of the planning effort, and identifying the budget and time constraints for completion of the plan.

Select the Planning Team Leader

It is important to select a qualified person to lead the planning effort. The person should be chosen by the chief executive of the institution or government organization responsible for the development of the plan. The person selected should have the commitment and support of the organization’s highest administrators, and have high credibility in the organization as well as with teacher educators and other important stakeholder groups (e.g., K-12 teachers and administrators, business leaders, community representatives who would be interested in or affected by the technology plan). The person selected need not be a technology expert, but should be someone who understands the potential of technology to improve education and has the communication, management, and interpersonal skills to lead the team and communicate with stakeholder groups in developing the plan.

Select Members of the Planning Team

The members of the team should be chosen carefully because it is important to establish a team that has the commitment, leadership, and needed expertise in teacher education, ICTs, and K-12 education. The planning team should be composed of individuals from the teacher education institution or agency developing the plan and representatives from external stakeholder groups. The team should include teacher educators, administrators, pre-service and in-service teachers, and members of other key stakeholder groups who will be affected by the plan. If the plan is developed within an institution of higher education, it is also important to have representation on the team from university computing services and other units in the institution that offer courses taken by students in the teacher education programme. The team should also include members who can contribute resources or expertise to the plan or whose support will be critical to the plan’s acceptance. Ultimately the commitment, expertise, and perspectives of the planning team members will determine the quality of the plan. It is often helpful for members to engage in team-building activities to get to know
each other and become familiar with the rich range of expertise and diverse perspectives that exist within the team.

**Determine the Scope of Work**

As a first task, the team must understand the scope of work, timelines, and budget constraints for developing the technology plan. In determining the scope of work, it is helpful to address questions such as:

- What are the expectations of the planning team?
- What is the prescribed deadline for completion of the plan?
- What funding or budget resources are available to support the planning effort?
- Is the plan driven by a particular need?
- What technologies are to be covered in the plan?
- Is the planning national or regional in scope or for an individual institution’s teacher education programme?
- Is it to be a one-year or multi-year plan?

Answers to these questions will help the planning team define the scope of work based on a shared understanding of the assumptions, expectations, resources, and constraints of the planning effort. On the one hand, it is important not to define the scope of work too broadly or to attempt more than can be accomplished within the time and budget constraints. On the other hand, defining the scope too narrowly may result in the planning team over-looking or underestimating the possibilities.

It is critical to understand the deadline for completion of the plan and to set milestones and timelines for completing each component of the plan. Planning always takes longer than expected, because a critical and time-consuming aspect of the planning process is building consensus on critical elements among the team members and stakeholder groups. It will not be possible to achieve consensus on every aspect of the plan, and at times the planning team or planning leader may need to make final decisions on specific plan elements.
ASSESSMENT AND ANALYSIS PHASE

The second major phase of the planning process is the Assessment and Analysis Phase. In this phase, the team will determine the present status of ICTs in the teacher education programme or institution that is the focus of the planning effort. This involves assessing the status of ICTs in teacher education and developing a powerful vision of learning with technology. The planning effort may be thought of as a journey or a quest. Before setting out on this quest, it is necessary to know the state of ICTs in teacher education at present. The vision describes the destination or desired state of ICTs in teacher education in the team’s country, region, or institution. The plan serves as the ‘road map’ to help the programme move from the current state to the desired state (i.e., the vision).

The major tasks of the Assessment/Analysis Phase of the planning process include:

- **Understanding current trends in the application of technology to learning.** What are national and international trends in technology use as a tool to enhance learning?

- **Assessing the present status of the teacher education programme related to technology and learning.** To what extent is technology integrated into the curriculum and instructional practices of teacher educators?

- **Examining student performance results.** What is the level of technology knowledge and skill of graduating teachers? What areas of the curriculum need improvement? Can technology be used to address curriculum needs?

- **Assessing the technology resources and facilities currently available in the teacher education programme.** What is the level of access to technology in the teacher education programme?

- **Identifying current levels of technology use and competency of teacher educators.** What are the present levels of knowledge and use of technology by teacher educators?

- **Reviewing national, provincial or state standards for student and teacher technology competency.** What are the desired levels of pedagogical and technology knowledge and skills of teacher educators and teachers?

- **Identifying teacher educator technology training and technical support needs.** What professional development is needed for teacher educators to
develop needed competencies? What technical support is required for them to use technology in their instruction?

- Developing a plan for communicating with stakeholders. Who are the key stakeholders in the technology plan and what are the most effective ways of communicating with them throughout the planning process?

Understand Current Issues and Trends

In order to understand the teacher education programme's current situation in relation to the national or international continuum, it is helpful to look at current issues and trends in the integration of ICTs into teacher education at the national and international level. The 'New Economy,' whether described as the information economy, digital economy, or knowledge economy, has produced significant changes in agriculture, industry, business and many other aspects of global society. It is also beginning to change our educational institutions and the teaching-learning process. It is important to understand what it takes for technology to improve learning. In developing the plan, consider the following conditions that are essential for schools to derive the full benefits of the new tools for learning:

- Teacher educators, teachers, and students have meaningful access to technology.
- Internet and communication capabilities are available to access libraries, museums, locally, nationally, and around the world.
- High quality content is available for the classroom.
- Teachers understand and know how to use the ICT tools for learning.

Much is now known about how humans learn, and this knowledge needs to be considered in determining how technology can best be used to create new and more powerful learning environments. Understanding current issues and trends in learning theory will provide the planning team helpful information for developing its vision of ICTs in teacher education.

Assess Present Status of ICTs in Teacher Education

It is important early in the planning process to determine the level of accessibility of ICTs in the teacher education programme and the extent to which technology is integrated into the curriculum and instructional practices of teacher
educators. The StaR Chart for Teacher Education, developed by the CEO Forum (2000), provides a tool that may be used to identify the current technology profile of the teacher education programme and to set goals and provide benchmarks for integration of ICTs into the programme. The chart ranks teacher education institutions into four categories:

- **Early Tech** teacher education programmes have limited technology resources and infrastructure. Most of the available technology resources are 5+ years old. The programme receives less funding than other campus programmes. There is limited partnership with schools for technology. There is limited technical support and less than 25% of the methods and content courses integrate technology into the curriculum. Most teacher educators are at an early adoption stage in using technology and have had little or no technology training.

- **Developing Tech** teacher education programmes have some clear goals and the level of funding for technology equals that of most higher education programmes. Technology is integrated into 50% of the courses and in the field experiences of students. Funding is about the same as other programmes on campus and there are growing investments in technology. The equipment is 3-5 years old. The teacher education faculties are either at the adoption or adaptation level in using technology with 75% using technology in their teaching practices. The institution rewards expertise in using technology in teaching and research. In addition, technology training workshops and technical support are provided to the teacher educators.

- **Advanced Tech** teacher preparation programmes are focused on continuous improvement of the programme. Funding for technology equals the top 2–3 programmes on campus and technology is integrated into most of the courses and into 75% of the field experiences. The teacher educators are at the adaptation or appropriation level in understanding and use of technology to enhance learning.

- **Target Tech** teacher education programmes integrate technology throughout the curriculum and into all teaching practices. Students and teacher educators use current digital resources both in the classroom and online. Pre-service and in-service teachers and teacher educators use digital means to communicate with each other and with experts locally, nationally, and globally. All graduates meet the highest standards of technology teaching expertise, are sought after for these skills, and become technology leaders in their schools.
ICTs in Teacher Education Benchmarks and Self-Assessment Tools

In planning to integrate ICTs into teacher education, it is important for teacher education institutions to understand types and levels of knowledge and skills needed for teachers to effectively use ICTs in instruction. They must also understand the level of readiness of the institution to integrate technology into the teacher education curriculum. The teacher education programme or institution must know the benchmarks, standards and guidelines for ICTs in teacher education. It is also important that they have access to tools that help the institution assess its level of readiness or progress toward infusing ICTs into the teacher education programme. A number of tools may be used as developed, or adapted as needed, to help the technology planning team assess the level of technology integration in their teacher education programme prior to developing plans for integrating ICTs into the curriculum. The tools will help determine the teacher education programme’s current level of readiness by addressing the following questions:

- What are the technology resources and facilities currently available in the programme?
- What is the level of technology knowledge and skills of faculty and staff?
- What are the available staff technology training and technical support resources?

As shown in Table 6.1, there are a number of web-based tools available to help the planning team or teacher education institutions assess their progress in incorporating ICTs into teacher education. As noted in the table, some of these tools are specifically for teacher education programmes and higher education institutions while others are designed for assessing technology integration or level of readiness for technology in K-12 schools. The K-12 profile or survey instruments have often been used or customized to yield information that is useful for assessing the status of technology infusion in teacher education.

Several of the assessment tools listed on the table are web-based and allow for online form submission and the automatic analysis of responses. Teacher educators may use some of the tools to provide a profile for self-assessment of technology use, knowledge, and skills. Other tools are designed to provide a profile for an entire school, college, or teacher preparation programme and may serve as useful indicators of the present level of readiness for the integration of technology into the programme. Many of the forms may also be used in a paper-pencil mode if desired.
The Edmin TechBuilder (2002) represents a suite of tools and a database specifically designed for acquiring and analyzing information for the development of a technology plan. Although designed for K-12 schools, the tools can be used by teacher preparation institutions to develop a comprehensive technology plan.

TechBuilder provides standardized multiple-choice surveys that can be completed online by teachers and staff. This information can be used to gain a better understanding of such questions as:

- What technology is currently used in the college?
- Where is technology being used?
- How is technology being used?
- What is the current level of staff knowledge and training?

Because information is stored in a database and analyzed in real time, it is possible to review results immediately. A sophisticated reporting engine identifies an institution’s specific areas of strength and weakness and shows progress through presentations, charts, and graphs.

Other tools listed on the table that may be helpful in assessing the present situation in technology integration include:

- **PT 3 Profiler**

  The PT3 Profiler is a tool developed by the SCR-TEC at the University of Kansas (2000) in the United States. It includes a Basic Technology Survey that can be used by teacher educators for self-assessment of technology integration knowledge and skills.

- **Targets for Technology Integration in Teacher Preparation**

  Targets for Technology Integration in Teacher Preparation is a tool developed at the Technology Leadership Academy at the University of Texas at Austin to assist teacher preparation programmes in monitoring progress toward technology integration. It provides descriptive indicators for each target. To use Targets for Technology Integration as an institutional self-assessment tool, one or more members of the faculty or administration complete the survey indicating their best estimate of their institution’s status in each of the target components. After completing the survey and clicking on the “submit survey” button, they
can then view the survey results along with an aggregate profile of all of the respondents from the teacher preparation programme (SCR*TEC, 2000).

### Table 6.1 Tools for Assessing Integration of ICTs into Teacher Education

<table>
<thead>
<tr>
<th>Assessment Tool</th>
<th>Designed for Higher Education?</th>
<th>Web Delivered?</th>
<th>Profile Provided?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>For Institutions of Higher Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher Education Information Resources</td>
<td>Yes</td>
<td>No</td>
<td>None provided</td>
</tr>
<tr>
<td>CEO Forum StaR Chart</td>
<td>Yes</td>
<td>Yes</td>
<td>Single respondent</td>
</tr>
<tr>
<td><strong>For Teacher Education Programmes</strong></td>
<td></td>
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<td></td>
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<tr>
<td>CEO Forum StaR Chart</td>
<td>Yes</td>
<td>Yes</td>
<td>Single respondent</td>
</tr>
<tr>
<td>Edmin Tech Builder</td>
<td>Adaptable</td>
<td>Yes</td>
<td>Multiple respondents</td>
</tr>
<tr>
<td>SCR*TEC Profiler-System-wide Tech Implementation</td>
<td>Adaptable</td>
<td>Yes</td>
<td>Multiple respondents</td>
</tr>
<tr>
<td>SEIR*TEC Survey</td>
<td>Yes</td>
<td>Yes</td>
<td>None provided</td>
</tr>
<tr>
<td><strong>For Teacher Educators</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>SCR*TEC Profiler</td>
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<td>Yes</td>
<td>Multiple respondents</td>
</tr>
<tr>
<td>Edmin Tech Builder</td>
<td>Adaptable</td>
<td>Yes</td>
<td>Multiple respondents</td>
</tr>
<tr>
<td>Milken Exchange Professional Competency Online Assessment Tool</td>
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<td>Yes</td>
<td>Single respondent</td>
</tr>
<tr>
<td>NCREL Technology Profile Tool</td>
<td>Adaptable</td>
<td>Yes</td>
<td>Single respondent</td>
</tr>
<tr>
<td><strong>For Pre-Service Teachers</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TLT Flashlight Current Student Inventory</td>
<td>Yes</td>
<td>Yes</td>
<td>Multiple respondents</td>
</tr>
</tbody>
</table>
• **Learning With Technology Profile Tool**

This tool helps teachers compare their current instructional practices with a set of indicators for engaged learning and high-performance technology. The tool was developed by the North Central Regional Educational Laboratory (NCR*TEC, 2002) for use by K-12 teachers but may also be used, or adapted for use, with teacher educators to help them assess their current instructional practices.

• **The Milken Professional Competency Continuum (PCC) Online Assessment Tool**

The PCC online assessment tool was developed primarily for K-12 teachers but is potentially useful for teacher educators. Developed by The Milken Exchange on Educational Technology, the tool provides educators with an opportunity to assess their status within the skill and knowledge areas described in that continuum (Milken Foundation, 2002).

• **Flashlight Current Student Inventory**

The Flashlight Current Student Inventory gauges and archives college student use and mastery of technology. Developed and distributed by The Teaching, Learning, and Technology Group (TLT), the tool helps faculty participants design customized web-based questionnaires from hundreds of self-rating and open-ended questions on student background, use, experience with technology, and satisfaction with course experiences (TLT, 2002).

Use of the above assessment tools can help teacher education institutions assess their present status and levels of readiness to integrate technology into the teacher education curriculum. These tools can also help the planning team establish benchmarks and monitor the progress of the implementation of the plan.

**Examine Student Performance Results**

The goal of technology infusion in schools is to improve student learning. One of the first tasks in the development of a technology plan is to identify the strengths and weaknesses of current teacher education programmes.

One way to determine teacher education programme performance results is to examine the data from exit assessments, certification tests used for grad-
uating teachers, or other relevant data. It is important to determine the knowledge and expertise of teacher education students in using technology in instruction. This may be done in various ways such as by observing pre-service or in-service teachers using technology in instruction, by examining electronic portfolios of students’ academic work, or by examining technology competency evaluations by supervising or mentor teachers.

Looking at the summaries of student performance data of the K-12 schools that hire the teachers also helps to identify areas that require improvement. Performance tests, final exam results, and dropout rates during the past two years may give a picture of the academic areas that are strong, as well as those that may require further improvement. It is also important to look at performance by gender, economic disadvantage, ethnicity, etc., to see if there are important discrepancies that need to be addressed. For those curricular areas needing improvement, consider how technology may help address the instructional need. For example, an international study of eighth grade mathematics (NCES, 2000) showed that middle school students using open-ended, problem-solving software significantly improved mathematics performance. Similarly, a number of technology tools and programs can help improve learning in science. Research also shows that technology can help improve writing, the learning of social sciences, foreign languages, and other elements of the curriculum.

In examining student performance data, it is important to assess the technology knowledge and expertise of graduating teachers in using technology in instruction. One way to do this is to ask pre-service teachers to compile an electronic portfolio of their work that demonstrates specific technology competencies.

Assess the Technology Resources and Facilities Currently Available in the Teacher Education Programme

Before the technology plan can identify what new or additional technology resources or facilities are needed to provide the desired learning environment in the teacher education programme, the planning team must first know what resources exist in the school and how those resources are used.

To determine a school’s technology resources it is important for the team to review or develop a complete inventory of the existing hardware and software within the teacher education institution. Existing inventories may be used for this purpose or the institution’s inventory control or technical
staff may prepare summaries of the types and quantities of hardware and software used in teacher education. In looking at the hardware inventory summary data, the planning team must determine not only the level of access to technology by teacher educators and students, but also the age and capabilities of the technology. For example, older computers may not have sufficient capabilities to access Internet resources. The team should also look at the technology infrastructure and determine the type and level of connectivity available to teacher educators. Is access limited to only a few phone lines? Is there broadband access for viewing graphics and video on the Web? What software is available for use in the teacher education programme? Does it reflect high quality and culturally responsive content? What software programs are most frequently used in teacher education? Answers to these questions are needed to develop an accurate picture of the status of the use of ICTs within the teacher education programme.

The type and condition of facilities in which the technology is to be used must also be carefully assessed. Questions to be addressed by the planning team include:

- What facilities are available to support the plan?
- Does the facility have the electrical wiring and infrastructure necessary to support a significant increase in personal computers and servers? Will this be the first capital expense?
- What is the state of the buildings used by the teacher education programme, and how easily can the wiring required for networks be installed?
- Which buildings and what rooms will be connected?
- Do the buildings have the necessary air conditioning and room security systems?
- Is there physical space for routers, hubs, servers, CD towers, and other key network equipment?
- Is the university or teacher education institution planning on constructing new buildings? New facilities can be built in ways that reduce the cost of technology adoption later on; for example, incorporating appropriate wiring or at least wiring ducts in new buildings greatly reduces the cost of adding technology later.

The Higher Education Information Resources Alliance has developed a set of guidelines that colleges and universities can use when conducting
institutional self-assessments of their technology facilities and resources. The Evaluation Guidelines for Institutional Information Resources are available at their web site (Higher Education Information Resources Alliance, 2001).

**Review National, Provincial or State Technology Competency Standards**

The assessment of teacher educator technology competencies should be based on the national, provincial or state standards for teacher technology knowledge and skills. The standards are efforts to identify the core knowledge and skills necessary for teachers to effectively use ICTs to enhance learning. If standards for teacher technology competency do not presently exist, it is helpful to look at standards for student knowledge and skill in using technology. These standards may be helpful in considering the core technology competencies also needed by teachers. It may also be helpful to view teacher technology standards used by other countries. As noted in Section III, the International Society for Technology in Education (ISTE) NETS Project is one example of a set of technology application standards for teachers. The NETS Standards for Teachers are found at the ISTE web site (ISTE, 2002). The NETS have been used in the United States and have been adopted or adapted by a number of other countries to meet the needs of their educational systems.

**Identify Current Levels of Technology Use and Competency of Teacher Educators**

In establishing a baseline for the technology plan, it is important to understand the present levels of technology proficiency of teacher educators in the teacher education programme. This may be accomplished by encouraging the use of self-assessment instruments such as those presented in Table 6.1. To obtain honest responses, it is often helpful to have the survey forms completed anonymously. Other means of assessing the present levels of integration of technology into the pre-service programme may include interviewing teacher educators on their use of technology, reviewing course syllabi for evidence of technology use in the course, and observing the level and type of technology use in the programme classes.
Identify Teacher Educator Technology Training and Technical Support Needs

ICTs represent new tools for many educators and there is ample evidence that providing teachers or teacher educators with technologies without training or technical support results in poor or limited use of ICTs to enhance the learning environment. As part of the analysis, it is important to understand the technology training that has been previously provided to teacher educators. Based on the assessment of the present levels of teacher educator knowledge and skill in using technology, the planning team can better determine the professional development needed to help the teacher educators develop the desired competencies. It is also important to determine the present levels of technical support provided to teacher education faculty and to identify the level and types of support needed to facilitate increased and effective use of technology in instruction.

Communicate with the Stakeholders

In developing the technology plan, it is important to keep stakeholders informed throughout the entire planning process by sharing information on the current situation of ICTs in teacher education, the identified needs, and the vision, mission, and objectives of the plan. It is also important to get input from all stakeholders to help build support and advocacy for the technology plan. Many impressive technology plans have failed because of the lack of effective communication with key stakeholder groups. Consequently, a critical element for the success of a planning effort is to develop an effective communication strategy. Such a strategy will:

- enhance consensus-building efforts by keeping everyone informed;
- attract potential business and community partners to the university or school;
- help attract in-kind contributions in support of the plan.

In a very real sense, the members of the planning team must also become effective communicators to stakeholder groups. As the team progresses through the planning process, they should meet with key stakeholder groups and determine the potential strengths and barriers to the plan’s implementation. The emerging plan may then be modified to address concerns or obstacles, and the team can tell stakeholders how these concerns will be addressed.

The communication strategy may involve meeting with university administration, faculty, students, K-12 school administrators and teachers, national,
state, or provincial educational agencies, business leaders, and community, civic or international organizations. Having "town halls" on local TV or radio stations and developing a brochure on the plan’s vision and goals are also important. It may be possible to solicit the volunteer services of local marketing or advertising firms to serve as consultants in developing a communication strategy. As the team approaches this task, it is important to ask:

- Who are the major stakeholders in the teacher education programme?
- What are their interests (political, economic, personal) in the programme?
- How will the stakeholders be sampled?
- How will the team communicate with the stakeholders?

Answers to these questions will help guide the development of an effective strategy to communicate with those whose commitment and supports are vital to the plan’s success.

**Analyze and Report the Assessment Data**

Once the comprehensive assessment is completed, the planning team must make sense of the different types of data and interpret what it says about:

- The progress made by the teacher education institution in the infusion of technology into the instructional and administrative processes;
- The technology resources and facilities currently available to the teacher education programme and how and to what extent they are used in the content and methods courses;
- The levels of staff technology expertise and training; and
- The areas reflecting local and national priorities that need immediate, concerted attention for improvement. It should be made clear how technology may help address the priority areas.

The results of the assessment should be summarized in a form that is easy for others to understand and should establish a clear picture of the present state of ICTs in the teacher education programme. The report should provide a brief description of the procedures used for the acquisition and analysis of the data and a concise presentation of the findings. In addition, it
should provide a summary interpretation of what the results indicate about the level of infusion of technology into the teacher preparation programme.

**Develop the Vision of ICTs in Teacher Education**

Knowing the current situation of ICTs in teacher education, the next step is to develop the vision statement that will serve as the focus of the strategic technology plan. A vision statement is the grand, global statement around which a teacher education institution will be focused for action. It is the most important part of the strategic technology plan and will guide the development of all of the elements of the plan. It describes a set of ideal circumstances that the teacher education programme will strive to achieve. The vision statement should provide:

- a clear and concise statement of the team’s vision for using technology to improve learning and teacher education;
- an indication of who will use the technology and how it will be used to enhance learning;
- an indication of the envisioned benefits that will result from the use of technology by pre-service or in-service teachers, teacher educators, administrators and others.

The plan’s goals, objectives, and implementation activities must tie back into the vision statement. The vision statement should be used to check the validity of any goal or activity specified in the strategic plan. For example, if the plan specifies the creation of interactive distance learning classrooms in the teacher education institution, the reason for creating those classrooms should be implicit in the vision statement. In this example, such a reason might be reflected in a statement such as “We will use technology to bring knowledge and new experiences from around the world to all of our pre-service teachers.” The vision statement is the one place where the purpose and intent of educational technology come together.

If the vision is to become a reality, careful planning, time for reflection, and adequate resources are imperative. The vision statement of the technology plan should be focused on learning and provide a clear idea of how the vision will help prepare a new generation of teachers who are able to effectively use the new and powerful ICT tools for learning.
There are two approaches for developing a vision. In one approach, the vision is developed prior to identifying the teacher education programme’s status in integrating technology into the learning process. The advantage of this approach is that it often leads to creative visions that are not constrained by the realities of the current resources and context. The other approach involves developing the vision after a careful assessment of the status. The advantage of this approach is that it may result in a more “doable” vision. Arguments can be made for either approach and the planning team must decide which approach to use. In using the latter approach it is necessary to let go of “what is” and reach for “what should be” in teacher education.

The vision statement should address the question “What do we want teacher education to look like in three to five years?” Five years is the recommended time frame of a long-range vision. If the time frame is too close to the present, the thinking will tend to pull to the current status of technology in teacher education. If the time frame is too far into the future, it may seem that the goal is unattainable and thinking can get sidetracked.

It is important to understand the difference between strategic planning and visioning. Strategic planning is combining what is known today with lessons learned from the past to develop a plan to set and accomplish the vision, mission, goals, and action plans of the teacher education programme. Visioning is about conceiving a desired future state, a picture of where and what the teacher education programme should be in the future, without being constrained by such factors as funding or resources, and then working backward to develop an action plan to get there. It is about imagination and discovery, not simply analysis and forecasts.

Vision represents the following characteristics:

- **Visions are grand and exciting.** Visions inspire and challenge the organization and its members. They capture the imagination. Little visions are not worth committing years to create, but a grand vision is something everyone can understand intuitively, take pride in, and work towards. Such visions can be the single most powerful influence on an organization’s destination. Successful technology plans are driven by vision; they are not driven by a chain of command.

- **Visions focus on the end state.** Visions can act like internal gyroscopes, directing individuals and their schools, building positive expectations
for success, and reducing fear of failure. A visionary teacher education institution or school knows what its future looks like; therefore, it can better recognize and seize opportunities that lead to it.

- **Visions are holistic.** Visions are holographic and they happen at multiple levels within the teacher education programme—personal, departmental, institutional, even community wide. Individuals see an image of themselves in the vision, what they would like to become, or how they would like to meet future challenges.

Stakeholders also need to be part of the visioning process because it is important that the vision statement represent an invitation to own the future together. A process that empowers many people through shared dialogue and teamwork (Senge, 1990) adds great value to strategic planning. The learning community can enlarge its circle of influence through this process (Covey, 1989).

The following are examples of good vision statements that were adopted as part of a 2001-2002 technology plan by the Government of Alberta. Although focused on K-12 education, they demonstrate the elements of a powerful vision for technology in learning:

...the performance of all students and staff is improved through the appropriate use of technology. Planning at the school, department, and district levels will ensure that access to technology is equitable and cost-effective. Parents and members of the community will understand and be supportive of the ways in which technology is used in schools to enhance learning and teaching.

Through the effective and efficient use of technologies as empowering communication and productivity tools, the district, in co-operation with its greater community, will enhance the education system for students, teachers, other staff, parents and community members, using appropriate information, applications, systems and communications technologies that will improve and maximize learning, productivity and performance:
The following recommendations by John Kotter (1996) may help the planning team to develop the vision statement:

- **First draft**: The process often starts with an initial statement from a single individual, reflecting his or her dreams.
- **Role of the guiding coalition**: The first draft is always modelled over time by the guiding coalition or an even larger group of people (such as an advisory group).
- **Importance of teamwork**: The group process never works well without a minimum of effective teamwork.
- **Role of the head and the heart**: Both analytical thinking and a lot of dreaming are essential throughout the activity.
- **Messiness of the process**: Vision creation is usually a process of two steps forward and one back, of movement to the left and then to the right.
- **End product**: The process results in a direction for the future that is desirable, feasible, focused, flexible, and is conveyable in five minutes or less.

### Create the Mission Statement

The mission statement is a clear, concise description of the overall purpose of the organization's technology plan. The mission statement is more specific than the vision statement and should communicate clearly what the technology plan aims to achieve with technology. It describes what the institution will do to achieve the vision, why achieving the vision is important, and who the intended beneficiaries of the vision are. As with the vision statement, it is important to obtain support for the mission statement from the stakeholders in the teacher education...
institutions and communities. Once the vision and mission statements have been developed, they should be presented to the chief administrators or policy board for approval before developing the other components of the plan.

**Develop the Goals and Objectives**

Goals are broad, comprehensive statements that identify the intended outcomes of the technology plan. They are statements of how the vision and mission statements will be achieved. The goals should specify the accomplishments needed if the vision is to become a reality, and should be clear, realistic, and attainable. The goals should include answers to the questions: who, what, how much, when, and according to which instrument?

The objectives are delineated from the goals and make clear how they will be achieved. They represent the specific steps—the specific activities—that must be accomplished to achieve each goal.

The objectives should have the following characteristics (a list that forms the acrostic SMART):

- S = Specific
- M = Measurable
- A = Attainable
- R = Realistic
- T = Timeline

Having developed the vision, the mission statement, and the goals and objectives, the planning effort is ready to move to the next stage of the process.

**FORMULATION PHASE**

The final phase in developing a technology plan is the formulation phase. In this phase the planning team develops the detailed plans for the teacher education institution to achieve the vision, mission, goals, and objectives of the plan. The team identifies specific projects, timelines for completing each component of the plan, and budgets. The stakeholders, including those responsible for carrying out the technology plan, must understand what is needed and what must be done to accomplish the vision. The plan must show how the technology will support
the curriculum and enhance meaningful, engaged learning for those in the teacher education programme. A well-written technology plan will answer clearly the who, what, when, where, why, and how questions related to achieving the vision and goals.

The many tasks involved in creating the technology plan will require a division of work among members of the planning team. The process may also require the support and participation of staff or consultants with needed expertise. As components of the plan are developed, it is helpful to continually ask the following questions:

- How will technology be used to improve learning and support a challenging curriculum through engaging instructional practices?
- What kinds of hardware, software, and infrastructures are necessary to support the educational goals of the teacher education programme?
- Will this technology be flexible, powerful, adaptable, and expandable?

As noted in the section on assessment tools earlier in this section, one suite of tools that may be helpful in developing components of the technology plan is Tech Builder. This resource provides a number of web-based instruments that can be used to acquire and analyze information needed to develop the plan. The free resource provides a database of the information collected and analyzed in the technology plan. Although designed for K-12 education systems, the tools can be used for teacher education technology planning. It includes a powerful search engine, analysis programs and display capabilities that enable a planning team to easily prepare reports, presentations, graphs, and charts.

Identify Issues

Many issues, concerns, and barriers must be identified and discussed as the technology plan is developed. The following are examples of the issues that may be considered:

*Equity issues:* A critical aspect of the plan is to ensure equity in the allocation and distribution of technology resources. Strategies and policies must be devised to assure that all pre-service teachers and teacher educators have equal opportunities to derive the full benefits of the technology. Some questions that should be considered include:
• How can technology resources be distributed among teacher education programmes and classrooms to ensure equitable access?

• How will budget and funding constraints affect equitable access and use?

• How will the plan address the needs of students with disabilities or limited proficiency in the national language?

**Funding issues:** What are the budgetary requirements for accomplishing the vision? What are realistic estimates of the funding available from internal and external funding sources?

**Faculty development/technical support issues:** What is the present level of technological skill and knowledge of teacher educators and to what extent is technology integrated into the curriculum? What resources are required to provide the needed professional development? What technical support will be required to sustain the planned programme?

**Technology standard issues:** What is the current state of the teacher education programme’s technology infrastructure and installed base of hardware? What is the present level of connectivity in the classroom? What types of hardware and infrastructure are needed to achieve the goals and objectives of the plan? What decisions for platform standardization must be made (e.g., Windows, Macintosh, multi-platform)?

**Teacher educator and pre-service teacher access to computers:** Will teacher educators receive personal computers to accomplish their work? What configuration of computers will be used (e.g., computer labs, wireless technology-rich classrooms provisioned with laptop computers, classrooms with a single computer, projector and Internet access)?

**Integrating new technologies with the installed base:** What is the optimal way to use existing technology resources with new hardware and software? What is the planned life cycle of the hardware to be acquired? Has the total cost of ownership of the hardware been considered?

**Facility issues:** To what extent will the existing facilities accommodate or support the new generations of technology? Is the present infrastructure sufficient? Is the electrical system adequate and safe for use with the new hardware? If not, what is the cost to replace the wiring in the buildings? What type of security will be provided for the new hardware?
Develop Conclusions and Recommendations

Based on the analysis of needs, and after identifying the concerns, problems, and barriers, the planning team should prepare a set of conclusions and recommendations to guide the remainder of the planning process. The conclusions and recommendations should identify the most important needs and challenges confronting the integration of ICTs into the teacher education programme and recommend the projects and steps to be taken to achieve the vision.

Create a Technology and Learning Statement

This section of the plan will provide a more specific description of the intended use of technology in the teaching-learning process within the teacher education programme. It discusses the plan’s model of student learning and the ways teacher educators and pre-service teachers will develop the desired knowledge and skills in integrating technology into instruction. This section may also discuss how technology may help transform the learning process and environment and change the roles of students from passive learners to active, engaged learners who take greater responsibility for their own learning (see Section I).

Identify Technology Standards and Requirements

One of the most important tasks in developing the technology plan is to determine the specific technology needed to achieve its vision and goals. The technology standards and requirements component of the plan will identify the hardware and connectivity/infrastructure standards to support the planned learning environments. It will also identify general software requirements and provide examples of the software needed to address the learning goals and objectives. To develop the standards and requirements, the planning team must first understand the current resources available to the teacher education programme and then identify the additional requirements needed to meet the goals and objectives of the plan.

In some instances, teacher education institutions and schools identify their hardware and network software requirements before they choose the software to support the curriculum and teaching-learning process. It is often wise to choose the software first, based directly on the vision of the curriculum and what the students and teacher educators will be doing in the learning process. Will they be working collaboratively with others in the class and across the country? Will
computers be used primarily as cognitive tools with powerful programs for acquiring, analyzing, and creating knowledge? Will special tools be needed to support certain areas of the curriculum, e.g. hand-held devices and probe attachments for field science studies, social/economic simulation software, or multimedia presentation tools to develop instructional presentations? By choosing the software before committing to a specific hardware platform, possible incompatibilities in the use of the programs are reduced.

In developing the software standards and requirements, it is important to first review the software inventory information to identify what software is currently available and what will be needed to support the plan. Although the plan might not list all the software programs that are related to the objectives, it may give examples of the types of software programs congruent with the vision of the learning process and the school curriculum.

In developing the software requirements, the following types of software programs may be considered:

- Tool software: These are generic tools that may be used across content areas and include word processing, spreadsheets, databases, desktop publishing, multimedia, presentation, and web development.
- Curriculum-focused software: These include software programs with content or functions designed to address a component of a specific educational discipline or knowledge domain (e.g., learning specific mathematical or science concepts).

In identifying software needs, it is important to recognize that the quality of educational software varies greatly and thus software must be chosen carefully to best meet the programme's needs. In some contexts, there may be a lack of high quality, culturally responsive software. The plan may include provisions for the development of software to meet specific needs of the teacher preparation programme or the national educational system. Teacher educators working with pre-service and in-service teachers and technology and media experts may develop software to address critical needs.

The next step in the planning process is to identify the technology equipment and learning devices that will be needed to meet the instructional objectives of the teacher education programme. Standards and requirements for the hardware need to be identified. At one time, the term hardware referred only to computers; however, now it refers to an endless list of computers, peripherals,
presentation tools, and broadcasting and networking equipment. In developing the standards, it is important to consider the following questions:

- What type of technology is available?
- For what purposes is the existing technology being used?
- Who is using the technology?
- What are the important unmet needs?

The numbers and types of computers and other equipment needed will depend on the plan’s vision of how technology may enhance learning. Will computers be in the classrooms, in computer labs, or both? What applications must the computers support (e.g., multimedia development, mathematical learning, writing and publishing, science experiments, Internet searches, web design, administrative functions)?

It is important to consider options for distributing computers that meet the goals of the plan and to understand the benefits and limitations of each option. The following are some points to be considered in making technology configuration decisions:

- *Computers labs* provide a convenient means for access to technology for a large number of users. They concentrate expensive resources in a single location that can be used by entire classes during instruction or as an open laboratory for individual student use at other times of the day. They reduce the costs of installing electricity, networking infrastructure, and servers to support use of the computers, and allow for more effective security. They also reduce connectivity costs to the Internet. The room selected may be larger than conventional classrooms to provide space for students to work collaboratively. Ideally, the facility is supervised and supported by one or two staff with technological and pedagogical expertise. The lab setting also may reduce software acquisition costs since all teacher educators and classes may share the same software tools.

The computer lab option also produces a number of constraints, such as competition among teacher education classes for access to the lab. Scheduling individual class use of the facility can be complex and may frustrate teacher educators and inhibit their use of the technology. It also makes just-in-time use of the technology by classes for learning projects and activities more difficult.
• *Placing computers in libraries* is an effective approach in situations where only a few computers may be acquired. This allows all students and teacher educators to have access to the computers, and to use staff available to provide assistance in accessing relevant information resources on the Internet.

• *Computers may be placed* in common rooms where instructors may use the technology for accessing relevant information and learning resources or to develop lesson plans.

• *Multimedia carts*, comprised of a computer, projector, and VCR allow instructors to demonstrate instructional uses of technology in their classrooms. If wireless access to the Internet is available in the building, the computer cart may be equipped with a wireless network card so that the instructor can access or demonstrate learning resources available on the Web.

• *Providing computers in individual classrooms* makes it possible for the technology to be accessed and used as part of the ongoing instructional process. However, it requires more than a few computers to be placed in the classroom, otherwise it will be difficult for the teacher educator to integrate the technology into the teaching-learning process. Placing computers in individual classrooms also provides a number of challenges such as the cost of providing electricity and connectivity to each room, renovation costs, space constraints, and costs for software and supplies to be used. It also poses challenges in providing security, maintenance and support services for the distributed computers.

• *A mobile computer lab* consists of a mobile cart containing a printer, wireless access point, and a classroom set of 20-25 laptop computers equipped with batteries and wireless network cards. The computers may be moved from classroom to classroom and shared by teacher educators. The mobile computer lab reduces the costs for installing electricity and connectivity in the classrooms. The laptop computers do not require special furniture and can be used by students at their desks. Printing can be done via the wireless network. The mobile lab also provides the benefit of lower software costs, similar to that provided by a computer lab. In addition, the mobile carts can be stored in a secure area when not in classroom use.

The mobile computer lab does pose some problematic issues that must be considered. The laptop computers are typically more costly than desktop computers, and the mobile computer lab provides the same potential for scheduling conflicts as noted for the computer labs. The
mobile lab cannot be moved between the floors of a building without elevators and is difficult to move between buildings unless there is a smooth walkway connecting the buildings. The use of the mobile lab requires a system for delivering the cart before each classroom use and retrieving the cart after the class, and instructors need to be trained in these procedures.

In developing the hardware requirements section of the plan, it is not necessary to specify the specific models of computers to be acquired. Technologies change rapidly, and a specific computer or other hardware item that may be state-of-the-art today might not be a few months from now. After the equipment needs are determined, the next step is to determine how the hardware will be acquired. If the plan calls for buying equipment, it is important to standardize purchasing as much as possible and set standards for accepting donations. If the institution standardizes on one or two platforms, it reduces costs for technical support, maintenance, and service of the equipment. It also provides the same environment in each classroom. Other considerations in planning for the acquisition of hardware include:

- Realistic appraisal of how much can be purchased. Know vendors’ procedures and policies on warranties and service, and get these included in price quotes.
- Purchase hardware in the largest quantities possible to obtain the best pricing.
- Make sure the hardware purchased is upgradeable and will connect to a network. There are Internet sites for online purchasing from major manufacturers (e.g., Dell, Sony, Compaq, Apple, Fuji, Phillips, Cisco).
- Consider leasing. Its advantage is that obsolete equipment may be traded in for new models.
- Keep informed of new and innovative technologies.
- Do not spend all at once; spread purchases over an extended period. This keeps equipment from becoming obsolete all at the same time.
- Consider donations, but set a minimum standard and consider the issues of maintenance costs, decreased utility, and “one-of-a-kind” concerns.
- Electrical wiring and facility costs must be part of the planning. Many schools in old buildings fail to provide the electrical capacity to handle computer equipment, adequate ventilation and cooling systems, additional telephone lines, and security systems (SEIR*TEC, 2001).
CONNECTIVITY: PLAN THE NETWORK INFRASTRUCTURE

Although not visible, one of the most critical elements of the technology system is the infrastructure that supports the network and provides the connectivity and communication capabilities for each of the connected computers. Planning the network infrastructure is an essential element of the technology planning process and the plan should be designed to meet not only the current needs, but also have sufficient capacity to meet future requirements. The goal should be to establish information systems and infrastructure which maximize connections among teacher educators, pre-service and in-service teachers, and students, and which provide access to expertise and information resources from universities, museums, libraries, and databases around the world.

It is clear that the development of detailed requirements for the network infrastructure requires specific technical expertise. It is possible, however, to identify the general needs and requirements for the network infrastructure as part of the technology plan. If the teacher education programme is part of a university, it would be important to align the network plans with those of the institution. In some instances, local telecommunications companies may be willing to provide some assistance in defining the infrastructure requirements.

Plan Technology Professional Development

The most significant factor in enabling teacher educators to integrate technology into the instructional process is faculty development. Too often technology plans provide substantial funding for the acquisition of hardware and infrastructure but provide limited funding for the needed professional development and support. Failure to provide teacher educators and staff with adequate professional development opportunities may result in limited benefits from the investments in computers and related hardware. Successful programmes for training teacher educators to integrate technology are emerging after years of experimentation. Three essential factors related to creating a successful teacher educator professional development programme are:

• First, administrators must provide development programmes that serve teacher educators with very different skills, needs, and interests. A fully rounded training programme should include not only introductory classes for those who need to learn the basics, but more advanced classes as well. It should have in-session training seminars and online courses. It should have short, targeted programmes that tackle one subject in
a couple of hours (how to create a PowerPoint presentation, for example) as well as semester-long courses or workshops.

- Second, effective development programmes involve teacher educators at every stage of the process. Teacher educators must identify their training needs, help plan the curricula, act as mentors, and provide feedback. In addition, teacher educators must be committed to using their newly developed skills in the classroom as soon as possible, because the training lessons will fade over time.

- Third, the best programmes use technology to teach technology. This type of hands-on exposure greatly enhances the acquisition of necessary skills. Engage the teacher educators in projects during training classes and in follow-up activities at their institutions or schools in order to cement the lessons learned.

The technology plan should identify an effective staff development programme to support achievement of the plan’s goals. There are different strategies and resources that may be used for professional development. The one that is least effective is the single large group workshop without follow-up or support. Better strategies for technology professional development include:

- Creating model teacher education programmes in the country to explore and pilot new practices and technologies that may be extended to other teacher education institutions. The model teacher education programme is used as a training site for other teacher educators in the region or country.

- Developing a technology resource team comprised of teacher educators who have successfully integrated technology into their instruction. These teacher educators are provided with additional training, and they then provide training and support to teacher educators in their programme or other programmes. The resource teachers may team-teach for brief periods to assist other teachers in integrating specific technologies into their instructional practices.

- Using self-instructional professional development programmes and materials. Many high-quality technology professional development materials are available on the Web. Materials are also available from a number of vendors.

- Mentoring, in which one teacher educator with higher levels of skill and knowledge mentors two or more teacher educators in specific applications of technology in the learning process. The constraining factor is
that many teacher educators have limited time for interaction and collaboration because of heavy teaching loads.

- **Telementoring**, in which teacher educators become their own best support system. The teacher education programme may establish online conference areas as part of the network system where faculty may seek help, advice, and support from other teacher educators.

- **Visiting classrooms**, particularly if the visiting teacher educator has sufficient opportunities to observe the instructional activities and to discuss with the teacher educator how the activities were planned and organized.

Although professional development is critical for teacher educators, it is also important to consider the training needs of other staff in the institution in planning the technology implementation.

**Plan for Technical Support Services**

The technology plan needs to identify the services needed to support the implementation of the plan. Providing the equipment, software, and training will launch the programme, but for it to be successful, it must provide for the ongoing and long-term support of technology systems. Failure to provide for support will lead to a gradual decline and eventual rejection of the new technologies that have been so carefully planned to improve learning.

Technical support is needed to maintain the network, servers, and computers in the computer laboratories, classrooms, and staff offices. In developing the technology support system, institutions will often hire a network administrator or technician because of their specialized skills; yet also expect this person to assist the teachers in the application of technology in instruction. This typically does not work well, because the technology specialist lacks the pedagogical knowledge needed to help teachers in technology integration. A more effective approach is to have on-site and on-demand professionals with expertise in technology and pedagogy to work with teacher educators, but finding professionals who have expertise in both areas is difficult. The technical support system may need differentiated staff to provide the technical and instructional expertise to support the implementation of the plan. Personnel is as important as hardware and software, and professionals with high levels of technology skill as well as those who understand how technology fits with instruction are necessary for the success of the technology plan.
Project Timelines and Budgets

After the vision, needs, goals, objectives and major projects of the technology plan have been developed and the foundation for successful implementation has been firmly established, it is important to identify the timelines for the initiation and completion of the specific projects and related tasks included in the plan.

It will not be possible to work on all tasks simultaneously. For example, the installation of network infrastructure may need to be done before the computers are installed. The plan will need to identify the sequence in which projects and tasks must be completed.

Timelines are usually presented in the form of a chart or table that lists the project or task along one side of the chart and the timelines for task completion on the top of the chart. Gantt charts are useful tools for identifying project tasks and timelines. They may be done on a sheet of graph paper or on a computer. Preparing a Gantt chart involves listing all of the major projects or activities in the plan down the left side of the page. Across the top of the page are listed the weeks or months available for completion of projects in the plan. The tasks are then plotted onto the chart by drawing a line for each task showing the start date and the end date. The Gantt chart need not identify all the tasks required, but it should at least identify the major projects or tasks that are critical to the success of the implementation. It should provide an estimated target date for initiating and completing each project or task.

Budget and costs: Ultimately, planning the implementation costs will be the most critical concern of the administration. In developing the plan, it is therefore important to carefully estimate all costs involved. If costs are overestimated, the plan may be rejected as too expensive. On the other hand, underestimation of costs can cause serious problems during implementation and may result in loss of support for the plan.

Bakia (2002), in a study of the costs of computers in classrooms in developing countries, found that initial hardware costs represent only a fraction of the total annual project costs. She notes the importance of considering the total cost of ownership (TCO) of the technology when estimating costs of ICT projects. TCO includes all of the costs involved in operating networks and computers, whether leased or owned. Traditionally used by businesses to help control costs and make strategic decisions, the concept of TCO in the education environment can help officials plan better budgets and make smarter choices when they deploy a network.
The budget should include all of the costs for implementation of the plan. These include:

- **Hardware costs**, including both initial acquisition costs and estimated replacement costs based on the estimated life cycle of the technology (e.g., many businesses replace computers every 2-3 years; most schools replace computers after 5-7 years.) Bakia (2002) found that equipment costs consumed 17%-49% of total project costs.

- **Software costs**, including estimated annual expenditures to acquire new software tools and to replace obsolete software. The costs vary depending on the number and configuration of computers to be acquired. The percentage of the budget for the acquisition and maintenance of software may range from 14%-26% of the project costs (Consortium for School Networking, 2001).

- **Connectivity and infrastructure costs**, including installation of network servers, cabling, routers, switches, wireless access points, and costs for Internet access via local telecommunications services or satellite. Connectivity costs will depend heavily on the type of connectivity made available to the teacher education institution. Telephone companies in many countries charge for Internet access and even for local calls. Where telecommunications are still operated by monopolies, the prices can be quite steep. Bakia notes that a dedicated line in Turkey is likely to cost $80 per month, and in Ghana, schools are paying an average of $86 per month in telephone dial-up charges. It is, therefore, important to consider these costs in developing the technology plan budget.

- **Maintenance and technical support costs**, including technical support personnel, special tools and equipment, and replacement parts. Once computers and networks are installed, technical staff are needed to maintain and support them. Users also require regular support. Bakia (2002) notes that in Chile, maintenance costs for schools were estimated at 10% of the equipment costs, while in Egypt, these costs were estimated at 4% of total costs.

- **Professional development costs**. Professional development is the most important element in achieving the technology plan goals. If teacher educators and other staff members do not understand how to use new technologies and incorporate them into the teaching-learning process, the teacher education institution’s technological investment will not achieve its desired results. A substantial portion of the budget should
be allocated for faculty and staff professional development in the use of the technology. The U.S. Department of Education, for example, recommends that 30 percent of the total technology budget be allocated to staff development. The budget for professional development should include costs of training and support staff, professional development materials, participant stipends, etc.

- **Facility renovation costs**, to adequately house and support the technology resources acquired in the plan. This may include installing or upgrading electrical wiring or modification of the facilities to house computer labs. The costs will vary based on the age of the buildings, the capacity and condition of the current electrical systems, whether asbestos removal is necessary, and many other factors.

- **Supply costs**, including such items as toner cartridges for printers, paper, ZIP disks, and CD-Write disks.

- **Utility costs**. The computers and other technology resources and facilities will increase the cost of electricity, heating, and cooling. It is helpful to discuss the plans with the utility companies since they may have experience in estimating the impact of technology on increased utility costs in business and industry.

It is helpful to use a spreadsheet in preparing the budget to allow continual changes and refinements as cost estimates are developed. The budget should be clear and specific in regard to the amount and purpose of each budgeted item. It is also helpful to provide a rationale for each budget item following the budget page to explain its importance to the plan and the basis used for developing the cost estimate.

In developing the budget, identify the sources of funding for the different components of the plan. For example, the facilities, network, and hardware may be funded with the institution’s special equipment accounts, while the personnel, software, professional development and technical support costs may be covered by the operational budget. There may also be components of the plan for which external funding may be sought. All of these issues need to be clarified in the budget section of the plan.

**Evaluating the Implementation of the Plan**

The evaluation section of the technology plan identifies how the intended outcomes of the plan will be assessed and how progress toward the plan’s goals and objectives...
The evaluation plan should list the specific types of information to be gathered, describe the methods to be used in acquiring the data, and identify the source of the data. Information can be gathered from teacher educators, students, administrators, and staff. Other information sources may include course syllabi, academic documents, professional development materials, maintenance records, learner performance data, and other relevant sources. Various methods may be used to gather data, including faculty or student surveys, interviews, focus groups, case studies, tests, and student electronic portfolios. Many of the tools used in the assessment of the current status of technology in the teacher education programme may also be helpful in evaluating progress in the imple-
mentation of the plan. The evaluation should also include a schedule for the submission of periodic reports on progress in plan implementation. This information can be included in the Gantt chart described earlier in this section. Including these elements in the evaluation plan will help assure an effective means of monitoring and managing the progress of the plan implementation.

A helpful resource in developing the evaluation is *An Educator’s Guide to Evaluating the Use of Technology in Schools and Classrooms* (U.S. Department of Education, 2000). It provides a number of assessment tools and worksheets that may be helpful in designing the evaluation plan. Another useful tool for monitoring progress of technology integration into the teaching-learning process is the SEIR*TEC Technology Integration Progress Gauge (SEIR*TEC, 2001). It can help the planning team to reflect on activities to date by comparing them to effective practices in technology integration and to consider strategies for maximizing the impact of technology on teaching and learning.

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