This chapter discusses the potential of intranets for transforming the learning process, including design and implementation issues.

Intranets for Learning and Performance Support

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At Company A, Michael checks his calendar and groans. The half-day training session on interviewing skills scheduled for this week involves two hours of travel to the central office. He resents the time lost, especially since he only hires a few people each year. By next time, he'll have forgotten everything he learned.

At Company B, Jenny checks her calendar and notices that she has interviews scheduled later in the week. It's been a while since she filled a position, so she logs on to her company's intranet to review a training module on interviewing. She skims most of the sections, concentrating on the few she truly needs. Jenny also downloads a "job aid"—a list of questions that she can use during the interview. Without leaving her desk, she's prepared for the week.

This scenario illustrates the potential that intranets have to transform the learning process. What exactly are intranets, and how are they being used for learning and performance support?

Intranet Structure and Use

The term *intranet* refers both to the technical infrastructure—the physical connections between computers—and to the total collection of software and information made available through that infrastructure. Technically, an intranet is simply an internal corporate or organizational network, over which information and programs can be shared by multiple users. A *firewall* or security system allows entry to authorized users only, creating a bounded system.

Intranets allow users to share files and programs, access information, and communicate with one another electronically. These capabilities have tremendous potential for organizations on a number of levels, including training and performance support.

This chapter will review the technical aspects of intranets, but will primarily focus on intranet-based training and performance support systems and their implications for adult learning.

Technical Infrastructure. Intranets use the same networking protocols as the public Internet (for example, TCP/IP, SMTP, and HTTP). The primary difference is that an intranet is only available to certain users who have been authorized to access it. These boundaries make it possible to describe an intranet in terms of size, scope, hardware and software, and even user characteristics. Like the Internet, intranets predate World Wide Web technology, but their use expanded exponentially once the Web developed. Though an intranet is not necessarily Web-based, the term often refers to internal networks that publish information on Web servers for access with Web browsers.

The technical advantages of delivering learning and performance support over an intranet include ease of distribution, ease of access, and use of existing infrastructure. These advantages offer immediate cost savings, as well as the promise of transforming work and learning as a result of increased connectivity.

Ease of Distribution. Distributing software and information through an intranet saves duplication, shipping, and other distribution costs. In addition, since shared resources can be reached by anyone on the intranet, each user's individual storage space ceases to be a limiting factor.

Ease of distribution affects not only the initial circulation of software or information but also subsequent maintenance. The original can be updated easily from a central location, alleviating concerns that users may be operating with outdated information, programs, or procedures. Centralized distribution is a genuine advantage for version control, cost savings, and timeliness of information.

An intranet may solve some distribution problems, but it creates others. First, users may not use all the resources they should. Though newer technologies *push* information to the user (that is, they supply information to the user's computer without a specific request from the user), most intranets still rely on users *pulling* (requesting) the material they need. Distribution issues have thus widened from making sure that resources are physically available to attracting the user to them. Second, although the information or program may be easily updated, the ability to access it may not keep pace. Available technology changes rapidly, and not every user within an organization is likely to be able to follow the changes at the same rate. This leads to the issue of access.

Ease of Access. One of the major strengths of intranets is that users can share programs, information, and tools across different computer systems and configurations. This ease of access makes it possible to create a network open to everyone in the organization.

However, technical accessibility is far from uniform. Standards are still evolving, so compatibility between different computer systems holds for only the most basic files. Even simple graphics can vary from computer to computer. Similar computers may be running different configurations of programs, such as the Web plug-ins that extend the functionality of browsers. Further, in large organizations, the cost of equipment replacement ensures that not all computer users will have the most current hardware. In terms of design, these technical constraints mean that audio, video, and downloadable files may not be available to all the end users. Designers have to balance high-end functionality against access issues.

Use of Existing Infrastructure. Use of existing network connections and computers is considered a particularly strong advantage for intranets, particularly for Web-based intranets. The architecture of the Web offers a nonproprietary system that is familiar to most users. Multiple providers for components mean that pricing is competitive and that companies need not fear investing in a dead-end technology.

At the same time, this open architecture makes decisions about hardware and software more complex. Different components may not work together as expected and can require laborious research and troubleshooting. The rapid pace of technological development makes system maintenance a moving target. To use the current infrastructure, some functions available on stand-alone systems have to be reconsidered. For example, network bandwidth limitations still hamper implementation of real-time audio or video over an intranet, which in turn limits the use of existing computer-based training that requires multimedia.

While it is true that recent advances continue to make intranet technology far more feasible, maintaining and selecting an appropriate system requires effort, expense, and expertise.

Learning and Performance Support. Although critical, technical considerations are only a small part of the picture. The value of an intranet lies in its content and use. Intranets permit just-in-time or on-demand training on an individual basis through improved delivery of learning resources. They also promote the development of shared resources and collaborative work practices.

Review of Learning and Performance Resources. Intranet resources include adaptations of existing, non-networked resources, such as information from printed materials, computer-based training, and electronic performance support systems.

The term *computer-based training* describes the delivery system more than the instructional content. Traditional computer-based training usually consists of tutorials, drills, simulations, or instructional games. However, computers are also being used to build more open-ended *learning environments* to encourage exploration and problem solving (Alessi and Trollip, 1991; Cognition and Technology Group at Vanderbilt, 1991; De Grave, Boshuizen, and Schmidt, 1996; Goodrum, Dorsey, and Schwen, 1993). Descriptions of such learning environments tend to merge with those of electronic performance support systems (EPSS).

The primary difference between a learning environment and an electronic performance support system is that the focus of an EPSS is not learning, per se: an EPSS represents a blend of learning and work, with an emphasis on performance as the ultimate goal (Rosenberg, 1995). Since individuals can access updated information and procedures when they need them, some learning becomes unnecessary. For example, an EPSS for a chair manufacturer might include a database containing colors, styles, and prices that users can access when talking to a customer. Instead of memorizing all the options that are available, salespeople can concentrate on finding combinations that fit the customer's needs. Using performance support to minimize rote learning in this way reduces information overload for workers and allows them to concentrate on higher cognitive processes.

A number of interrelated fields contribute to perspectives on EPSS: performance technology, instructional technology, knowledge engineering, information engineering, business process reengineering, and systems thinking (Laffey, 1995; Raybould, 1995; Rosenberg, 1995). Initial developers of electronic performance support systems conceived an EPSS as an electronic system that provided integrated, on-demand access to information, advice, learning experiences, examples, and tools to enable a high level of job performance with a minimum of support from other people (Gery, 1991). The goal of an EPSS is "to provide whatever is necessary to generate performance and learning at the moment of need" (Gery, 1991, p. 34).

Current definitions of electronic performance support systems have shifted their focus from specific components to overall impact. Performance-centered design is usually cited as one of the hallmarks of an EPSS (Gery, 1995a; Laffey, 1995; McGraw, 1997; Raybould, 1995, 1997). Performance-centered design reflects the user's goals within a work environment, communicating what the user needs to do to achieve those goals and providing support in carrying out the associated tasks (Dickelman, 1995; McGraw, 1997; Norman, 1993). In addition to making the right tool available at the right time, a good performance system clarifies relationships, sequences, priorities, decisions, and standards related to the task (Gery, 1995b; McGraw, 1995; Raybould, 1995; Rosenberg, 1995).

In practice, performance and learning are so deeply interconnected that systems designed for performance support often support learning as well. Situating information and learning resources in a work context provides a natural way for learning to take place, especially since adults are usually task-centered, self-directed learners (Dorsey, Goodrum, and Schwen, 1993; Duchastel and Lang, 1995–96; Ference and Vockell, 1994; Merriam, 1993; Schwen, Goodrum, and Dorsey, 1993; Wilson, 1993). Nonetheless, EPSS development has been driven by businesses rather than by educational institutions (Hudzina, Rowley, and Wager, 1996).

Advocates of performance support systems—a term that includes learning experiences such as computer-based training—identify advantages for both individuals and organizations. Table 2.1 summarizes some of the major benefits cited for each.

Table 2.1. Advantages of Performance Support Systems

For Individuals	*For Organizations*
• Access to information bases • Just-in-time, on-demand learning experiences, focused on user's needs • Access to procedural guidance (job aids, checklists, and so on) • Collection of tools, templates, and guidance to support performance • User selection of resources and strategies • Reduced demands on memory • Situated learning in task context	• Consistent training • Reduced travel costs • Procedural consistency • Rapid performance for novices

For individuals, just-in-time access to information, tools, and training enables them to focus on their goals. Without the demands of a class schedule, individuals can linger on unfamiliar material and not waste time on things they already know. Users select the resources that they need, so individuals can customize their use of the system.

For organizations, on-demand training reduces travel time and increases the applicability of learning to the individual's needs and immediate situation. These factors improve productivity while lowering training costs. Performance support tools and templates also allow less experienced workers to perform more advanced tasks than they would ordinarily be capable of, so that more experienced—and higher-paid—workers can concentrate on tasks where their specific expertise is required (Thomas, Baron, and Schmidt, 1994).

Advantages of Intranet Connections. The advantages of stand-alone training or performance support systems are enhanced by placing them on an intranet. A connected system can not only facilitate individual learning but ensure that new knowledge is captured, recorded, and made available to others in the organization (Laffey, 1995; Raybould, 1995; Rosenberg, 1995).

The immediate implications of intranet connections are that all the components of a performance support system—training, information, tools, and other resources—can be consistent, up to date, and available from any individual's workstation. Performance support using Web technology offers the additional advantage of a consistent and familiar interface, reducing cognitive load.

At the same time that an intranet allows more access to existing resources, it usually leads to the creation of more resources. Web pages are not difficult to produce, and departments may choose electronic publishing for information once distributed in print: reports and updates, company handbooks and policies, organizational charts, and so forth. They may also create resources for their workers and internal clients and share them with others in the organization.

From this array, users acquire the resources they need, tailoring their collections in much the same way they customize their workspaces (Sherry and Wilson, 1996).

For the organization, the scope of electronic performance support systems can be enlarged to include entire work groups, sometimes in ways that transform their tasks (Laffey, 1995; Raybould, 1995; Rosenberg, 1995; Ryder and Wilson, 1996; Scales and Yang, 1993; Thomas, Baron, and Schmidt, 1994). Collaborative group work can be better supported, leading to increased sharing of information between users. For example, imagine a computer-repair company that has technical engineering support in different geographical regions. If the engineers can add new problems and solutions to a shared database, they can draw on the expertise of all their colleagues to solve problems instead of locally reinventing the solution everywhere the same problem appears. Thus, as members of an organization learn, their new knowledge can become part of the performance support system, disseminated to others who can use it. *Dynamic EPSS* is one name for a performance support system to which users contribute (Laffey, 1995). Instead of delivering a static performance support system, the intranet becomes an evolving performance support system composed of shared resources distributed throughout the organization.

Concerns and Issues

The explosion of new resources supported by an intranet can be a tremendous advantage to individuals and organizations. It can also be a tremendous disadvantage, contributing to information overload. Problems occur when the key characteristics that define a true performance support system—performance-centered design and integration with the working environment—are neglected during resource development and overall system design. Unbridled development and lack of organization can lead to fragmented and poorly utilized resources.

The value of an intranet depends on three factors: the individual quality of the resources; the degree to which they are maintained; and the ease with which the users can find, select, and use them. Resources are sometimes developed without adequate consideration of the users' needs and working environment. Once developed, they may not be adequately updated, so that they become unreliable. And even when adequately maintained, they may be fragmented and hard to find; separate resources need to be integrated into an overall system, particularly in larger intranets where locating information becomes a challenge.

Factors external to the system may affect its impact as well. Users may lack skills for choosing among the resources appropriately. More significantly, organizational policies, procedures, or culture can create unexpected barriers. Imbalances between individual and organizational needs—for example, systems that simplify processes to the point that they deskill workers—are also a major concern (Clark, 1992; Hudzina, Rowley, and Wager, 1996; Nickerson, 1993; Salomon, 1993; Scales and Yang, 1993).

Successful implementation of an intranet depends on thoughtful initial assessment, a wide array of development expertise, a commitment to maintenance, and iterative evaluation and redesign. In addition, it usually requires attention to the larger organizational context. It may include strategies such as training in its use, modification of policies and procedures, and alignment of individual and organizational incentives (Clark, 1992; Kling and Jewett, 1994; Nickerson, 1993; Sherry and Wilson, 1996). Processes that stress iterative design, incremental development, regular evaluation, and participation from the end users improve chances of success (Laffey, 1995; Raybould, 1995).

Implications for Adult Learning

On the surface, working with well-designed performance support systems satisfies many of the conditions conducive to adult learning. Characteristics of adult learners include an independent self-concept, a background of prior experience, a natural orientation toward learning, and strong internal motivation (Pratt, 1993). Recent theories involving the context of learning suggest that learning is to some extent situation-specific; thus, work provides a natural setting for adult learning (Brown, Collins, and Duguid, 1989; Dorsey, Goodrum, and Schwen, 1993; Goodrum, Dorsey, and Schwen, 1993; Lave and Wegner, 1991; Wilson, 1993). As users call on the resources of the system to achieve their goals, they have the opportunity to build their expertise.

However, such learning is not a given. It requires not only experience but reflection (Schön, 1983). Intranet users may not have the time, energy, or personal motivation to pursue learning; they may simply choose to get their work done as quickly as possible. In addition, novices are often unable to accurately assess their learning needs or the strategies to best fulfill them. Moreover, a system may be designed so that human skills are undeveloped (Salomon, 1993; Scales and Yang, 1993).

As technology increasingly supports knowledge work, one of the most critical decisions involves distinguishing situations in which learning is desirable from those in which it represents unnecessary effort (Brown, Collins, and Duguid, 1989; Clark, 1992, 1995; De Grave, Boshuizen, and Schmidt, 1996; Ference and Vockell, 1994; Scales and Yang, 1993; Wilson, 1993). Identifying what needs to be learned—or not learned—in a technical society is a question with enormous implications for educators.

Users will need help in learning how to best use the resources available to them. To maximize the use of these systems for performance and learning, individuals and work teams need to develop both technical skills and conceptual skills. Supporting performance support involves coaching people in how to use the system and tools effectively (Sherry and Wilson, 1996). At the same time, it involves encouraging reflective practices that allow people to learn from their work activities—and that maximize their ability to learn from performance support systems (Brown, Collins, and Duguid, 1989). As Martin Ryder and Brent Wilson said about the Internet, “Since we can no longer filter

and select proper materials for our students, our highest calling as educators will be to support students in developing such discipline for themselves" (Ryder and Wilson, 1996, p. 651). The same is true for intranets and performance support systems.

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