

# 4

## Learning Technologies

Technology is changing the way learning occurs within organizations on a daily basis. Understanding the different technologies available to you and their uses within an organization is critical to providing value-driven training and learning. Management of a learning function requires the development of a diverse network to understand availability, use, and functionality of these technologies. Because technologies can either be a hindrance or enhancement to learning, the WLP professional should understand what the technology can do and its advantages and disadvantages.

### Learning Objectives:

- ☑ Describe how learning technologies will support the organization's goals and business objectives.
- ☑ Identify and select appropriate learning technologies to achieve the desired learning outcomes.
- ☑ Design instruction by applying appropriate technology-based solutions that support the desired learning outcomes.
- ☑ Articulate a strategy that seamlessly integrates desired training content with optimal instructional methods, available presentation methods, and the best distribution methods.
- ☑ Employ evaluation strategies in order to compare the benefits of one delivery system versus another to choose the most effective model or technology.
- ☑ Articulate the role that learning management systems and knowledge management systems play in developing and employing specific training initiatives for an organization.
- ☑ Discuss the advantages and disadvantages of various technology-based training solutions, including computer-based training, electronic performance support systems, simulations, and intranets.

## **Organizational Strategy as it Relates to Technology**

Technology has had an immeasurable effect on the way we learn today, whether the learning takes place formally through structured courses or informally by searching the Internet or collaborating with peers. Learning technology can provide continuous access to training materials, compress learning times by 50 to 60 percent compared to traditional classroom instruction, provide personalized instruction at the learner's own pace, and deliver instruction with optimal consistency.

Most organizations today are in the midst of rapidly changing global competitive markets and are still determined to be world-class companies in the eyes of their stakeholders—customers, owners, employees, and their communities. They know this happens only if they deliver the best products, services, performance, results, and innovations in their industry on a sustainable basis.

Strategy drives the direction of an organization and determines the goals and focus for that company. Strategy is defined as identifying the mission and vision of the organization, creating tactical goals and objectives, and translating the goals into action. For WLP professionals, the organizational business strategy should also drive their initiatives and focus when managing the learning function.

In particular, WLP professionals need to develop a strategy for the learning function that is aligned with the CEO's strategic goals. The strategy needs to address not only the learning delivery formats that will be used to address employee development, but also the technologies and investment needed for the learning function to support the business strategy, goals, and objectives.

## **Organizational Culture**

Investment and deployment of technology isn't the only consideration for success of the learning function. The organizational culture plays an enormous role in the success of the learning function when deploying technology-based learning. Think about what happens when a great learning program runs into the barrier of an unsupportive learning culture. The culture always wins.

If learning technologies (including e-learning) aren't supported over the long haul by an organization, it will be difficult to keep these efforts going. Marketing helps, but learning technologies can only be sustained when sponsors and learners believe that it is truly beneficial and preferable to traditional instructional approaches so much so that they become advocates themselves.

True learning organizations aren't those with the most courses; they are characterized by the broader culture of open knowledge exchange. For example, do people willingly share what they know? Do they take the time to coach and explain? Do organizational performance management systems encourage knowledge sharing or knowledge hoarding? For technology-based learning solutions to thrive within an organization, the company

must have a supportive culture that fosters information flow across organizational and geographic boundaries.

## **Past Experience with Technology**

From the 1970s through the 1990s, companies built bricks-and-mortar training centers at an exponential pace. E-learning courses were available to learners on CD-ROM and were slow and expensive to develop.

The Internet leveled the playing field. Technical roadblocks could now be hurdled and online training skyrocketed. Everything was moving to technology, and by the early 21<sup>st</sup> century, corporate training centers were seen as yesterday's news. Web-based courses were cropping up everywhere. Shareable Content Object Reference Model (SCORM) made interoperability more reality than dream, and blended learning soon became the latest watchword—everyone was sprinkling a little classroom instruction and e-learning into programs.

For many WLP professionals today, the biggest struggle is getting learners from different generations to embrace learning content delivered via many new technologies as part of a structured program—and encouraging self-directed learning by accessing content anytime and anywhere to help them perform better on the job.

As a result of the Internet and all of the new technologies that quickly became available to WLP professionals to develop and deliver content to learners, many organizations are reassessing their learning technology investments and questioning the value they are getting for their dollars. Organizations and WLP professionals continue to struggle in defining the success criteria for these solutions.

## **Align Support Systems to Overall Goals and Objectives**

When implementing any technology solution as part of a learning program, any solution should link to at least one of the organization's goals. When WLP professionals can demonstrate a strategic link to business drivers, it is typically easier to get approval from the executive team.

Most organizations have a technology leadership function that, in conjunction with the CEO and senior leadership team, establishes a technology roadmap for the next 12 months. This roadmap is crucial because it is the recommended information technology (IT) production schedule for the length of the year. If the learning function's requested technology projects are not on the schedule for that year, they might not get supported or funded. WLP professionals need to work with their IT departments to identify project requirements.

Typically learning technology infrastructure will have costs associated with it. Those costs are most likely budgeted by the organization's chief information officer (CIO) or chief technology officer (CTO). WLP professionals will need to research what technology-enabled learning solutions are needed for the upcoming years and how they will

be funded. For example, if the organization is rolling out a new sales force automation tool, which the learning function will need to support, how much of the cost to deliver this training will be included in the sales budget versus the learning function budget? It is a good idea to understand how IT budgets are established and note any requirements needed to make a request for IT-related investment in future budgeting cycles.

To help drive technology solutions for the learning function, WLP professionals should get to know the IT team as they can help when maneuvering through the IT application landscape. Taking proactive steps to meet and greet this critical group will help build a positive relationship and build an understanding of the current IT department processes. Researching the technology landscape is mission critical for the learning function to successfully implement technology-enabled solutions.

## Technology Selection Process

Technology has changed learning by moving it out of only the classroom and into the workplace, according to Allison Rossett, professor of Education Technology at San Diego State University. Many studies show that the classroom is less central to training and development today, and is growing less central every year. In many cases, the classroom has moved online. Learning enabled by technology now allows learners to gather more data from more sources in targeted and smaller chunks.

Blended learning is now also possible via the advent of technology, which involves a combination of approaches to reach a goal: teaching individually or in a group, in a classroom or while employees are at work, with an instructor, or via technology. Rossett points out that learning is growing more employee centric, which is both glorious and dangerous. It is glorious because of its closeness to work, its targeted nature, and because it's multi-modal. The danger occurs when employees do not look up information in a knowledge base, don't bother with e-learning modules, and don't take advantage of an e-coach.

WLP professionals determine which technologies are most appropriate for achieving the desired learning outcomes of a program by focusing on the following steps:

### **Step 1. Identify learning objectives and desired outcomes**

The first step in the process of selecting the right technologies for a learning program is the first step in any instructional design process: identifying the learning objectives and tasks and clarifying the desired outcomes the learners must be able to complete for the program to be a success. This step helps to ensure that performance—not technology—is the key driver when creating a learning program.

## Step 2. Identify needs of audience and geographical location(s)

As with any analysis phase in the instructional design process, the next step includes understanding the target audience, their demographics, and how geographically dispersed they are.

For example, a learning function needs to provide a learning program for a new sales force automation tool. Most of the sales force is already familiar with the current business processes, which will not change. The new information that they need to know includes how to navigate and enter data in the new system. The sales force is currently located in three countries around the world.

Many constraints will impact which technologies are used, such as the time to create and deploy the solution, the budget, geographical time zones, and the amount of time that management will allow the sales representatives to be out of the field to attend training.

In this example, the WLP professional responsible for the project decides that everyone must first understand the current business processes before focusing on training the new tool. Perhaps the learning solutions should include a self-paced module on information known as a “refresher” to ensure that everyone has the same baseline knowledge before tackling the new application functionality. If the application functionality is extremely hands-on, then perhaps an instructor-led module either in the classroom or online is appropriate to communicate and build the knowledge and skills on the new tool.

Some specific considerations at this point in the process include listing the available technologies at all locations, assessing the computer skills of the learners, and gathering information regarding any cultural or language considerations.

An example of the type of information that should be gathered and documented during an audience analysis appears in Table 4-1.

**Table 4-1. Sample Audience Analysis Profile Form**

Area	Questions	Findings
BACKGROUND	Range of school experience	
	Native language	
	Cultural considerations	
	Average reading level	
WORK EXPERIENCE	Existing skills or knowledge related to proposed training	
	Variation of work experience levels	
TRAINING	Motivation	
	Recent training experience	
	Effect on current job	
	Degree of accountability	

Area	Questions	Findings
DELIVERY	Number of people to be trained	
	Location of people to be trained	

Source: Adapted from McArdle (1999).

### Step 3. Determine which activities and interactivity are needed

Many WLP professionals struggle with how to get participants interested and involved in learning. Research shows that learners understand concepts better and retain information longer when they are actively involved in the learning process. Therefore, the most effective means of delivering training—no matter what mode of delivery or technology is used—are active training techniques. The key from a technology perspective is that all of the media selected have a definite purpose and not selected just for the sake of including technology as part of the solution.

The choice of an appropriate instructional strategy for a particular audience is, at best, a guess if a formal audience analysis has not been conducted as noted in the previous step. One way to match an instructional strategy with a particular audience is to be sensitive to an audience's demographics and preferences. The technology should be suitable for the audience, the content, the organizational environment, and, most of all, the proposed learning objective. These preferences provide WLP professionals with a design template to assist in developing the content and a checklist for making decisions about learning activities.

WLP professionals need to conduct a job analysis (as depicted in Table 4-2) to identify the specific tasks that learners need to be able to perform in order to complete specific job functions. Once the specific tasks are defined, then one can determine the most appropriate instructional strategies, activities, and interactivity for learners to master these tasks.

**Table 4-2. Sample Job Analysis Form**

Functional Responsibilities	Tasks Involved
Write 30-minute training module	Define objectives
	Develop topical outline
	Decide on instructional strategies
	Produce course works
Evaluate 30-minute training	Determine level of education
	Include test items in design
	Determine methods of data collection, analysis, and reporting

Source: Adapted from McArdle (1999).

Some examples of the most common instructional strategies used as part of a learning program include:

- lecture
- role play
- group discussion
- self-discovery
- self-paced or self-programmed instruction
- case studies
- competitive games
- cooperative games
- movies or videos
- individual or group projects
- simulations.

#### **Step 4. Review design considerations**

A great number of considerations go into selecting the appropriate technology as part of the solution to engage learners including the type of learning (verbal information, cognitive, or motor skills), audience, demographics, learning styles, number of learners, budget, physical site and resources available, and the facilitators' skills and training style.

Some specific questions that WLP professionals need to confirm at this point are:

- How much interaction is needed among the instructor and the learners?
- Will learners need to work on their own?
- How much support will learners need?
- What resources are needed by the learners?

After these key questions have been answered, the WLP professional needs to consider the advantages and inherent attributes of each technology to determine which one(s) is most appropriate to support the goals and objectives of the learning program. The key is to focus on performance by aligning the learning needs of the target audience with technological capabilities.

#### **Step 5. Construct a rationale for the technology choices**

Just as WLP professionals need to develop a rationale for the type of training solution proposed (Is training the right solution to address the problem? If so, then how will the proposed training impact the target audience? What is the acceptance level expected from the audience, supervisors, and management? What is the learning solution impact

on the entire organization?), they also need to include a rationale for the types of technologies proposed as part of the learning solution and make a business case for any investment needed by the organization to support this solution. This rationale should address the following:

- benefits to learners
- alignment with organizational strategy and goals
- cost effectiveness.

This rationale should also be supported with a benchmarking analysis and reports to show the current knowledge, skills, and performance metrics for the target audience to help build the business case. These measures and metrics will be critical after training deployment to show the effectiveness of the learning program and the technologies used.

## Technical Requirements

After considering the organizational culture, the first hurdle in planning and implementing a training initiative, WLP professionals need to consider the technical requirements. Technology-based learning has set high standards and often requires a high-performance, scalable, and reliable platform to meet baseline user requirements. Users (learners, managers, and administrators) have come to expect a quality experience with any technology-enabled learning solution and generally will reject slow or unreliable solutions. These requirements are the same whether the learning solution is managed behind the firewall on a customer's intranet or through an application service provider (ASP). The following are some technical requirements when designing, developing, and implementing technology-based solutions within an organization:

- One of the biggest hurdles to overcome is learner resistance and changing the organizational culture's perspective on learning technologies. You don't want to take two steps backward for any gains that you've made with the acceptance and adoption of learning technologies in an organization. Use technology that has proven to be suitable to the task.
- Once learners are able to navigate and access information when they need it to perform on the job, nothing will squash all of these learning design efforts faster than links that do not work or do not direct learners to relevant content. Provide consistent links to related subjects for learning content, and ensure that these links are maintained.
- Tailor the technology requirements as close as possible to the learning environment of the company.
- To facilitate knowledge sharing in an organization, provide an open environment on the Internet for collaboration and discussion. If employees don't have the option to collaborate with each other beyond face-to-face meetings, organizations are missing a significant opportunity to provide access to and leverage experts, break down communications across organizational boundaries, and change the corporate culture.

- The best way to find out what's working well and what needs improvement from a learning technology perspective is to ask for feedback from the learners. Because learning technologies come at an expense, all hard and soft data that can be collected about the effectiveness of technology-based learning solutions is invaluable. Consider using electronic surveys to gather data in order to help justify the investment in learning technologies and for continuous improvement of learning solutions.
- Learners will only use technologies that they find to be valuable. If the technology is too slow, too difficult to access and navigate, and doesn't providing search capabilities to quickly point learners to what they need, they will soon abandon using the technology. Implement easy-to-use websites, tailored to what the learners want, not what the organization thinks they want.
- Information flows within organizations are often chaotic. Knowledge seekers are trying to get answers to questions, get information or advice to help them with job performance, or seek expert feedback on a new idea. To facilitate the ability to find the right information exactly when it's needed in the organization, consider identifying the work flow of all company processes and information highways including automating forms and processes.

## Design/Blend/Develop

***Distance learning*** was one of the first terms used in the early 19<sup>th</sup> century to describe the distribution of education in a nontraditional manner. Although technology innovators, like Edison, have always been certain that their latest contributions to the media field would be the way to get education to everyone, everywhere, and anytime, technology alone wasn't the answer. Educators soon realized that using a medium for instructional purposes required special instructional design considerations that were different from mainstream application of the medium.

In early technology-based solutions, technology wasn't the only problem. A lack of systematic instructional design was a huge culprit in early failures. It seems strange that organizations were willing to discard their understanding of what makes a good learning solution simply because the delivery method changed. Two factors seemed to drive this:

- There was a misguided perception that the use of technology eliminated the need for a designer, much in the same way a dishwashing machine eliminated the need to wash dishes by hand.
- Organizations had already invested so much time and money in purchasing and installing learning technologies that it seemed the best use of resources was to get as much content out to the users as quickly as possible.

A common result was training that did not meet the mark and fell short of the quality standards expected in the traditional setting. Many made the assumption that technology

was not the appropriate delivery medium for the content. Although that may have indeed been the case, most of the issues were due to the lack of solid instructional design and assessment techniques.

Before WLP professionals can design effective technology-based solutions they should have a working knowledge of the newest generation of delivery tools. In particular, WLP professionals should be up to speed on asynchronous e-learning and synchronous virtual learning.

## Asynchronous E-Learning

According to the glossary at Learning Circuits (2008), ***asynchronous learning*** is “learning in which interaction between instructors and students occurs intermittently with a time delay. Examples are self-paced courses taken via the Internet or CD-ROM, Q&A mentoring, online discussion groups, and email.”

Asynchronous e-learning became commonplace in the 1980s when content became easily accessible via diskette, CD-ROM, or internal networks. It was adopted by organizations rather quickly because the content could be quickly disseminated to large audiences, who could then participate at a time of their choosing. Although there were early roadblocks that kept asynchronous e-learning from meeting expectations (e.g., much of the content was heavy-text “page-turners” with little interactivity), today this category includes many learning solutions from collaborative discussion boards to self-contained tutorials on the web.

## Synchronous Virtual Learning

For WLP professionals who have been working in the field for the last decade or so, the terms ***virtual classroom***, ***synchronous learning***, ***live online learning***, ***e-meetings***, and ***webinars*** all mean basically the same thing—content delivered live over the Internet to geographically dispersed participants.

This category of technologies has great potential for delivering learning solutions to audiences who may otherwise not have the opportunity to participate in a learning event. The implications are tremendous for improving communications among organizations, bridging cultural divides, and providing educational opportunities to global destinations that might be too expensive or time consuming to travel to in person.

When participants encounter programs that do not interest them, when session leaders don't prepare, or when technical goofs slow a program, participants may get the impression that virtual learning is not as effective as traditional classroom training.

Because these technologies are somewhat new, professionals have often been creating programs without the benefit of success models, without best practices, and without full knowledge of how to use the technology to its best advantage. Too often synchronous virtual learning provides participants little or no opportunity for interaction with the course content and too few chances to collaborate with other participants.

Today, virtual learning means you can pull workers off the job for two hours, train them, and get them back to work with a limited interruption to productivity.

## **Blended Learning**

WLP professionals struggle with knowing which media to mix when creating a blended learning solution. A blend is an instructional strategy for delivering on promises of learning and performance. Blending involves a planned combination of approaches, such as coaching by a supervisor; participation in an online class, breakfast with colleagues, competency descriptions, reading, reference to a manual, and participation in workshops or online communities.

A study by Peter Dean and his colleagues found that providing several linked options for learners, in addition to classroom training, increased what they learned. In 2002, Harvard Business School faculty DeLacey and Leonard reported that students learned more when online sessions were added to traditional courses. Student interaction and satisfaction improved as well.

## **Designing Technology-Based Solutions**

When designing technology-based solutions, the same instructional design principles apply, along with some additional considerations. For example, WLP professionals need to align the instructional strategies and content to learning technologies if there is latitude to do so.

Many times WLP professionals do not have a choice in what technologies are used when designing and developing a learning program. They are constrained to use the existing, mandatory technology choices that the organization has already invested in.

When considering technology-based solutions, organizations need to be sure that they are designing learning to address SCORM and 508 compliance requirements. SCORM is the industry standard generated by the U.S. Department of Defense's Advanced Distributed Learning (ADL) organization, that fosters creation of reusable learning content as "instructional objects" within a common technical framework for computer- and web-based learning. SCORM describes that technical framework by providing a harmonized set of guidelines, specifications, and standards.

Another standard, Section 508 of the Americans with Disabilities Act, requires that when federal agencies develop, procure, maintain, or use electronic and information technology (EIT), federal employees with disabilities must have comparable access to and use of information and data as federal employees who have no disabilities, unless an undue burden would be imposed on the agency.

Section 508 also requires that individuals with disabilities who are members of the public seeking information or services from a federal agency have comparable access to and use of information and data as the public without disabilities, unless an undue burden would be imposed on the agency.

Although federal agencies have an explicit statutory obligation to make all EIT that they develop, maintain, or use compliant with Section 508, the current emphasis is on newly procured EIT because it is the category that is explicitly enforceable by legal action.

Options for blended learning go beyond the classroom. Blended learning provides WLP professionals with the opportunity to design learning programs that leverage technology- and non-technology-based solutions. They are formal and informal, technology- and people-based, independent and convivial, and directive- and discovery-oriented. Essentially blended learning is about developing and using a mix of technologies—such as synchronous web conferences, classroom instruction, and threaded discussions after training.

Table 4-3 lists some categories of technologies for developing training and creating blended learning solutions.

**Table 4-3. Categories and Example of Technologies**

<p><b>Live Face-to-Face (formal)</b></p> <ul style="list-style-type: none"> <li>• Instructor-led classroom</li> <li>• Workshops</li> <li>• Coaching/mentoring</li> <li>• On-the-job training (OJT)</li> </ul>	<p><b>Live Face-to-Face (informal)</b></p> <ul style="list-style-type: none"> <li>• Collegial connections</li> <li>• Work teams</li> <li>• Role modeling</li> </ul>
<p><b>Virtual Collaboration / Synchronous</b></p> <ul style="list-style-type: none"> <li>• Live e-learning classes</li> <li>• E-mentoring</li> </ul>	<p><b>Virtual Collaboration / Asynchronous</b></p> <ul style="list-style-type: none"> <li>• Email</li> <li>• Online bulletin boards</li> <li>• Listservs</li> <li>• Online communities</li> </ul>
<p><b>Self-Paced Learning</b></p> <ul style="list-style-type: none"> <li>• Web learning modules</li> <li>• Online resource links</li> <li>• Simulations</li> <li>• Scenarios</li> <li>• Video and audio CD/DVDs</li> <li>• Online self-assessments</li> <li>• Workbooks</li> </ul>	<p><b>Performance Support</b></p> <ul style="list-style-type: none"> <li>• Help systems</li> <li>• Print job aids</li> <li>• Knowledge databases</li> <li>• Documentation</li> <li>• Performance/decision support tools</li> </ul>

Source: Rossett, A. et al (June 2003).

Let's apply these various examples of technologies to an urgent situation with little time for development. For example, you work for a pharmaceutical company and one of your products has received some bad press, which is at many times inaccurate. Every newspaper in the country has raised fears about hormone replacement therapy. The organization now needs to get the right information about the product out quickly to

physicians. Patients are concerned and want to switch or stop using the medication and physicians are not sure what information is accurate and how to communicate the technical data correctly to patients.

Notice figure 4.1, which depicts a breakdown of the types of content that could be used in a blended solution and lists which media provides short or longer development timeframes. Due to the circumstances in this particular situation, the content is somewhat stable and the WLP professionals have a short timeframe to create the content and disseminate it. For those reasons, we should focus on the technology solutions that are listed in the left quadrants of the table.

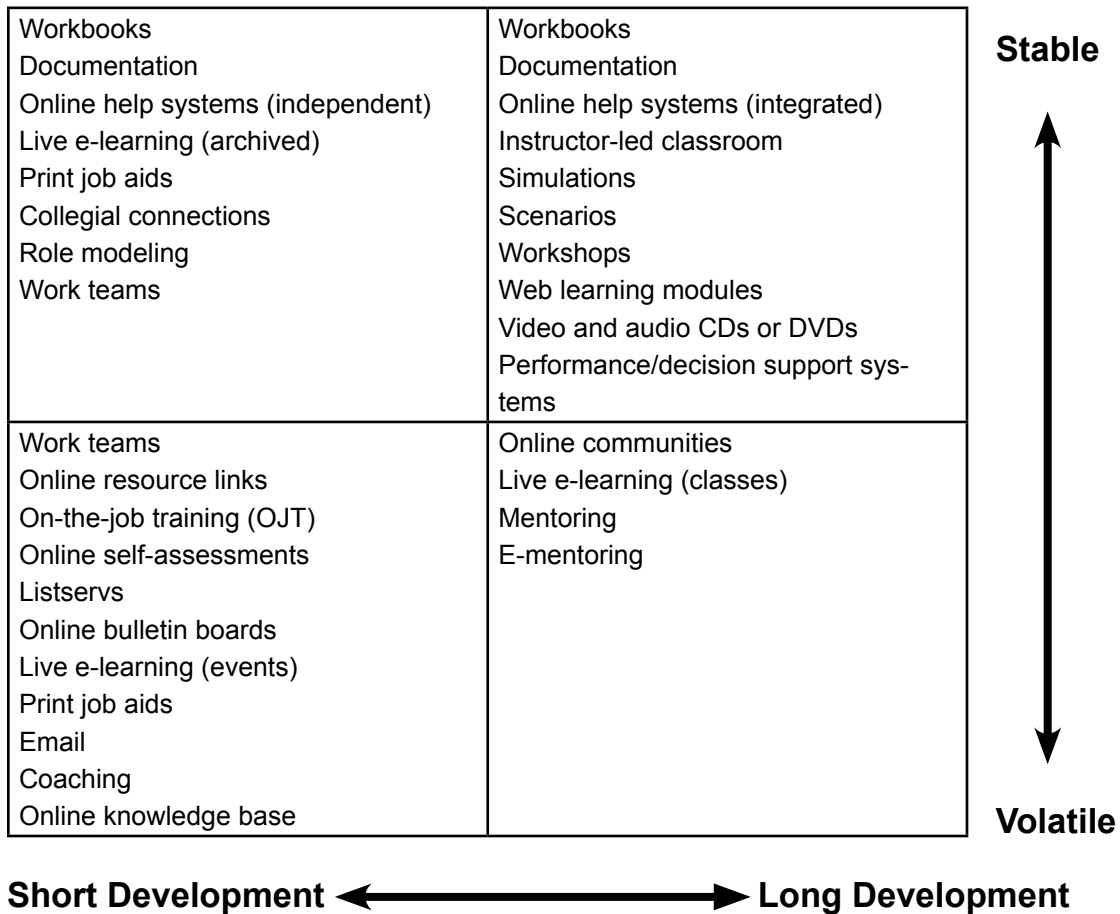
For example, some solutions which would meet the short development criteria include:

- an online knowledge base to serve as a central repository of information and a directory containing relatively stable content, which is not expected to change often
- coaching over the phone that would allow physicians to process emergent concerns with experts
- a print job aid, produced by experts on the topic that summarizes the benefits and risks of each treatment, combined with a reading list and links to online articles
- a devoted listserv that pushes the very latest information to physicians on a daily or weekly basis
- live online briefings that provide physicians with updates about the latest findings, as well as allowing them to participate in discussions. Events with stable content could be archived for later reference, providing value to new doctors and others unable to participate in online events.

When developing learning solutions, WLP professionals often know the constraints and need to apply their expertise in crafting the right solutions—often a blend—to meet the business objectives and learner performance outcomes.

For example, you may have \$100,000 to develop and deliver an effective training program to a group of sales representatives. Perhaps you have three months to develop the program before you need to begin delivering the training and the sales representatives are spread all across the United States. You've also found out from management that the learners will be expected to attend a kickoff call (in which you'll have 15 minutes to "plug" the program and training they'll receive), and that the learners will be expected to take the training on their own after hours (so as not to cut into selling time in the field) and that their manager will be the primary go-to person and coach for any questions. All of these givens (budget, timeframe, geographically dispersed audience, and the fact that the manager is to act as the trainer if questions arise) drive the instructional design

**Figure 4-1. Learning Option Comparison by Stability and Time to Implement**



Source: Rossett, A. et al (June 2003).

approach, the instructional strategy, and the technologies that will be selected to craft the right solution.

As mentioned previously, technology-based learning solutions are relatively new within many organizations. As a result, the last step in the process after designing and developing any technology-based learning should include capturing successes and lessons learned. As learning functions implement more and more technology-based solutions, WLP professionals need to establish a process, if one does not currently exist, to collect the best practices to make strides with regard to technology. This step helps to avoid reinventing the wheel each time a technology-based solution needs to be designed and developed in the organization.

## Using Technology-Based Solutions

As technology plays a bigger role in training and learning, it is incumbent on WLP professionals to become learning-technology literate and develop a vision for how and when to apply it for specific purposes and objectives.

One barrier to understanding technology is the sheer volume of learning technologies available. In fact, there are more than 500 companies that provide learning technology solutions today across multiple categories. Development tools, collaboration tools, and the considerations that go along with each of these categories of tools all fall into the mix when designing effective technology-enabled instruction.

### Development Tools

Development tools are software applications that enable WLP professionals to create learning content, without requiring previous programming skills, that can be delivered and tracked online. Keep in mind that not all development tools are designed for the same purpose. Some can be used to create both websites and online learning, while others are used to create time-based animations. Some convert Microsoft PowerPoint presentations to online courses, and still others allow the use of templates to create highly interactive simulations. Studies have indicated that most companies use multiple authoring tools (Nantel et al., 2007), selecting the right tool for the job.

Within this general category of development tools, there are specific types of tools available to WLP professionals including authoring (general purpose course authoring), rapid-development tools, simulation, instructional games, and assessment tools.

### Authoring and Rapid-Development Tools

The practice of using authoring tools has been around since early CBT (computer-based training) times and these tools have evolved and are now usually delivered over the Internet.

Consider how the dynamic of shifting learning delivery formats affects the skill sets required by WLP professionals. In the early days of technology-delivered learning, when only a small percentage of training was delivered via CBT, there was often a clear delineation between those who designed instruction and those who coded, assembled, and authored courses using technology. These early technology-based courses often took a long time to develop and were costly.

With today's authoring tools, the costs and timeline to develop technology-based learning have both decreased, as shown in Table 4-4.

**Table 4-4. Authoring Tools Summary**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• They are inexpensive and reliable.</li> <li>• They enable worldwide distribution.</li> </ul>	<ul style="list-style-type: none"> <li>• Materials require frequent maintenance to ensure that they're kept up to date.</li> <li>• They may have steep learning curves.</li> </ul>

Source: Goldsmith (2000).

Even though authoring tools are targeted to the nonprogrammer, many authoring tools still have a steep learning curve. They allow for considerable flexibility in creating high degrees of interactivity. Studies indicate that it takes 220 person-hours of development to create a single hour of finished e-learning content (Chapman et al., 2006). Vendors have been working to shorten development times, making authoring easier for nontechnical content contributors, and making learning development more cost effective. Some rapid-development tools allow novice developers, instructors, and subject matter experts to work in familiar tools, such as PowerPoint, to create learning content by converting the PowerPoint files into online courses complete with narration and interactivity.

A survey of rapid-development tool users suggests a dramatic savings in development time: 33 person-hours for each finished hour of course content created, a significant reduction from the 220:1 ratio when creating traditional technology-based content. Although rapid-development is not suitable for all types of learning content, many achieve the best results by using these rapid-development tools and mixing them with the rich interactivity of other applications, such as Flash exercises or simulations.

## Collaboration Tools

What is collaborative learning? According to Rosenberg (2008), there are two ways to look at it. The first is more formal. WLP professionals build collaborative experiences into formal courseware in the form of group work, case studies, and other active learning approaches. There is no doubt that such techniques enhance the learning experience, but the collaborative learning discussed here doesn't necessarily happen in the context of a course or a classroom; it happens informally in the context of the workplace, driven by the individual's or group's immediate need to connect to others to answer a question, assess a situation, solve a problem, or develop a solution.

Informal learning is a requirement for organizations to remain competitive today. Learning functions need to transform themselves from being the main distributor of information in the form of training courses to one where employees have greater stewardship in their own learning.

Information flows in an organization are often chaotic. Making the problem worse is the fact that knowledge seekers, in their continued search for help, find neither the expert

nor the nonexpert, but the “false” expert—those who believe they have the right information but in fact are unknowingly misinformed.

One of the best ways to facilitate this transformation and empowerment of learners is through the many tools and technologies that create support for informal learning, including knowledge bases or newer Web 2.0 technologies such as wikis, blogs, discussion groups, and online communities. These Web 2.0 technologies are often low cost or free and easy to deploy.

In the late 1990s, Web 1.0 emerged and was primarily one way and informational in nature. Massive amounts of information became readily available. Today, almost 80 percent of American adults are online (*New York Times*, 2007), and have become comfortable with the Internet as a primary information source. We now see the emergence of Web 2.0, not just a technology, but a significant change in direction, characterized by dynamic person-to-person and group-to-group interactions (for example, LinkedIn and Facebook). These interactions are driving the transformation of technology-based learning into much more of an instantaneous and collaborative experience.

Collaboration tools may be one of the most important technologies in support of informal learning today. These systems are designed to capture and share expert knowledge through frequently asked questions, discussion groups, knowledge bases, or direct contact with experts via chat or instant messaging capabilities. Some examples of technologies in this category include communities of practice, social networking, wikis, and blogs.

### **Communities of practice**

Communities of practice (often abbreviated as CoP) can serve as organizing structures and platforms for entire workplace-based learning efforts. CoPs are trusting groups of professionals united by a common concern or purpose, dedicated to supporting each other in increasing their knowledge, creating new insights, and enhancing performance in a particular domain. Members of a CoP are people who want to work with, learn from, and help each other achieve business goals (Hessan and Vogt, 1999). Much more than chat rooms or discussion threads, CoPs are more fully integrated into actual work. Many people have been part of vertical CoPs for decades, just look at any organizational chart. In vertical CoPs, information flows up or down, but the biggest value to be gained from communities is when they are horizontal, where the information flows from side to side.

Most recently, CoPs have become associated with knowledge management as people now see them as ways of developing social capital, nurturing new knowledge, stimulating innovation, or sharing existing tacit knowledge within an organization. It is now an accepted part of organizational development (OD).

The argument against communities is that no one uses them, especially on a regular basis. However, this issue is just as much of a cultural and sponsorship issue as it is a technology issue. CoPs flourish when members think their time is spent wisely and is valued by

their peers and managers. So, communities must provide content that is deemed critical and important to members now, not at some point in the future.

### **Social Networking**

Social networking lies at the very core of collaborative learning. John Seely Brown, former chief scientist at Xerox, first popularized the idea that learning and information sharing are social activities. People learn much more from each other than they do from more explicit information in books, magazines, websites, or videos. Adding social networking to CoPs ensures that conversations become more informal and personal, just like they are among friends and colleagues in the workplace. Tools like LinkedIn, Facebook, and MySpace are the most popular social networking sites. According to ComScore.com, Facebook and MySpace combined had approximately 166 million visitors in the last year.

Online social networks can be extensions of personal networks in the workplace, or they can focus on personal interest areas outside of work. When people can easily find others with common experience and expertise, shared knowledge can be significantly increased. The ability to instantly reach out to people with similar interests and knowledge is a powerful force in collaborative learning.

Talking about shared problems and common goals and helping others improve performance are important first steps in building a collaborative learning environment on the web.

### **Wikis**

Wikis are generating a great deal of excitement in learning circles. A wiki (Hawaiian for quick) is a software tool that supports collaborative knowledge creation. Wikis allow groups of people to contribute and edit content in a knowledge base that has been defined and structured by a group, practically in real time, without the need for any programming knowledge. The most popular wiki by far is Wikipedia, the online encyclopedia, where almost anyone can contribute, edit, and manage information.

Wikis are based on both group-think and individual expert modules where a wide variety of participants can help to ensure that, as the group authors and edits content over time, all perspectives and points of view are heard. In addition, individual experts can evaluate and edit the content to ensure accuracy and completeness. This group collaboration, in addition to being a learning activity on its own, can serve as a collective intelligence around a particular knowledge domain.

Wikis present a group opportunity for communities of people to create knowledge bases in short order. Project teams, subject matter experts, market managers, and other groups of workers are often spread out geographically, and can quickly use wiki technology to create and maintain repositories of information.

## **Blogs**

Blogs, short for “weblogs,” are online diaries or web journals that allow authors (bloggers) to easily and quickly communicate with large numbers of readers who then collaborate with the author by adding comments, links, and other insights and material that might be useful to the conversation. In 2006, 14 million blogs were launched, and there are an estimated 70 million blogs worldwide. Blogs are extremely easy to create and maintain; like wikis, no authoring or HTML expertise is required, just the desire to communicate and share knowledge. Unlike a wiki, a blog is usually authored by a single individual, and its format is almost always chronological.

Blogs can be powerful learning tools. They can maximize how new ideas are disseminated and discussed by a larger audience. Although it is important to ensure that those doing the blogging know what they are talking about, there is no need to restrict blogs to just a few anointed subject matter experts. Project managers can use a blog to keep teams, or even entire organizations, informed about a project’s status. Much better than email updates, blogs form a permanent, organized record of activities and progress that can be archived and referenced. WLP professionals can use blogs to chronicle course activities that they are facilitating, perhaps over multiple offerings, in which insights from one course would not be lost to the next.

## **Considerations Related to Technology-Based Solutions**

Although these new technologies pose exciting opportunities to enhance workplace collaboration and learning, there are several considerations to keep in mind during the selection, design, and development of technology-based learning. Some considerations are the authoring tool learning curve, the cost, how it will integrate with other systems, the mistake of assuming learners know how to use the technology, compatibility with LMS or portal technology, and different workstation configurations.

### **Authoring Tool Learning Curve**

Authoring tools have made it more realistic for more WLP professionals to create their own learning content, unlike the days when technology experts had to code and program e-learning courses. There is still a learning curve associated with all technologies used in designing and developing learning programs today.

### **Cost**

Many of the Web 2.0 tools may be relatively inexpensive, but authoring, rapid-development, and other development tools can come with some steep price tags if you are purchasing multiple licenses for these technologies.

## **Integration with Other Systems**

Another consideration with regard to technology-based solutions includes integration with other systems. For example, when designing and developing content using a development tool, it is critical to understand the environment where the content will eventually live (i.e., a learning management system (LMS) or portal) and the specifications of the learners' computers to uncover all technical requirements early in the process and ensure that there are no compatibility issues when implementing the learning program.

## **Assuming that Learners Can Use Technology-Based Learning Solutions**

We'd like to think that the long hours devoted to designing and developing comprehensive learning programs provide all the guidance needed for learners to access and navigate within the programs. No matter how much WLP professionals love and admire their compelling technology-based programs, if the learners find the content difficult to find and use, they will not spend time to figure it out. Today's content often has glossaries, file attachments, FAQs, narration scripts, progress quizzes, software simulations, games, interactive exercises, and more. Be sure to provide instructions on how to log on to a portal or LMS (where the content is housed), how to access and navigate the content, as well as pointing learners to all of the relevant performance support systems and job aids that will help them with their tasks on the job.

## **Compatibility with LMS or Portal Technology**

If your content needs to run within a portal or LMS, it isn't prudent to assume that it will work perfectly when added to the site. Work with the LMS administrator or other resources to determine the publishing settings, publish a prototype early in the process and then test it to ensure that the content runs without freezing up or causing any other technical glitches. Be sure to test the content from the end user perspective to gather and communicate any setting changes that individual learners may need to make for the content to play optimally in their environment.

## **Workstation Configurations**

Your content runs fine in any web browser, but don't assume that it will work perfectly with every learner's workstation configuration. In the technology-based learning world, learners across different departments or hierarchies may have different computers, laptops, resolutions, settings, browsers, Flash versions, and audio capabilities (some may have sound cards and others may not). Take time to work with the IT team to determine workstation configurations for the primary target audience for the technology-based learning.

Keep in mind that no matter the combination of blended learning solutions and technologies used to create a learning program, the learning must enhance performance and support the organizational strategy or else it is all for nothing.

Finally, it is critical to know the culture of the organization. When great learning initiatives, especially ones that are new and different, are pitted against a unsupportive organizational culture, the culture wins every time. If people are resistant to knowledge sharing and if collaboration is almost always forced, then it would be prudent to focus on improving the learning culture first before beginning a new and unique learning program.

## **Deliver/Implement/Deploy**

As with any new application or technology in an organization, adoption is the key to its ultimate success. In many companies in the early to mid-1990s, there were rampant and often heated discussions about whether or not to implement email systems in organizations. People asked many questions: What is email? Why would we ever need email? Should we just give email access to management? Should we just give email access to management's administrative staff? How are we ever going to train everyone on such a potentially large enterprise application?

These questions get answered after implementation and through real-life implementation activities, but they are representative of similar questions that arise with any new technology adoption in any company. Even though there were questions when these systems were implemented, these same organizations would most likely feel completely unprepared for daily work without email connectivity.

Often, when people or organizations have issues about technology efficacy, they often stem from a lack of skills or a perceived lack of skills, which minimizes the likelihood that people will want to use these tools. This can be overcome with appropriate training, management support, and technology updates.

## **E-Learning**

E-learning refers to anything delivered, enabled, or mediated by electronic technology for the explicit purpose of learning. E-learning allows trainers to hold classes in much the same way they would in the classroom, with a few additional considerations related to the technology. E-learning uses technology as part of the delivery process. CBT, CD-ROMs, DVDs, videos, learning portals or online communities, virtual classrooms, message boards, chat rooms, and podcasts are all examples of types of e-learning that are distributed many different ways to learners.

E-learning can be placed in one of two categories: learning that occurs with a live instructor (synchronous) and learning that does not (asynchronous).

Advancements in real-time, web-based technologies have made synchronous learning possible through virtual classrooms, where participants can have a classroom learning experience without getting together in one place.

Virtual classrooms reap the benefits of traditional classroom instruction without incurring the usual costs and inconveniences (facilities, travel expenses, and so forth). Other benefits include the ability to see and hear the instructor and other participants when

audio and video are used, the ability to use an unlimited number of whiteboards and to save whiteboard content automatically to use in other sessions, live online demonstrations by sharing applications, and facilitated interaction.

Other synchronous options enable learners to participate in 3-D virtual worlds, like Second Life®. Second Life is a virtual world where users, called residents, interact with each other through avatars, which are a virtual representations of users. Residents can explore, meet other residents, socialize, participate in individual and group activities, and create and trade virtual property and services with one another, or travel throughout the world, which residents refer to as the grid.

Asynchronous learning, also called self-paced or self-directed learning, is where an instructor doesn't interact with the learner simultaneously. Using email is one form of asynchronous training. The greatest benefit of asynchronous training is its flexibility; learners can fit the course into their schedules rather than the instructor's.

E-learning also includes learner-to-learner interactions, which might occur in an online learning community, for example discussion groups, onscreen guided tours and workbooks, learning games, telementoring, and e-coaching.

Table 4-5 summarizes the advantages and disadvantages of e-learning.

**Table 4-5. E-Learning Summary**

Advantages	Disadvantages
<p>E-learning</p> <ul style="list-style-type: none"> <li>• gives the learner control</li> <li>• is outstanding for teaching rote skills because slower learners receive more remediation</li> <li>• is excellent for teaching prerequisite materials</li> <li>• allows ease of updating content in one place on the Web as opposed to hundreds of CDs</li> <li>• offers flexibility in scheduling</li> <li>• is delivered quickly</li> <li>• requires no travel.</li> </ul>	<p>E-learning</p> <ul style="list-style-type: none"> <li>• requires a computer</li> <li>• requires a moderate to high degree of computer literacy</li> <li>• may have steep startup costs if no technical infrastructure is in place or the infrastructure is outdated</li> <li>• may be resisted by employees</li> <li>• decreases human contact.</li> </ul>

### Pairing Instructional and Presentation Methods

A key to gaining buy-in for technology-based solutions within the organization is to ensure that the right instructional methods have been appropriately paired with effective presentation formats to clearly communicate content, engage learners, and achieve the desired outcomes. A key goal includes engaging learners' senses by using a variety of presentation methods that cater to various adult learning and intake styles.

As technology continues to evolve, so do instructional design techniques to more effectively pair the appropriate instructional and presentation methods. WLP professionals need to understand that technology should be selected based on the content and learning objectives and not the other way around.

The key benefits of audio and video go back to the fundamentals of cognitive learning theory. Multisensory learning engages the learner and increases retention. Audio and video can often convey feelings and subtle contexts of learning more effectively than other tools. Video is particularly effective in demonstrating a kinesthetic task, such as a tennis serve or the correct turning procedure for a bolt assembly.

There are two basic techniques—downloadable and streaming—when using audio and video content in a learning solution. Downloadable audio and video files are sent to a user’s computer in their entirety before they can be played. With streaming formats, audio or video content can be played as it is being downloaded, with only a short delay at the beginning.

The advent of podcasts have made the use of audio and video more cost effective and prevalent, but audio and video are not always used. Why? A number of factors must be considered, including equipment, logistics, and extra time and cost. Even with compression techniques that make audio and video as small as possible while maintaining sound and image quality, network resources are often strained by using audio and video. When incorporating sound or images in e-learning instruction, WLP professionals must also be aware of copyright issues. More on copyright, fair use, and other legal issues is covered in Chapter 15, “Legal, Regulatory, and Ethical Requirements.”

Table 4-6 summarizes the advantages and disadvantages of audio and video.

**Table 4-6. Audio and Video Summary**

Advantages	Disadvantages
<p>Audio and video</p> <ul style="list-style-type: none"> <li>• enable multisensory learning, which engages the learner and increases retention</li> <li>• allow WLP professionals to leverage a large library of existing audio or video training content.</li> </ul>	<p>Audio and video</p> <ul style="list-style-type: none"> <li>• have equipment and logistical considerations, such as required hardware (a sound card and speakers) and bandwidth restrictions</li> <li>• require money and time to develop.</li> </ul>

Source: Adapted from Metcalf (2000).

Adding audio, video, and kinesthetic elements to technology-based learning is great from the learner perspective, but WLP professionals have to operate within the constraints of the organization’s perspective as well. Perhaps the network does not have enough bandwidth to effectively stream audio and video in programs for the learners, it is too cost prohibitive, or adding these elements requires more time than is available to craft and

deliver the training. More information on using audio and video is covered in Module 2, Delivering Training, Chapter 4, “Training Delivery Options and Media.”

## Selecting Appropriate Distribution Methods

It might be surprising to some to find out that distance learning is not a new concept—formal distance learning in the United States can be historically traced as far back as the first half of the 19<sup>th</sup> century. The introduction of every new communication medium seemed to be fast, followed by the desire to use it to distribute education in a nontraditional manner. As early as 1913, Thomas Edison was forecasting the demise of traditional education models, asserting that “it is possible to teach every branch of human knowledge with the motion picture” and that “books will soon be obsolete in the public schools.”

Although technology innovators like Edison have always been certain that their latest contributions to the media field are the best way to get education to everyone, everywhere, and at anytime, technology alone wasn’t the answer. Educators soon realized that using the media for instructional purposes required special instructional design considerations that were different from mainstream applications of the media.

### Evolution of Modern Educational Technologies

Generation 1: 1840s—First correspondence study via mail (shorthand)

Generation 2: 1900s—Audio recordings

Generation 3: 1910s—Motion picture camera

Generation 4: 1920s—Radio stations

Generation 5: 1930s—Television

Generation 6: 1960s—Satellite

Generation 7: 1980s—Fiber optic, audiovisual technology, CD-ROM

Generation 8: 1990s—World Wide Web, email

Generation 9: 2000s—E-learning, virtual learning, mobile learning, blogs, wikis, discussion forums, and online communities

Source: Biech, E. (Editor), (2008).

Technology-based training uses electronic technologies to deliver information and facilitate the development of skills and knowledge. To be effective in the role of a training manager, WLP professionals need to be aware of available technologies and their advantages and disadvantages. They don’t need to be able to design or program these technologies but should be able to work effectively with e-learning designers and programmers, use the correct terminology, and understand the potential uses of each solution. Many technol-

ogy-based solutions discussed in this chapter have overlapping uses, definitions, and terminology, which reflect ongoing debates about these terms in the WLP industry.

Learning technologies offer a wide variety of distribution methods including:

- web-based (e-learning, learning portals, online communities, web conferencing)
- network-based (e-learning, email, collaborative tools)
- disc-based (DVD/CD-ROM)
- simulations and virtual reality (including tactile gear)
- mobile learning (PDA- and phone-based)
- TV-based (satellite, teleconferencing, cable)
- EPSSs
- job aids.

When considering options for learning technologies, WLP professionals should be aware of the advantages and disadvantages of various distribution methods, both in terms of the benefits they provide to learners and the organization, as well as costs and resource requirements.

## **Web-Based**

The Internet, intranets, learning portals, online communities, bulletin boards, email communication, online courses and reference manuals, and live web conferencing enable organizations to create an electronic campus where a learner can navigate to interact with other learners, instructors, reference materials, and training sessions. Unlike a university campus, which is limited to a collection of buildings at one location, an electronic campus may have resources separated by thousands of miles.

An important difference between an intranet and the Internet is their reach. The Internet has a worldwide scope and can be traversed by anyone who can access it through a computer. Intranets, however, are usually intended for a restricted audience—those who have authorized access, usually employees of the organization that owns the intranet. An intranet may be connected to the Internet so that employees can have access to information from the Internet. However, a firewall, which is a computer security system, prevents external organizations or users from accessing the intranet.

Table 4-7 summarizes the advantages and disadvantages of Internet- and intranet-based training.

**Table 4-7. Web-Based Training Summary**

<b>Advantages</b>	<b>Disadvantages</b>
<p>Web-based training</p> <ul style="list-style-type: none"> <li>• is available from many online libraries</li> <li>• enables content owners to readily update materials</li> <li>• has low distribution costs</li> <li>• enables learners to access multiple courses on a single piece of web software</li> <li>• allows self-paced training.</li> </ul>	<p>Web-based training</p> <ul style="list-style-type: none"> <li>• requires a computer</li> <li>• requires a moderate to high degree of computer literacy to create WBT sites</li> <li>• may have bandwidth issues, especially when content includes sound and streaming video</li> <li>• offers limited video and sound transmission</li> <li>• requires security measures to prevent unwanted viewing.</li> </ul>

### Network-Based

Many organizations provide training and content to learners via their corporate network. Corporate networks often provide one-stop shopping for learners to access anytime, anywhere learning from one key point.

One benefit of providing network-based learning solutions includes a reduced distribution cost. With disc-based delivery methods, discs need to be made for each learner, then delivered. Network-based learning skirts the challenges and additional cost of disc-based distribution.

Corporate networks, however, often have bandwidth restrictions. Content developed to be delivered via a network may need to be limited with regard to the amount of audio, video, interactivity, or the final size of the e-learning content in order to meet the IT guidelines and standards for delivering content this way. Table 4-8 summarizes the advantages and disadvantages of network-based delivery.

**Table 4-8. Network-Based Summary**

<b>Advantages</b>	<b>Disadvantages</b>
<p>Network-based training</p> <ul style="list-style-type: none"> <li>• available to learners through a wide variety of content</li> <li>• can be distributed quickly to numerous locations</li> <li>• eliminates concerns about scheduling constraints</li> <li>• allows self-paced training</li> <li>• has low distribution costs and evaluation built into the instruction</li> <li>• enables use of existing videos and visuals.</li> </ul>	<p>Network-based training</p> <ul style="list-style-type: none"> <li>• requires a computer</li> <li>• may have high development costs and lengthy development timelines</li> <li>• requires moderate computer literacy of users</li> <li>• may not be appropriate for learners with low self-directedness</li> <li>• may be constrained by amount of audio, video, interactivity that is included in the content due to bandwidth or other IT restrictions.</li> </ul>

## Disc-Based

CBT content can also be distributed to learners via disc-based methods (primarily DVDs and CD-ROMs). CD-ROM, an initialism of Compact Disc Read-Only Memory, is a pre-pressed compact disc that contains data accessible to, but not writable by, a computer. The compact disc format was originally designed for music storage and playback. When DVD arrived, it quickly became the most popular disc-based media format.

DVDs, also known as Digital Versatile Discs or Digital Video Discs, have the same dimensions as CDs but store more than six times as much data. The large storage capacity enables many organizations to take advantage of learning solutions that don't require learners to go online. For example, some organizations may have size limitations on courses that can live on the LMS. For courses or learning programs that are too large because of large amounts of audio and video, the learning content can be distributed to learners on a disc rather than via the Internet or intranet.

Table 4-9 summarizes the advantages and disadvantages of disc-based learning.

**Table 4-9. Disc-Based Summary**

Advantages	Disadvantages
<p>Disc-based training</p> <ul style="list-style-type: none"> <li>• allows for larger courses and content without LMS or bandwidth restrictions</li> <li>• eliminates concerns about scheduling constraints</li> <li>• allows self-paced training</li> <li>• has evaluation built into the instruction</li> <li>• enables use of existing videos and visuals.</li> </ul>	<p>Disc-Based training</p> <ul style="list-style-type: none"> <li>• is not as easily distributed as network- or web-based distribution methods</li> <li>• has higher distribution costs compared to web- and network-based distribution methods</li> <li>• requires a computer</li> <li>• may have high development costs</li> <li>• may require lengthy development timelines</li> <li>• may not be appropriate for learners with low self-directedness.</li> </ul>

## Simulators & Virtual Reality

Ask any group of WLP professionals to define the word *simulation* and you're likely to get a wide variety of answers. Educational simulations are a broad genre of simulations that focus on increasing participants' mastery level in the real world.

Educational simulations use simulation elements to model and present an abstracted reality, including

- real-life or target actions, reflected in the interface
- how the actions then affect relevant systems, including any units, maps, and work

processes

- how those systems produce feedback and results.

The simulation elements are then mixed with game elements to make it engaging. The addition of pedagogical elements, including coaching, make it effective.

Simulations are also organized into tasks and levels to create incrementally challenging practice environments and can be engaged by one or more participants and often surrounded by a community.

Once understood, different genres of simulations make creating and using simulations much easier and more predictable.

### **Genre 1: Branching Stories**

A branching story is an educational simulation genre in which learners make a series of multiple-choice decisions to progress through and affect an event. Specifically, learners start with a briefing, then they advance to a first multiple-choice decision point (or branch). Based on the decision or action they make, they see a scene that provides some feedback, advances the story, and then sets up another decision. Learners continue making decisions, traversing some of the available branches, until they either win or lose by reaching a successful or unsuccessful final state. Finally, learners get some type of after-action review.

### **Genre 2: Interactive Spreadsheets**

Another popular genre of educational simulation is the interactive spreadsheet. This is an educational simulation in which learners typically try to affect three or four critical metrics indirectly and over time by allocating finite resources along competing categories over a series of turns or intervals. Learners get feedback on their decisions through graphs and charts after each interval. The entire simulation might continue for between three and 20 intervals. These interactive spreadsheets are often used in a multiplayer or team-based environment with significant competition among learners and often with a coach or facilitator to help.

### **Genre 3: The Virtual Lab**

The third genre is virtual labs, in which learners are given realistic, online versions of objects or applications, and given challenges to solve. For example, automotive dealers might be given a smoking car. They have to find the right tools, such as a diagnostic computer terminal, pop the hood by pressing the right buttons, attach the cable to the right spot in the engine, and start the computer by pressing the right sequence of buttons. What learners do, where they do it, how hard they do it, and how long they press the “turn wrench” button all matter, which means that there is much kinesthetic learning going on.

### **Genre 4: Minigames**

The final popular genre of simulations is called minigames. Minigames, also called casual games or microgames, are easy to access, most often Adobe Flash-based, and represent

between five and 20 minutes of learner engagement. Minigames are fun (quick gameplay, bouncy music, and appealing graphics) and educational. This genre is perfect for skills or activities that need repetition and practice.

Naturally, cost is always a deciding factor. The costs for these technologies have decreased in recent years, such that simulations are becoming relatively affordable.

Virtual reality (VR) is a computer-based technology that gives learners a realistic, three-dimensional, interactive experience. This powerful tool enhances learning by allowing students to perform skills in a realistic, engaging simulation of a real-life environment. Like other types of e-learning, VR can reduce average learning time and, therefore, the cost associated with learning. Many organizations use VR to deliver performance-based learning solutions.

Authors Mohr, Field, and Frank (2000) point out in *The ASTD Handbook of Training Design and Delivery* that VR is inherently a self-directed and self-paced experience. A single learner, immersed in a virtual environment, interacts with surrounding objects, and then experiences the results of those actions through visual, aural, and sometimes tactile feedback. VR is often applied to simulation or scenario-based learning applications that enable learners to perform skills and apply knowledge while working at their own pace. It can be used in self-paced learning, instructor-led learning, and other learning methods, depending on factors such as cost, time to delivery, learning content, and learners.

VR-based, self-paced programs are most effective for teaching cognitive or procedural skills. These programs can be designed for orientation for new staff, refresher/remedial instruction for experienced staff, and skill practice and rehearsal for all staff. VR shares the benefits of other CBT technologies, but some specific benefits and disadvantages are listed in Table 4-10.

**Table 4-10. Simulation-Based Summary**

Advantages	Disadvantages
<p>Simulator-based</p> <ul style="list-style-type: none"> <li>• engages learners in the learning experience and increases their motivation to learn</li> <li>• provides a wide variety of realistic conditions and feedback from practicing and rehearsing skills in a safe, risk-free environment</li> <li>• promotes conceptual and procedural learning tasks</li> <li>• reduces errors in performing skills, particularly for complex tasks</li> <li>• increases retention.</li> </ul>	<p>Simulator-based</p> <ul style="list-style-type: none"> <li>• requires an initial investment in hardware and software that may be cost prohibitive</li> <li>• requires a detailed understanding of cause and effect</li> <li>• requires a number of resources for developing and delivering learning applications</li> <li>• may need specialized equipment depending on requirements for the type of interaction.</li> </ul>

Source: Adapted from Mohr, Field, and Frank (2000).

## TV-Based (Satellite, Teleconferencing, and Cable)

Businesses have used video teleconferencing for several years in lieu of face-to-face meetings, primarily in a small number of sites. However, it has become one of the most common methods of training at a distance. Learners can see and hear the instructor, and the instructor can see and hear learners. Video teleconferencing is sometimes referred to as “two way, two way,” referring to the two-way transmission of both audio and video signals.

With video teleconferencing, the equipment is often the same at both the instructor site (or source site) and the learner site (or remote site). Having the same equipment offers the flexibility for any site in the system to become an instructor site. Typically, equipment in a video teleconferencing classroom includes:

- **Cameras:** Cameras at each site capture what the instructor and learners are doing. The setup usually includes three cameras: one oriented toward where an instructor sits, a second overhead camera directed at where an instructor places visual aids (paper, slides, or three-dimensional objects), and a third camera pointed where learners sit. The cameras can be controlled by those physically at the site or by someone at a remote site.
- **Remote control:** A remote control, similar to that for a television or video recorder, allows an instructor or a learner to choose which camera is displayed and control the camera’s angle and zoom. Other devices to control cameras include one that zooms in automatically on whoever is talking.
- **Codec:** A camera’s video signal is fed to the “brains” of the site, an electronic box called a codec (short for coder/decoder). The codec converts the camera signal, along with audio signals from classroom microphones into digital information. The information is then sent, usually over high-capacity phone lines, to remote sites. After remote sites have received the digital information, the codec at each site converts the digital signal back to a signal that can be displayed on a television monitor.
- **Television monitors:** Two large television monitors allow participants to see both what cameras at their own site (outgoing video) are seeing and what cameras at the remote site (incoming video) are seeing.

Other audiovisual sources can be linked to the codec. Most sites are equipped with a video recorder so the instructor can transmit a videotape signal to the other sites. A special type of 35mm slide projector commonly used at video teleconference sites displays slides as video signals that are fed into the codec, not as images that go through a lens to a wall or screen. With this technology, existing 35mm slides can be used during an instruction or training period.

Table 4-11 summarizes the advantages and disadvantages of video teleconferencing.

**Table 4-11. TV-Based Summary**

Advantages	Disadvantages
TV-Based <ul style="list-style-type: none"> <li>• allows instructors to see learners (and vice versa)</li> <li>• offers the flexibility of multiple “instructor” sites</li> <li>• enables learners to interact with each other visually.</li> </ul>	TV-Based <ul style="list-style-type: none"> <li>• has high transmission costs</li> <li>• has high costs for establishing sites</li> <li>• presents difficulties in managing visual interaction with several sites.</li> </ul>

Source: Mantyla and Gividen (1997).

## Mobile Learning

One of the latest trends in distance learning is mobile learning. According to the Learning Mobile Citizen, mobile learning is “the use of mobile or wireless devices for learning on the move.” Mobile learning provides curricula where and when you need it, using delivery technologies that enable learners to carry learning with them.

Technologies in this category include MP3 players, pocket PCs, mobile phones, and personal digital assistants (PDAs). PDA-based learning delivery includes podcasts (audio) and vodcasts (video). There are certainly many other miniature devices that will fall into this category, not to mention the combination of technologies to create new learning devices. The launch of the Apple iPhone is an example of the convergence of these technologies, as consumers are becoming less willing to carry around multiple devices. As this convergence continues, the types and amounts of instruction that will be delivered via mobile learning will exponentially explode.

This delivery method represents a new take on old technology. What was once sent out on audiocassettes, videotapes, and CD-ROMs/DVDs is now downloaded directly off the Internet or a local hard drive. Along with easier-to-use production tools, the ability to distribute a wide variety of audiovisual material over the Internet has made the podcast and all its cousins extremely popular and far less costly than past approaches. Another contribution of the podcast is that it has transformed the traditional perceptions of what a knowledge base is.

Ultimately, mobile learning is convenient. Learning can occur when you need it (just-in-time) and, in theory, from wherever you happen to be.

For example, do you need to know how to fix a pressure gauge on an agricultural vehicle when you are 20 miles away from the office? Use a PDA to help guide you through the steps. Learning a new language? Listen to a podcast with headphones while commuting on the train. Watching a how-to video on an MP3 player with video capability and missed a step? Simply rewind and watch again.

Table 4-12 summarizes the advantages and disadvantages of mobile learning.

**Table 4-12. Mobile Learning Summary**

Advantages	Disadvantages
<p>PDA-based Solutions</p> <ul style="list-style-type: none"> <li>• are inexpensive to create</li> <li>• do not require high-end skills to create content</li> <li>• are easy to use and low cost.</li> </ul>	<p>PDA-based Solutions</p> <ul style="list-style-type: none"> <li>• have limited or no use of graphics</li> <li>• contain potential trap of quickly creating content without thought to instructional design.</li> </ul>

Mobile devices and podcasts have grown in number and sophistication. This technology is a no-brainer in knowledge dissemination and learning as it offers the user the ability to learn on the go, from experts who otherwise would have a more limited reach, and to get updates to the content every day if desired (if synched with a computer).

### **EPSS (Electronic Performance Support System)**

An EPSS is a software program that provides just-in-time, on-demand information, guidance, examples, and step-by-step dialog boxes to improve job performance without the need for training or coaching by other people. An EPSS is, in other words, a comprehensive computer-based job aid. EPSS applications often include

- databases of job-related information organized to facilitate rapid access and optimize clarity
- calculators and wizards that simplify and automate procedures
- decision-support modules that offer intelligent assistance with problem solving
- embedded tutorials and simulations that provide instruction in work-related concepts and procedures.

A well-designed EPSS is more than an electronic page turner or multimedia document. It incorporates the decision support of expert systems, the information accessibility of electronic text retrieval systems, and the individualized instructional capabilities of CBT or web-based training (WBT). It can even include advanced communication features.

An EPSS—or any job aid, for that matter—addresses the same performance needs as training. In fact, when performers lack the knowledge or skills required to perform the job at hand, only two possible interventions work: training and job aids. Of course, performance opportunities aren't generally either/or situations; training and job aids are often used together as complementary interventions.

EPSSs are best used for noncomplex tasks. If learners have to make too many decisions within steps, they may get lost. Table 4-13 summarizes the advantages and disadvantages of EPSSs.

**Table 4-13. EPSS Summary**

Advantages	Disadvantages
<p>EPSSs</p> <ul style="list-style-type: none"> <li>• allow self-paced training</li> <li>• have low distribution costs</li> <li>• can be used to address a performance problem caused by a knowledge or skill deficiency.</li> </ul>	<p>EPSSs</p> <ul style="list-style-type: none"> <li>• require a computer</li> <li>• may not be an appropriate training intervention for psychomotor tasks</li> <li>• may need extensive employee and organizational commitment to keep procedures and other information up to date in the system.</li> </ul>

Source: Adapted from Sanders and Thiagarajan (2001)

## Job Aids

A job aid (sometimes also called a “cheat sheet”) is a storage place for information on how to perform a specific task. A job aid provides an audio or visual signal to a performer about when to carry out a task and steps, reducing the amount of recall that’s needed and minimizing error. In everyday life, people use job aids when they are at an ATM or a self-service gas pump, for example.

Job aids reduce training time and support learning. For example, in a commercial airplane, pilots use a job aid (a preflight checklist) to make sure they carry out vital tasks to ensure a safe flight. The key to creating good job aids is to organize the information according to how users will actually use it, step by step. For more on developing and using job aids, refer to Module 2, *Delivering Training*, Chapter 4, “Training Delivery Options and Media.” Table 4-14 summarizes the advantages and disadvantages of job aids.

**Table 4-14. Job Aids Summary**

Advantages	Disadvantages
<p>Job aids</p> <ul style="list-style-type: none"> <li>• are excellent for tasks performed with low frequency, highly complex tasks, tasks with a high consequence of error, and tasks likely to change in the future</li> <li>• can be used as “checklists” when a series of tasks or checkpoints must be completed in a certain order every time, for example, a preflight checklist that must be done before takeoff.</li> </ul>	<p>Job aids</p> <ul style="list-style-type: none"> <li>• can’t be used for tasks that have strict time restrictions, such as tasks a pilot must perform midflight when immediate reaction times are crucial</li> <li>• aren’t practical for use in some environments; for example, a scuba diver can’t handle a booklet in dark, wet conditions.</li> </ul>

Source: Adapted from Sanders and Thiagarajan. (2001)

## Types of Organizational Knowledge Management Systems

Technology serves as an enabler to allow organizations to capture, store, retrieve, and share knowledge among members. Many organizations use several ways to share knowledge via content management systems, websites, and intranet portals. Several types of knowledge management systems include:

A **content management system** (CMS) is a computer software system for organizing and facilitating collaborative creation of documents and other content. It is often a web application used for managing websites and web content, though in many cases, content management systems require special client software for editing and constructing articles.

A **learning content management system** (LCMS) applies the primary functions of content management—storing, searching for, and reusing content—to the training development process. In an LCMS, content is chunked (typically into learning objects, which are small, reusable pieces of content) and then managed, published, and delivered on demand. LCMSs integrate different courses and learning materials and then package the content for print, DVD, or electronic publication. Most are capable of importing prepackaged content from other learning content development tools, such as Microsoft Word and Macromedia Dreamweaver. Most LCMSs enable course developers to author learning content as well.

A **web portal** is a website that serves as a starting point to other resources on the Internet or an intranet. Intranet portals, also known as enterprise information portals, provide access to an array of resources and services, such as email, forums, search engines, and online shopping malls. The first web portals were online services, such as AOL. Today, many early search engines have changed into web portals to attract a larger audience. Many business portals offer collaboration services to share information in workplaces.

A **document management system** is a computer program (or set of programs) used to track and store images of paper documents. More recently, the term has been used to distinguish between imaging and records management systems that specialize in paper capture and records, respectively. Document management systems commonly offer check-in, check-out, storage, and retrieval of electronic documents. Electronic document management systems typically include a workflow model for certifying and electronically signing documents.

**Collaboration tools** are software systems designed to capture and share expert knowledge through frequently asked questions, discussion groups, knowledge bases or direct contact with experts via chat or instant messaging capabilities. Some examples of technologies in this category include: wikis, social networking sites (e.g., LinkedIn, Facebook), communities of practice, discussion threads, chat, and instant messaging.

## Conclusion

The Internet and technology has changed everything in the world of learning. Resources, education, information, varied points of view, and communities of practice are now possible wherever we are. It has enabled WLP professionals and employees to be the producers and creators of lessons, stories, and modules.

The learning technology space is evolving quickly, sometimes faster than our ability to plan how we can leverage the technology to keep pace with what learners need. Only five years ago, blogs were just making a splash and few knew what a wiki was before Wikipedia recently became a household name. With numerous learning technology components available, it is becoming increasingly important to keep up with what's happening in each category of the various technologies.

From the perspective of a WLP professional, these new learning technologies require several new skills and areas of expertise in addition to traditional instructional design skills. Specialties like information design, knowledge architecture design, library science, user interface design, community facilitation, collaboration strategy, content analysis, and change management are becoming increasingly important. These new technologies represent more than profound changes in the technology alone; they are transforming the implementation of organizational change. Where once WLP professionals could only provide courses to meet the learning needs of employees to building, they now can maintain and deliver workplace-based information and collaboration services as well.