CHAPTER 18

DESIGN, DELIVERY, AND EVALUATION OF TRAINING SYSTEMS

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1 INTRODUCTION

Training has become a way of life in many organizations. Organizations depend on learning methodologies, training technology, and learning and development efforts to prepare its workforce. Without a knowledgeable and skillful workforce, organizations will be less likely to succeed, so training in organizations has become big business. The American Society for Training and Development's "State of the Industry Report" (ASTD, 2003) states that on average, organizations spend $826 per employee for training and employees spend an estimated 28 hours in training each year. These costs result in an estimated $54.2 to $200 billion being spent each year in training and developing employees (Salas and Cannon-Bowers, 2001; Galvin, 2002). With this in mind, designing and delivering effective training systems should be of utmost importance to any organization. Why? Because the benefits of properly designed training systems can be a competitive advantage. A skilled and prepared workforce can yield higher productivity and better service, improved quality, higher motivation and commitment, fewer errors, increased safety, and higher morale and teamwork. Furthermore, a poorly developed workforce can cost organizations billions of dollars in legal fees (e.g., Goldman, 2000). In addition, the National Safety Council (2001) reports that $131.7 billion is spent in private-sector firms as a result of worker-related injuries and deaths, costs that can be mitigated with training efforts.

Although the purpose of training in organizations varies (e.g., improve safety, increase competencies, better product quality, error reduction), the overarching theme is to create a high-quality workforce and better products for consumers. To accomplish

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this, organizations, we suggest, must rely on the science of training (Tannenbaum and Yukl, 1992; Salas and Cannon-Bowers, 2001), a science that now offers tools, techniques, strategies, and methodologies that if applied systematically can yield desired outcomes. This science has produced an enormous quantity of information, all of which must be applied during the design, delivery, and evaluation (as well as transfer) of training systems. Therefore, the purpose of this chapter is to highlight the scientifically derived information necessary for designing and delivering an effective training system. To do this, we reviewed the available training literature (e.g., Goldstein, 1980, 1993; Tannenbaum and Yukl, 1992; Ford et al., 1994; Swezey and Llaneras, 1997; Salas and Cannon-Bowers, 2001) and extracted from it principles, concepts, and suggestions that scientists and practitioners can use, apply, and explore.

1.1 Training Defined

Training can be defined as the systematic acquisition of knowledge (i.e., what we *need to know*), skills (i.e., what we *need to do*), and attitudes* (i.e., what we *need to feel*) (KSAs) that together lead to improved performance in a particular environment. Training is about cognitive and behavioral change. Training is about a permanent change in people's behaviors and actions. Training is about people getting the right competencies to do a job. This change occurs when training events are carefully crafted. We submit that the design and delivery of a training system should be done systematically (see Salas and Cannon-Bowers, 2000a). Effective training should create an environment where trainees can (1) learn the requisite KSAs, (2) practice applying the learned KSAs, and (3) receive constructive and timely feedback to improve performance in the future. This is accomplished by creating instructional strategies that are focused on the specific needs of the organization (Salas and Cannon-Bowers, 1997, 2001).

We note that training should not be equated by simulations or technology. Simulations and technology are just tools available to enhance the learning environment, but these are not training systems in and of themselves. These need to be augmented with instructional features (e.g., diagnosis, performance measurement) that facilitate the learning process.

Campbell (1971) reviewed the training and development literature and concluded that "by and large, the training and development literature is voluminous, nonempirical, nontheoretical, poorly written, and dull" (p. 565). This indictment of the training literature has led to an explosion of research—specifically, on theory development. Three decades later, the science of training brought a number of theoretical frameworks to guide the science of the design, delivery, and evaluation of training systems as well as what leads to the transfer of the newly acquired skills. This progress in training research can be attributed to more profound, more comprehensive, and more focused thought. Specifically, research has produced more and better theories, models, and frameworks (Salas and Cannon-Bowers, 2001). We illustrate some next.

*Although much of the literature refers to the "A" of KSAs as abilities (e.g., Goldstein, 1993), in this chapter we refer to the "A" as attitudes.

2 SCIENCE OF TRAINING: THEORETICAL DEVELOPMENTS

Transfer of training has become an increasingly important aspect of training research. Thayer and Teachout (1995) proposed a model outlining the proper climate necessary for transfer of training to the job (see Figure 1). This model outlines several variables that can influence learning, which, in turn, has a direct effect on transfer. Specifically, Thayer and Teachout (1995) describe seven pretraining variables, supported by the literature: (1) reactions to previous training (Baldwin and Ford, 1988; Mathieu et al., 1992), (2) previous education (Mathieu et al., 1992), (3) self-efficacy (pretraining) (Ford et al., 1992), (4) ability (Ghiselli, 1966), (5) locus of control (Williams et al., 1991), (6) job involvement (Noe and Schmitt, 1986), and (7) career/job attitudes (Williams et al., 1991). All of these create a pretraining environment that can promote or inhibit learning. In addition, learning can be affected by trainees' reactions to the training intervention (Kirkpatrick, 1976). As shown in the model, self-efficacy is also a posttraining factor. Research supports the role of self-efficacy as both an antecedent and outcome of training (Latham, 1989; Tannenbaum et al., 1991). The final set of variables and a major focus of this model are the transfer-enhancing training activities and climate for transfer. Transfer-enhancing strategies (e.g., goal setting, relapse prevention) have been identified as factors that can enhance transfer through such phenomena as overlearning (e.g., McGhee and Thayer, 1961). The climate for transfer (i.e., environmental favorability/unfavorability), both cues and consequences, can contribute significantly to transfer (e.g., Rouiller, 1989; Williams et al., 1991; Ford et al., 1992). These variables include positive transfer cues, as well as consequence variables, as listed in the model. The final factor in the model is the results. The relationship between transfer and results refers to the appearance of learned knowledge of skills and behaviors in the workplace (i.e., transfer) and the outputs of that transfer (i.e., results).

In addition to Thayer and Teachout's model, Kozlowski and Salas (1997) proposed an integrative multilevel framework for the implementation and transfer of training within an organization (see Figure 2). Based on organizational theory, this framework characterizes the factors and processes that comprise the training and transfer environment. First, this framework distinguishes between different levels within the organization (i.e., organization, team, and individual levels) and discusses the process linkages between these levels. Next, this framework identifies relevant features that comprise the contexts and distinguishes between technostructural and enabling process content. Finally, a critical mechanism of the framework

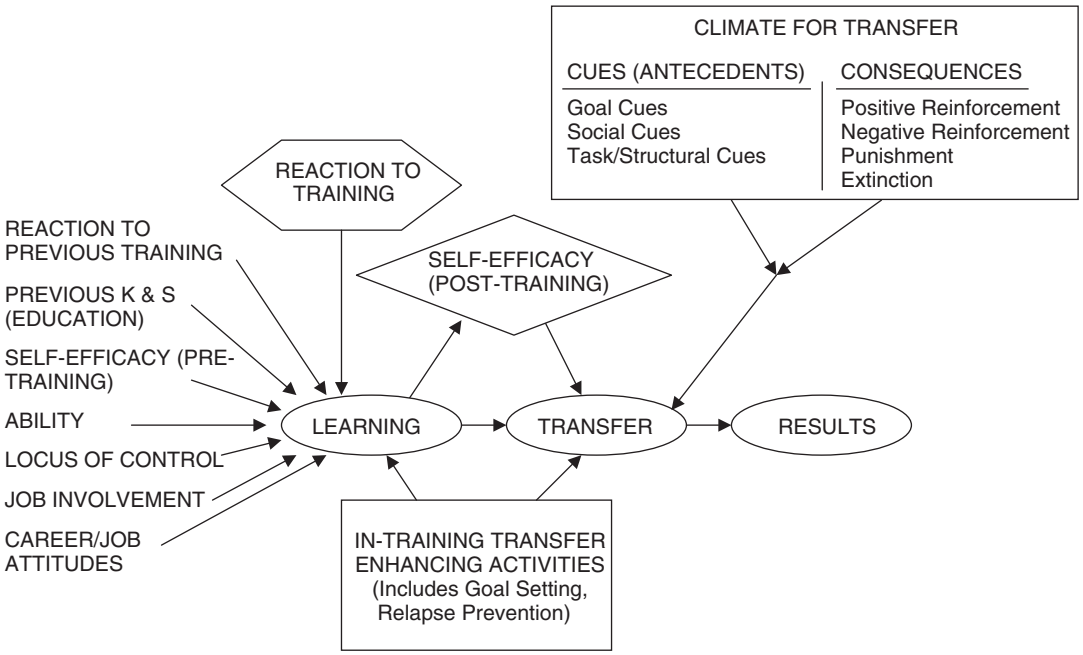

Figure 1 Model of training transfer. (From Thayer and Teachout, 1995.)

is the congruence that conceptualizes configurations among key variables comprising the organizational system. Taken together, this framework addresses how variables within and between content domains, and between levels, are connected.

More comprehensive frameworks of training effectiveness have also been proposed and investigated by Tannenbaum and colleagues (1993; Cannon-Bowers et al., 1995). The model presented in Figure 3 takes a longitudinal, process-oriented approach that integrates the variables affecting the acquisition of competencies and its transfer prior to, during, and after training. In addition, this model recognizes the influence of factors outside the training that affect its effectiveness (e.g., individual, organizational, and situational factors). Finally, this model specifies the critical steps that should be taken for training to be a success (e.g., training needs analysis, training evaluation).

Other researchers have examined specific issues within training, such as training motivation (Colquitt et al., 2000), individual characteristics and work environment (Tracey et al., 2001), training evaluation (Kraiger et al., 1993), and transfer of training (Quinones, 1997). The shift toward using teams in organizations has also resulted in a number of theoretical developments. Kozlowski and colleagues (2000) investigated the organizational factors and training issues that affect the vertical transfer from individual-level processes to organizational and team-level products. Tannenbaum and colleagues developed the team effectiveness model, which provides a framework for all the variables and factors that may inspire team performance. This framework helped organize the literature into input process/output factors that influence team functioning. More recently, Salas and colleagues (in press) have undertaken an effort to integrate the more than 50 models available in the team literature. They proposed a much more comprehensive model of the factors, variables, processes, and mediators that affect individual and team outcomes.

2.1 Summary

The steps that researchers have taken to overcome the criticism in Campbell's (1971) review have resulted in great progress toward creating a better science of training and at putting to rest the fact that the training field is atheoretical. Furthermore, the models and frameworks that have been advanced have provided a solid foundation on which empirical research can now be conducted. And much has.

3 INSTRUCTIONAL SYSTEMS DEVELOPMENT MODEL

For the purpose of this chapter, we take a macro-level, systems approach to discussing the design, delivery, and evaluation of training. We argue for the systems approach suggested by Goldstein (1993), which includes four components: (1) training program design is iterative and thus feedback is used to update and modify the program continuously; (2) complex interactions are formed between training components (e.g., trainees, tools, instructional strategies); (3) a framework for reference to planning is provided; and (4) recognition that training systems are just a

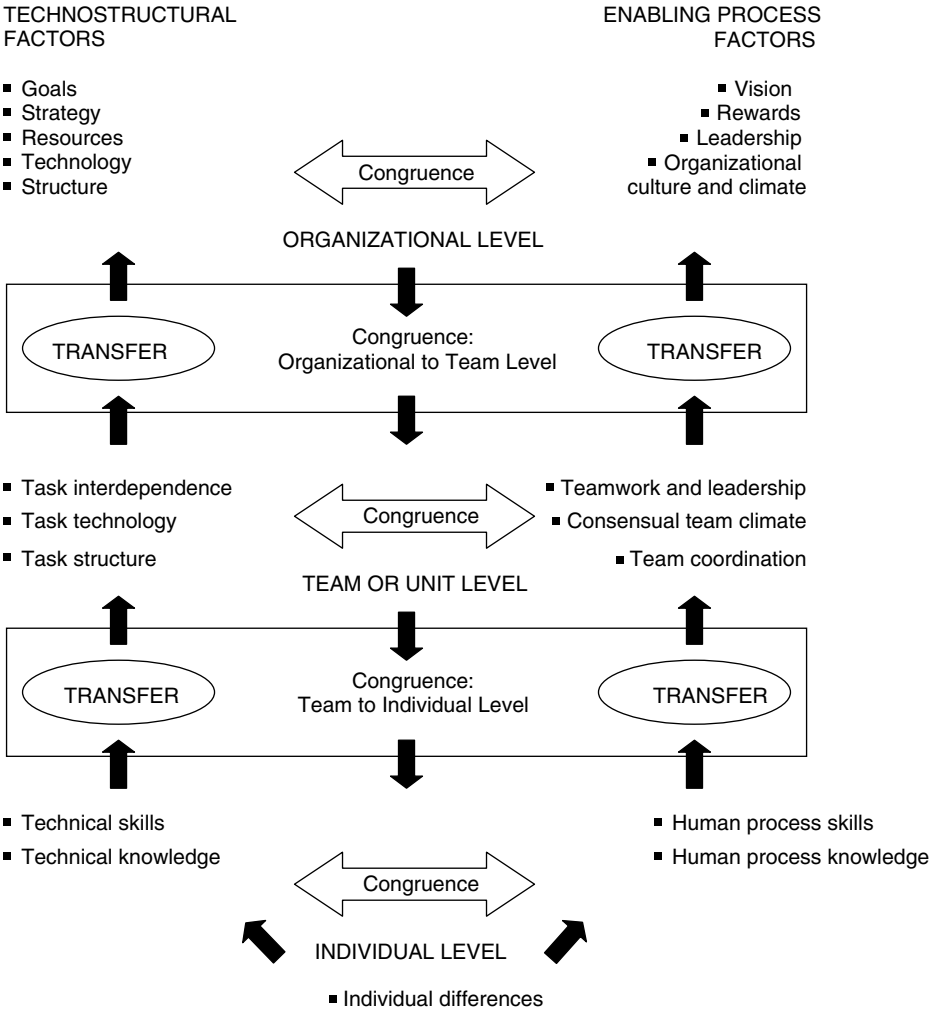

Figure 2 Training implementation and transfer model. (From Koslowski and Salas, 1997.)

small component of the overall organizational system, and as such, components of the organization, task, and person need to be considered in the design. We use the instructional systems development (ISD) model (Branson et al., 1975) to guide much of this chapter. The ISD model was developed over 30 years ago (commonly used in the development of U.S. military training programs) and continues to be widely used today, as some have argued that it is the most comprehensive training design and implementation model available in the literature (Swezey and Llaneras, 1997). Because this model has its critics as well, we use the model to organize the literature that we have reviewed rather than as an endorsement of its superiority over other models in the literature.

There are five basic steps to the ISD model: analysis, design, development, implementation, and evaluation. We added a sixth step to the process: transfer of training because we feel this, too, is an important aspect of any training system. We will also utilize what we know about the science of training to delineate each phase and provide a comprehensive discussion of how training should be designed, delivered, and evaluated (see Salas and Cannon-Bowers, 2000a, 2001). We discuss briefly the six phases before delving more deeply into each of them. The purpose of the first phase, *training analysis*, is to identify the needs of the organization, task, and person, develop training goals, and develop a plan for the design, implementation, and evaluation of training. Phase two, *training design*, encompasses the development of learning objectives and performance measures, and storyboarding the progression of training. It is in this phase when the principle of learning and training are used to guide the design of the learning events. *Training development*,

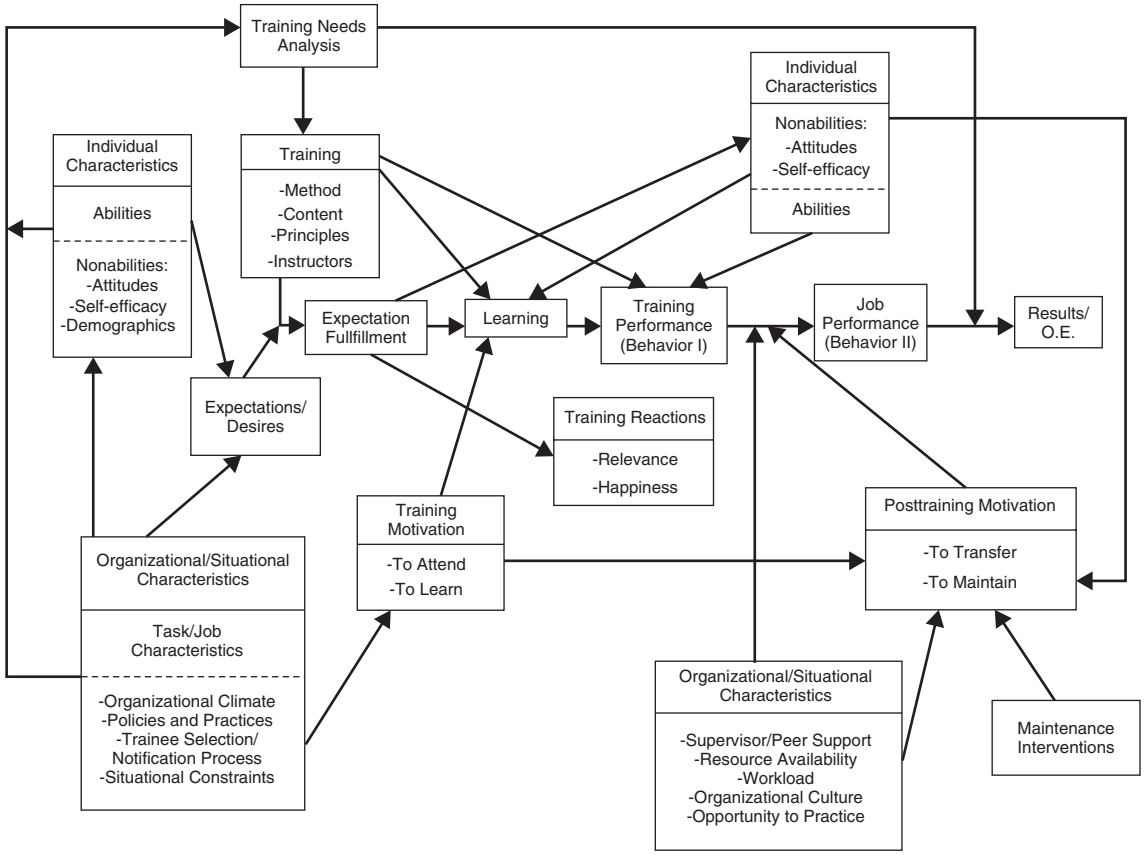

Figure 3 Training effectiveness model. (From Tannenbaum et al., 1993; Cannon-Bowers et al., 1995.)

phase three, is the actual development of the training program. This phase is important in the identification of any weaknesses in the training program to correct them before the training program is implemented. The next phase, *training implementation*, is the actual execution and delivery of the training. In this phase, the mechanics (e.g., location) of the delivery are prepared. Once this phase is completed, the training program should (must) be evaluated. We argue that the *training evaluation* phase must take a multilevel approach to determine training's effectiveness. Finally, once training has been evaluated, the *training transfer* phase ensures that the trained competencies are transferred (or applied) to the actual task environment. The reader will see as we progress through each of these phases that they are not mutually exclusive and thus there will be some overlap between them.

3.1 Summary

There are numerous models in the literature that can be used to guide the design, delivery, and evaluation of training. The reader must take these models at face value and recognize that no single model is perfect. Therefore, the effective design, delivery, and evaluation of training may require a combination of several models. We argue that a systems approach needs to be taken and use the instructional systems design model as a framework by which to organize this chapter.

4 TRAINING ANALYSIS

One of the most important and first steps when designing a training program is conducting a training needs analysis (Goldstein and Ford, 2002). A training needs analysis allows training designers to understand several critical aspects of the training program: (1) where training is needed, (2) what needs to be trained, and (3) who needs to be trained (Goldstein, 1993). There are several outcomes of a training needs analysis: (1) specification of learning objectives, (2) shaping of the design and delivery of training, and (3) criterion development. As noted by Tannenbaum and Yukl (1992), limited empirical evidence can be found on training needs analysis. Three types of analyses must be conducted: organizational, job/task, and person analyses. We discuss each of these next.

4.1 Organizational Analysis

The first step of a training needs analysis is to conduct an organizational analysis. The purpose of an organizational analysis is to ascertain the system-wide components (e.g., climate, norms, goals), available resources, constraints, and support for transfer of the organization that may affect how the training program is delivered (Goldstein, 1993). Furthermore, the organizational analysis focuses on determining how well the training objectives (see Section 5.1) fit with these organizational factors. In addition, an organization's environment must support the training program. For example, if the purpose of a training program is to improve safety on the job, the organizational environment must be designed such that it supports safe behaviors (e.g., error management). Later we discuss the need for a positive transfer climate to support the application of newly acquired skills on the job (Rouiller and Goldstein, 1993; Tracey et al., 1995). As the organizational factors, especially constraints and conflicts, may significantly affect the effectiveness of training, it is important that organizations pay close attention to them prior to implementing a training program.

It was not until the early 1990s that organizational analyses were recognized as important by researchers. Several studies have been well cited in the literature as demonstrating the importance of the organization. For example, research by Rouiller and Goldstein (1993) suggested that the climate of the organization (e.g., situational cues, consequences) was a powerful predictor of whether trainees at fast-food chain restaurants would transfer the learned skills. Similar findings were demonstrated by Tracey and colleagues (1995), whose research suggested that the culture and climate of the organization were directly related to behaviors following training (i.e., transfer of training). These studies, and others, provide a clearer picture of the influential effects of organizational factors on the transfer of trained competencies (i.e., knowledge, skills, and attitudes) to the job.

4.2 Job/Task Analysis

In addition to the organization analysis, the job/task analysis is another necessary component of the training needs analysis. The purpose of a job/task analysis is to uncover characteristics of the tasks being trained, which in turn create the learning objectives (Goldstein, 1993). First, the job/task description needs to be clarified. This description generally includes information pertaining to the essential work functions of the job and the resources needed to complete the job effectively (e.g., materials, equipment). Once the job description is complete, the next step of the job/task analysis is to determine the specifications of the task. Task specifications include the specific tasks to be performed by trainees and the conditions under which the tasks are completed. The final step of the job task analysis is the determination of the task requirements or competencies (i.e., knowledge, skills, and attitudes) needed by trainees to complete the job. This could be considered one of the more difficult of the steps to complete because knowledge and attitudes are more difficult than skills to observe and thus are more likely to be ignored by training designers.

Furthermore, as for more complex tasks that require high cognitive demands (e.g., decision making, problem solving), it is important that these less observable competencies be focused on. A cognitive task analysis has been developed to help uncover these competencies.

4.2.1 Cognitive Task Analysis

Recent research has been aimed at understanding how trainees acquire and develop knowledge and how they mentally organize rules, concepts, and associations (see Dubois et al., 1997–1998; Zsambok and Klein, 1997; Schraagen et al., 2000). Furthermore, research has examined the nature of expertise and how experts make decisions in natural, complex environments (Gordon and Gill, 1997). This research has led to the development of tools such as cognitive task analysis (CTA) (see Salas and Klein 2000; Schraagen et al., 2000). CTA allows training designers to gain insight into the cognitive processes and requirements for job performance of subject matter experts through the use of knowledge elicitation techniques (e.g., verbal protocols, observation, interviews, conceptual methods) (Cooke, 1999; Klein and Militello, 2001). The information generated from the CTA provides templates for expert mental model development, cues for promoting complex decision-making skills, cues for developing simulation- and scenario-based training, and information for the design of performance measurement and feedback protocols.

Some argue that three criteria need to be met if CTA is to be successful (Klein and Militello, 2001). First, the CTA needs to uncover new information relating to trainee judgments (e.g., patterns), decisions (e.g., strategies), and/or other cognitive demands (e.g., cue patterns). Next, there must be effective communication between the cognitive scientists conducting the CTA and training designers. In other words, the information obtained from the CTA must be translated and provided to training designers. Last, the findings from the CTA must be put into action successfully (i.e., it must have an impact). See Table 1 for steps to take to conduct a CTA.

4.3 Person Analysis

The third and final stage of a training needs analysis is the person analysis. The purpose of this analysis is to determine who needs to be trained and what training is needed by each person (Tannenbaum and Yukl, 1992; Goldstein, 1993). In other words, the person analysis makes certain that the right people get the right training. Not all people need the same training. Taking the aviation community as an example, flight crews need different training from that of cabin crews, who need different training from that of maintenance crews. Additionally, pilots new to an airline require different training from that experienced pilots receiving recurrent training (e.g., Feldman, 1988). Research examining the training of managers suggests that managers at

Table 1 Steps in Conducting Cognitive Task Analysis

Step	Guidelines
1. Select experts.	• Consider how many subject matter experts (SMEs) would be appropriate. • Select SMEs who have experience with domain. • Select SMEs who have experience with task.
2. Develop scenarios based on task analysis.	• Develop scenarios that are task relevant with problem statements. • Pretest scenarios to determine if they are complete.
3. Choose a knowledge elicitation method.	• Determine the information you are trying to get at.
• Interviews	• Ask SMEs about cognitive processes needed to complete task scenarios.
• Verbal protocols	• Require SMEs to think out loud as they complete task scenarios.
• Observations	• Observe SMEs performing tasks.
• Conceptual methods	• Develop inferences based on SME input and relatedness judgments.
4. Implement chosen knowledge elicitation method.	• Decide how many sessions to be recorded. • Obtain consent and provide task scenario to SMEs.

• Interviews	• Provide each scenario to each SME.
	• Ask SMEs relevant questions:
	  • What rules/strategies would they use to complete scenarios?
	  • What knowledge and cognitive skills would they use to complete scenarios?
	  • If A or B happens, what would you do?
	• Keep a record of SME responses: use video, audio, pen and paper, etc.

• Verbal protocols	• Provide each scenario to each SME. • Require SMEs to think out loud as they complete task scenarios. • Keep a record of SME responses: use video, audio, pen and paper, etc.
• Observations	• Provide each scenario to each SME. • Be as unobtrusive as possible, but don't be afraid to ask for clarification when necessary. • Keep a record of SME responses: use video, audio, pen and paper, etc.
• Conceptual methods	• Provide each scenario to each SME. • Present pairs of tasks to experts. • Ask SMEs for relatedness judgments regarding task pairs.
5. Organize and analyze data.	• Keep a record of similarities between SMEs. • Interview additional experts if questions arise from data. • Identify the rules and strategies applied to the scenario. • Identify knowledge and cognitive skills required. • Generate a list of task requirements. • Verify list with additional SMEs.

different levels within an organization require different skills and thus require different training. Specifically, it was suggested that lower-level managers require more administrative skills than do high-level managers (Ford and Noe, 1987). Whereas the job/task analysis identified the competencies required to complete the tasks effectively, the person analysis identifies whether or not trainees have the requisite competencies. In addition, trainees' motivation to learn and participate in training is determined from this analysis.

4.4 Summary

The training needs analysis is especially critical if training is to be effective: that is, if trainees do not meet the requirements for training (e.g., have the right competencies), if training is not specific to the job, or if the organization is not prepared for training, training will fail to be a success. Our advice: Conduct a thorough training needs analysis in the design of any training system.

5 TRAINING DESIGN

The next step in the ISD framework is training design. Driven by the outcomes of the training analysis phase, training design ensures that training is developed systematically and produces a blueprint or model of what the training program will look like. During training design, training developers need to focus on several things: development of training objectives, factors external to the training program (i.e., individual and organizational characteristics and resources), selection of instructional strategies and methods, and specification of program content.

5.1 Training Objectives

Information obtained from the training needs analysis drives the development of the training or learning objectives. It is important when developing these objectives that they are specific, measurable, and task relevant. This will ensure that they can be evaluated when training is completed. The training objectives have three general characteristics that help guide

training (Goldstein, 1993). First, training objectives provide both trainers and trainees with expectations as to what trainees should be able to do as a result of the training (i.e., performance). Specifically, training objectives should state the competencies that trainees are expected to acquire and demonstrate once the training is complete. Second, objectives describe the conditions under which the performance, stated by the first guideline, should occur. Finally, objectives provide a description of acceptable performance criteria. In short, training objectives describe at what level the trainee should perform and when to be judged acceptable. Once clearly defined, training objectives are used to guide what instructional strategies should be implemented. These strategies, discussed later, should be selected based on their capability to promote the task-relevant behaviors and competencies determined in the objectives. See Table 2 for guidance on developing training objectives.

Table 2 Steps in Developing Training Objectives

Step	Guidelines
1. Review existing documents to determine job tasks and competencies required.	Examine your sources: • Performance standards for the organization • Essential task lists • Past training objectives • SMEs and instructors to mine their previous experiences

2. Translate identified competencies into training objectives.	Include objectives that:
	• Specify targeted behaviors.
	  • Use ''action'' verbs (e.g., ''provide,'' ''prepare,'' ''locate,'' and ''decide'').
	  • Outline specific behavior(s) that demonstrate the appropriate skill or knowledge.
	  • Say it in a way that can be easily understood.
	• Clearly outline the conditions under which skills and behaviors should be seen.
	• Standards to which they will be held when behaviors or skills are performed or demonstrated.
	  • Make sure that standards are realistic.
	  • Make sure that standards are clear.
	  • Make sure that standards are complete, accurate, timely, and performance-rated.

3. Organize training objectives.	Make sure to categorize: • General objectives that specify the end state that trainees should attain/strive for. • Specific objectives that identify the tasks that trainees must perform to meet the general objectives.
4. Implement training objectives.	Use training objectives to: • Design exercise training events (e.g., scenarios). • Use events as opportunities to evaluate how well trainees exhibit training objectives. • Develop performance measurement tools (e.g., checklists). • Brief trainees on training event.

5.2 Individual Characteristics

When designing any training program, training designers must focus on characteristics that each trainee brings to the training program; these have been shown recently to influence learning outcomes. Individual characteristics suggested to influence training's outcomes are cognitive abilities, self-efficacy, goal orientation, and motivation. We discuss each of these next.

5.2.1 Cognitive Ability

Cognitive ability (i.e., *g* or general ability) is one trainee characteristic that has been shown to influence the outcomes of training. Research investigating how cognitive ability influences training outcomes indicates that it influences the attainment of knowledge about the job (see Ree et al., 1995; Colquitt et al., 2000), is a strong determinant of training success (e.g., Ree and Earles, 1991; Randel et al., 1992; Colquitt et al., 2000), and promotes self-efficacy and skill acquisition (e.g., Hunter, 1986). Taken together, these findings suggest that trainees high in cognitive ability are likely to learn more and be more successful in training when all other things are equal.

5.2.2 Self-Efficacy

Another individual characteristic influencing the outcomes of training is self-efficacy or one's belief in his or her own ability. Research examining self-efficacy and learning has been extensive throughout the past decade. These studies indicate that self-efficacy, whether acquired during training or held prior to it, is influenced by cognitive ability (see Hunter, 1986), influences reactions to training (Mathieu et al., 1992), has motivational effects (Quinones, 1995), leads to better performance (e.g., Martocchio and Webster, 1992; Ford et al., 1997; Stevens and Gist, 1997), and dictates whether trainees will or will not use training technology (Christoph et al., 1998). Furthermore, self-efficacy has been shown to mediate numerous individual variables, including the relationship between conscientiousness and learning (Martocchio and Judge, 1997), job satisfaction, intention to quit a job, commitment to the organization, and the relationship between training and the adjustment in newcomers (Saks, 1995).

5.2.3 Goal Orientation

In recent years, goal orientation has received considerable attention regarding its ability to influence trainees' learning (e.g., Phillips and Gully, 1997; Ford et al., 1998; Brett and Vande Valle, 1999). Defined as the mental framework used to interpret and shape how to behave in achievement- or learning-oriented environments, goal orientation takes two forms: mastery or performance (Dweck, 1986; Dweck and Leggett, 1988). Mastery-oriented (or learning-oriented) persons seek to acquire new skills and master novel situations. Research examining mastery-level goal orientation suggests that it is a strong predictor of knowledge-based learning outcomes (Fisher and Ford, 1998) and is related positively to a person's metacognition (Ford et al., 1997) and self-efficacy (Phillips and Gully, 1997). Performance-oriented persons seek to achieve high performance ratings, as this assures them of their own competence, and to circumvent low ones. Despite what we know about goal orientation, the debate continues as to whether goal orientation is a disposition and/or a state (e.g., Stevens and Gist, 1997), whether the construct is multidimensional (e.g., Elliot and Church, 1997; VandeValle, 1997) or whether mastery and performance goal orientations are mutually exclusive (Buttom et al., 1996). Continued research in this area will provide the necessary clarity.

5.2.4 Motivation

Trainee motivation can be conceptualized as the direction, effort, intensity, and persistence that people put forth toward learning-oriented activities pre-, during, and posttraining (Naylor et al., 1980, as cited in Goldstein, 1993; Kanfer 1991; Tannenbaum and Yukl 1992). Trainee motivation is affected by characteristics of the person (e.g., self-efficacy) and the organization (e.g., notification of participation). Research suggests that trainees' motivation to learn and participate in training has an effect on their acquisition, retention, and willingness to apply trained competencies (i.e., KSAs) on the job (e.g., Martocchio and Webster, 1992; Mathieu et al., 1992; Tannenbaum and Yukl, 1992; Quinones 1995). Furthermore, the greater the motivation of trainees before training, the greater the learning and positive reactions to training that will result (see Baldwin et al., 1991; Tannenbaum et al., 1991; Williams et al., 1991; Mathieu et al., 1992). Finally, research examining trainee motivation suggests that trainees who believe that training outcomes are relevant to their job performance will be more likely to apply trained KSAs on the job (Noe, 1986).

The literature looking at trainee motivation is fairly clear, however, lacking is conceptual precision and specificity—the literature is somewhat piecemeal (Salas and Cannon-Bowers, 2001). Recently, however, Colquitt and colleagues (2000) conducted a meta-analysis to understand the underlying processes and variables influencing trainee motivation throughout the training process. This effort indicated that trainees' motivation to learn is influenced by individual (e.g., self-efficacy, valence, anxiety, cognitive ability, and age) and situational (e.g., positive climate, supervisor and peer support, and organizational support) characteristics. One of the most important findings from this research was that trainee motivation is multifaceted, suggesting the need to expand the training needs analysis phase of training design to consider a wider array of individual characteristics and how they might affect learning outcomes.

5.3 Organizational Characteristics

In addition to individual characteristics of trainees, organizational characteristics (i.e., those present within the organization to which the newly acquired KSAs are to be applied) may also influence the outcomes of training and need to be considered during its development. Examples of these characteristics are organizational culture, policies and procedures, situational influences (e.g., improper equipment), and prepractice conditions (see Salas et al., 1995, for more detail).

5.3.1 Organizational Culture

The term *organizational culture* was not discussed in the literature until the 1980s (Guldenmund, 2000). Since then, research examining this concept has suggested that organizational culture is critical to an organization's success (Glendon and Stanton, 2000). Organizational culture can be defined as "a pattern of shared basic assumptions that the group learned as it solved its problems of external adaptation and internal integration . . ." (Schein, 1992, p. 12). Furthermore, culture has been argued to consist of norms, values, behavior patterns, rituals, and traditions that influence all aspects of the organization, including training outcomes. These assumptions must "therefore, be taught to new members as the correct way" to perceive, think, and feel about a number of issues, problems, and so on, in the organization (Schein, 1992, p. 12). Similarly, Burke (1997) asserts that once developed, organizational culture is transmitted by organizational leaders to others through the socialization process. Part of the socialization process is training. In addition to leadership and management support of training, policies and procedures of the organization will influence the outcomes of training. We discuss these next.

5.3.2 Policies and Procedures

Underlying an organizational culture are the organization's policies and procedures. Policies can be described as broad requirements that management have established to provide employees with a set of expectations regarding various things (e.g., performance on the job) (Degani and Wiener, 1997). Related to set policies are procedures that provide employees with guidance on how to meet these expectations. For example, if management has an established policy that all employees perform a series of quality control checks, they may provide employees with a checklist to follow to make sure that all quality control checks are completed correctly. A well-designed training program can be used to make trainees aware of these policies and

procedures and allow them to practice applying them so that they will adhere to them on the job. Concerns arise, however, when there are social pressures within the organization that are more influential on employees than the formalized policies and procedures (e.g., Hofmann and Stetzer, 1996). Continuing the quality control example discussed previously, if there are unwritten policies that encourage (or rather, don't discourage) employees to make shortcuts and deviate from established checklists, the written policies and procedures will be less effective. This phenomenon has been observed in the oil production industry, for example, which led to a significant number of accidents and incidents (Wright, as cited in Hofmann et al., 1995). As such, if an organization wants to ensure that policies and procedures are followed, it is important that the desired attitudes and behaviors be developed during training and promoted on the job.

5.3.3 Situational Influences

There are two situational influences that have been argued to influence trainees' motivation to learn during training and transfer of training to the job: framing of training participation (i.e., voluntary vs. mandatory), the work environment (e.g., improper equipment), and previous training experience. First, the framing of training has been shown to influence the outcomes of training. For example, attendance policies have been shown to affect trainees' motivation to attend training. Specifically, research suggests that when training attendance is voluntary, trainees are more willing to attend training than when training is mandatory (Baldwin and Magjuka, 1997). In addition to attendance policies, training can be framed such that it is remedial or advanced. Research by Quinones (1995, 1997) indicates that this type of framing can influence the motivation and learning of trainees. Similar findings were found by Martocchio (1992) when training assignment was labeled as an "opportunity" for trainees. Second, perceptions of the work environment can also influence trainees' motivation to learn and whether or not trainees will transfer the learned competencies to the job (e.g., Goldstein, 1993). Also within the work environment, situational constraints such as lack of proper materials and information can lead to employee frustration and poor performance on the job (e.g., Peters et al., 1985). Finally, trainees' previous training experiences have been shown to influence their learning and retention. Previous training that is viewed by trainees as a negative experience will hinder their ability to learn and retain information in future training programs (Smith-Jentsch et al., 1996a).

5.3.4 Prepractice Conditions

Prepractice conditions can be described as elements in the pretraining environment that serve to prepare trainees for practice during training. The research suggesting the benefits of practice for skill acquisition is well documented. However, not all practice is the same. For example, task exposure or repetition alone is not enough, as practice for skill acquisition is a complex process (Schmidt and Bjork 1992; Shute and Gawlick, 1995; Ehrenstein et al., 1997). Cannon-Bowers and colleagues (1998) delineate which conditions might lead to enhanced utility and efficacy of practice. Their review of the literature suggests that interventions applied prior to practice, such as preparatory information, advanced organizers, or metacognitive strategies, can help prepare trainees for training, thus leading to more learning. Although these interventions are just beginning to be investigated empirically, their benefits appear promising.

5.4 Practice Opportunities

Important to any successful training program are the practice opportunities provided to trainees during training. It has been suggested in the literature that experience with different situations (either simulated or real) will improve performance on the job by generating knowledge structures within a meaningful context (i.e., mental models) (Satish and Streufert, 2002). The use of practice scenarios that are scripted a priori will ensure that trainees are practicing the correct competencies and will allow for better performance assessment as well. Although it is widely accepted among laypersons that practice contributes to better performance, training studies have also focused on how practice relates to learning. For example, Goettl et al. (1996) found support for and advantage in learning when alternating task modules (i.e., video game practice and algebra word problems) with a massed protocol, which blocked sessions on the tasks. The findings showed improvement in learning and retention when practice was provided. Further evidence is provided by Bjork and colleagues (Schmidt and Bjork, 1992; Ghodsian et al., 1997). These researchers looked at practice schedules and argued that introducing difficulties during practice will enhance transfer of training for the trainee, although there may not be an improvement in performance immediately following training. These studies reconceptualized interpretation of data from several studies and proposed a new protocol for practice scheduling. Specifically, Schmidt and Bjork (1992) recommended introducing variations in the ordering of tasks during practice, in the nature and scheduling of feedback, and in the versions of the task to be practiced, providing less frequent feedback. In all the versions above, researchers found that this method enhances retention and generalization, even though an initial decrease in acquisition (i.e., immediate) performance was observed, suggesting deeper, more meaningful information processing. These findings were supported by Shute and Gawlick (1995) in an investigation of computer-based training for flight engineering knowledge and skill.

5.5 Feedback

Providing feedback to trainees in a constructive and timely manner is important to the success of any training program because it allows trainees to know how they did during training and where improvements are needed (Cannon-Bowers and Salas, 1997). This requires that several criteria be met. First, feedback should be based on the person's or

team's performance during practice and on the training outcomes. Next, feedback provided to trainees should be specific to the skill performance of trainees but not critical of the person. Third, feedback should provide trainees with the necessary knowledge that allows them to adjust their learning strategies to meet the expected performance levels. Finally, feedback must be meaningful to trainees and focus on both individual and team performance (if applicable). Without feedback, breakdowns in performance may go unnoticed by trainees, corrective strategies will not be developed, and errors will probably occur on the job.

5.6 Instructional Strategies

The design of training includes the selection of instructional strategies that are appropriate for the trainees and the organization. A number of instructional strategies are discussed in the literature that can be used to train both individuals and teams (see Table 3). Depending on the needs and resources of the organization, the desired outcomes of training can range from classroom based to simulation driven.

To ensure effective training, strategies should be follow four basic guidelines: (1) Strategies should present information or concepts to be learned, (2) strategies should demonstrate the KSAs to be learned/targeted, (3) strategies should create opportunities for practice, and (4) strategies should provide opportunities for feedback to trainees during and postpractice. Although much progress has been made in the investigation of effective training strategies, it is also true that there is no single method to deliver all training. Therefore, researchers continue to address how best to present targeted information to trainees, based on a number of factors (e.g., organizational resources, who is being trained, what needs to be trained). The goal of current research is to develop and test cost-effective, content-valid, easy-to-use, engaging, and technology-based methods of training (e.g., Bretz and Thompsett 1992; Baker et al. 1993; Steele-Johnson and Hyde, 1997).

As organizations progress into the twenty-first century, they will be faced with several issues influencing the training strategies that will be chosen: increasing use of teams, improvements in technology, and internationalization. As such, we organize the instructional strategies that we discuss here around those three issues. Taking these issues into consideration but regardless of the instructional strategy chosen by the organization, for training to be a success we argue that the strategy must address three main issues. First, the instructional strategy should encourage trainees to be adaptable to changing situations and to recognize when things go wrong. For example, as technology is introduced into the workplace, employees will need to maintain vigilance and be able to adapt quickly if the technology system is to fail. The training of flexible knowledge structures (i.e., mental models) will allow employees to adjust their behavior to compensate for any changes in their environment. Second, all training strategies must include constructive feedback for trainees. When trainees are provided feedback, they can readjust or correct their strategies and compensate for incorrect behaviors, which will result in better performance. The third and final issue is that training must be dynamic or interactive. Unfortunately, recent reports have suggested that only 10% of delivery methods are interactive, digital technologies (Bassi and Van Buren, 1998). In contrast, the most commonly used delivery methods (approximately 90% of the time) were videotapes and workbooks, and 84% of all companies surveyed used classroom-based and instructor-led training. Computer-based or other technology-based training was used only about 35% of the time.

5.6.1 Teams

The past 40 years has witnessed much change in the areas of organizational theory, structure, and business practice. As noted in the literature, teams are used heavily in industry, government, and the military (e.g., Tannenbaum and Yukl, 1992; Guzzo and Dickson, 1996). Leading up to this are technological advances, geopolitical stability, and free-trade agreements that have increased organizational competition within a global economy. To remain adaptive and to prosper under these circumstances, many organizations are witnessing a flattening of traditional hierarchical structures in favor of teams (Kozlowski and Bell, 2002; Zaccaro et al., 2002). It is estimated that at least 50% of all organizations and 80% of organizations with 100 or more employees use teams in some form (Banker et al., 1996). Similarly, 80% of surveyed workers report that they are currently members of at least one team, and this estimate will continue to increase in step with evolving environmental complexities (Fiore et al., 2001). Ultimately, organizations believe that teams are the answer to many of their problems and are implementing them more readily into their daily business practices.

As a result, researchers have invested a large amount of resources in the study of teams and team training (Salas and Cannon-Bowers, 2001). The focus on team training evolved from problems in the real world, especially in aviation. For example, during the 1970s there were an increasing number of accidents that could be attributed to failures of teamwork in flight crews. To address this, a form of team coordination training known as *cockpit* (and now *crew*) *resource management* (CRM) was introduced as a way to mitigate these failures (Weiner et al., 1993). Since its inception in the early 1980s, CRM training has evolved and spread to the military and a host of other organizations (e.g., health care, nuclear power, offshore oil production), making it one of the most successful team training strategies in use today.

The commercial and military aviation communities have been a driving force in team and team training research (e.g., Salas et al., 1995), investing significant resources to explore these areas further (Tannenbaum, 1997). As a result, a number of theoretically driven team training strategies beyond that of

team coordination training (e.g., CRM) have emerged and been validated that are useful for all organizations (e.g., cross-training and team self-correction training). These team training strategies are nothing new and have been discussed widely in the literature. We feel that a lengthy discussion of these strategies here would be redundant, and we encourage the reader to look to others for this review (see Salas and Cannon-Bowers, 2001; Wilson et al., 2005). We do, however, provide a brief description of these team training strategies and additional resources in Table 3. In addition, throughout the next two sections we refer at times to team training strategies that are less common in the literature but are still important to the future success of organizations.

5.6.2 Technology

Not surprisingly, training is slowly turning toward the use of learning technologies as a delivery method vs. traditional classroom training; however, the percentage of training using the classroom method still exceeds that of learning technologies (72% and 15.4%, respectively). There has been an explosion of technological advancements in recent decades. As such, organizations will face two challenges: training employees to interact with technology or utilizing technology to train employees. In today's technology-driven environment, it is difficult to remember a time when certain key tools were not the norms. E-mail, tele- and videoconferencing, text messages, and chat rooms are now the norm. Everyone has become accustomed to the countless "help" icons in various software programs. We not only accept them, we expect them. Thus, training has readily accepted both the benefits and challenges inherent to the utilization of technology.

Advances in technology have enabled training to incorporate technological tools into interventions, and in recent years we have experienced an upsurge in the use of technology (e.g., computer- and Web-based) to train employees (Goldstein and Ford, 2002; ASTD, 2003). The development of intelligent tutoring systems has the potential to reduce or eliminate the need for human instructors for certain types of learning tasks. For example, Anderson and colleagues (Anderson et al., 1995) has proposed that intelligent software can be programmed to monitor, assess, diagnose, and remediate performance successfully in computer programming and to solve algebra problems, and may be extended to other tasks. Additionally, technology-based training offers trainees added control over their learning by allowing them to choose what method to use, the amount of time taken to learn, how to practice, and/or when to receive feedback during training (e.g., Milheim and Martin, 1991). Thus, learner control has been shown to improve trainees' attitudes and motivation toward learning (e.g., Morrison et al., 1992), leading to better learning and performance (Schmidt and Ford, 2003). In this section we discuss some of the technology-based instructional strategies as well as some strategies that organizations can use to help employees better adapt to the use of technology in the workplace. Although some of these strategies still require significant investigation, they have begun to change the face of training. Most important, as this technology becomes more widely available and less costly to develop, it may provide organizations with better alternatives to the traditional classroom training that we may be used to.

Simulation-Based Training and Games One technological advance that has revolutionized aviation and military training for decades is simulation and game-based training. When manuscripts and theories were first being developed in the late 1960s for publications on simulations and learning, the idea was novel (Ruben, 1999). Up until then, a majority of training theory assumed that the learning process consisted of articles, lectures, and books being related to trainees by an instructor. But times have changed. Technology-assisted learning is now emerging as the leader in training innovations. Computer-based instruction and simulations are now readily accepted (and even preferred by younger, tech-savvy participants). Practice and application of KSAs, often difficult in classrooms settings, are now enabled by technology. Computer simulations and games are now being used for instruction, practice, and feedback in training at a rapidly expanding pace.

Simulators continue to be a popular training method in business, education, and the military (Jacobs and Dempsey, 1993), especially within the military and in commercial aviation, which are probably the biggest investors in simulation-based training. Although evidence supports the position that simulation is an effective training tool, the reasons why simulators are so effective remain vague. A few studies have provided preliminary data (e.g., Ortiz 1994; Bell and Waag 1998; Jentsch and Bowers 1998). However, it may be a misnomer to say confidently that simulation (in and of itself) leads to learning. One reason for this is that a majority of the studies addressing these issues rely on trainee reactions and not on actual performance data (see Salas et al., 1998). Although more rigorous and systematic evaluation of simulators is needed to make definitive connections between technology and performance, the use of simulation continues unchecked at a rapid pace in medicine, maintenance, law enforcement, and emergency management settings.

The most popular application of simulators is flight simulation in commercial and military aviation. Flight simulation has been a front-runner in training and evaluation technology, covering such topics as adaptive decision making (e.g., Gillan, 2003), discrimination, performance (Aiba et al., 2002), response time (Harris and Khan, 2003), performance under workload (Wickens et al., 2002), and team issues (Prince and Jentsch, 2001). Driving simulators, originally used primarily for evaluation and assessment for factors such as fatigue and age effects, have begun to explore driving training. Driving simulators have now become popular methods of driver training, safety training, and driver assessment (e.g., Fisher et al., 2002; Roenker et al., 2003). In addition, the medical community has recently begun to utilize simulations for training skills (e.g., the METI doll) as well as team training.

Table 3 Instructional Strategies

Strategy	Definition	References
Technology-based strategies		
Simulation-based training and games	Uses technology to provide opportunities for practice and instruction in realistic settings: lifelike terrain, interaction, and dynamic situations. Used in business, the military, and research. Simulation and games vary according to their fidelity, immersion, and cost.	Tannenbaum and Yukl, (1992),Marks (2000)
Distance learning	Uses technology to facilitate training between instructors and students separated by time and/or space. Uses synchronous or asynchronous and technology, including the World Wide Web, CD-ROM, e- or online learning, videoconferencing, and interactive TV. Broader than e-learning and encompasses nonelectronic learning.	Moe and Blodget (2000)
E-learning	Uses similar methodology to distance learning but is more specific and uses electronic and mostly computer-based methods. Uses Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. Ideal for employees who lack the time for formal training.	Kaplan-Leiserson (2002)
Learner control	Provides learners with the opportunity to make one or more key instructional decisions in the learning process. The structure is ideal for e-learning and other distance learning strategies.	Wydra (1980),Brown and Ford (2002)
Scenario-based training	Provides embedded scenarios with dynamic, complex, and realistic environments. These scenarios trigger targeted behaviors in complex environments. Provides guidelines and steps for training objectives, trigger events, measures of performance, scenario generation, exercise conduct and control, data collection, and feedback. Incorporates technology and uses a meaningful framework to embed opportunities for practice and feedback within meaningful learning events.	Fowlkes et al. (1998),Oser et al. (1999a, b)
Collaborative learning	Incorporates technology tools to facilitate training in groups. Utilizes group interaction to facilitate training, while not necessarily focusing on training for tasks. Focus is on group interaction.	Arthur et al. (1996, 1997)
Error training	Promotes learning through trainees experiencing errors, seeing the consequences of such actions, and receiving feedback. May be especially useful with new technology, where errors may be more prevalent.	Dormann and Frese (1994),Ivancic and Hesketh (1995)
Stress exposure training	Provides information-based instruction that links stressors, trainee affect, and performance. Can be useful in overcoming stress caused by technology or promote the use of technology to mediate stressor effects. Provides coping strategies for trainees in dealing with stressors.	Johnston and Cannon-Bowers (1996),Driskell and Johnston, (1998)
On-the-job training	Provides an opportunity to practice actual required behaviors needed to do a task, including interacting with new technology performing actual tasks. Targets team members procedurally based cognitive skills and psychomotor development. Training is provided in the same environment in which they will be working.	Goldstein (1993),Ford et al. (1997)
Team-based strategies		
Team coordination training	Provides training and practice opportunities for team coordination, communication (both explicit and implicit), backup behavior, and other KSAs that lead to effective coordination. This may be especially important with the introduction of new technology lessening traditional team, face-to-face (FTF) interaction.	Bowers et al. (1998),Entin and Serfaty (1999),Serfaty et al. (1998)
Cross-training	Provides team members with training and practice for performing other team members' roles and tasks. Leads to a better understanding of other team members' responsibilities and task work. Leads to enhanced shared mental models and interpositional knowledge. Also helps understanding the technology used by team members and how it may relate to their own roles and tasks.	Volpe et al. (1996),Salas et al. (1997)

Table 3 (*continued*)

Strategy	Definition	References
Team self-correction training	Helps team members assess themselves by training team members to correct and evaluate their own behavior to assess the effectiveness of the behavior. Team members also learn to assess the other team members. Encourages constructive feedback and correction of discrepancies. Can help compensate for miscommunications and errors due to new technology.	Blickensderfer et al. (1997),Smith-Jentsch et al. (1998)
Distributed team training	Provides team training to teams distributed by time and/or space that must rely on some type of technology to communicate and coordinate. Uses strategies to promote team competencies and performance by utilizing technology when teams are not colocated, but can encounter problems.	Townsend et al. (1996),Carroll (1999)
Internationalization-based strategies		
Individual-level strategies	Traditionally, multicultural training was focused on two broad categories of learning focused on the individual: didactic or information-giving and experiential learning activities.	Deshpande and Viswesvaran (1992),Kealey and Protheroe (1996)
Attribution training	Provides training for expatriates and others that allows them to make attributions for behaviors more similar to the point of view of members from other cultures. Provides understanding and knowledge of other cultures.	Befus (1988),Bhawuk (2001)
Cultural awareness training	Employs many strategies to teach trainees about their own feelings, concerns, emotions, and unconscious responses. Also, gives information about these areas in other cultures. Goes on the assumption that by knowing their own cultures, people can better understand other cultures.	Bennett (1986),Befus (1988)
Didactic training	Involves information-giving activities, including factual information regarding working conditions, living conditions of the other cultures, and cultural differences, travel, shopping, and appropriate attire. Also includes information about the political and economic structure of other countries.	Kealey and Protheroe (1996),Morris and Robie (2001)
Experiential training	Involves learning by doing where trainees are put through scenarios, often in the form of simulations, so that they can practice their responses to realistic situations. Provides trainees with knowledge (i.e., cognitive tools) and attribution skills for working and interacting with people from different cultures.	Kealey and Protheroe (1996),Morris and Robie (2001)
Team-level strategies	Multicultural team strategies have been developed or adapted to target the complexity of team interactions. Promotes effective performance in multicultural teams involving both team leaders and members. Five common components: (1) a goal to enhance teamwork, (2) reliance on a traditional team performance framework, (3) application of appropriate tools and feedback, (4) the combination of more than one delivery methods, and (5) a short duration to deliver.	Salas and Cannon-Bowers (2001)
Team leader training	Provides leaders with strategies (e.g., coaching) that help promote effective team performance in heterogeneous teams. Organizations can apply a number of guidelines to identify what role team leaders should play within multicultural teams.	Kozlowski et al. (1996),Thomas (1999)
Team building	Allows team members to be a part of the planning and implementation of change rather than having it forced upon them. Relies on one of four team building models: goal setting, interpersonal relations, problem solving, and role clarification.	Dyer (1977),Beer (1980),Buller (1986),Salas et al. (1999)
Role-playing	Provides team members with scripted scenarios that they must act out together. Creates awareness and can be adapted to fit any cultural interactions. Two types of exercises: (1) learning about one's own culture and biases (i.e., enculturation), and (2) learning about other cultures (i.e., acculturation).	Bennett (1986),Roosa et al. (2002)

Another example of simulation training that has received significant attention in recent years is behavior role modeling. For example, Skarlicki and Latham (1997) found that a behavioral role-modeling training approach (e.g., role-playing,) was successful in training organizational citizenship behavior in a labor union setting. In a similar study, Smith-Jentsch et al. (1996b) found that emphasizing practice through role-playing and performance feedback through a behavior modeling approach was more effective in training assertiveness skills than a lecture-only or lecture-with-demonstration format. In another assertiveness training study, Baldwin (1992) found that the best way to achieve behavioral reproduction (i.e., demonstrating assertiveness in a situation that was similar to the training environment) was to expose trainees to positive model displays alone. However, exposing trainees to both positive and negative model displays was most effective in achieving behavioral generalization (i.e., applying the skill outside the training simulation) four weeks later.

Simulations contain a great deal of variability with regard to cost, fidelity, and functionality. Although early simulators were sometimes archaic by today's standards, these environments have come a long way. With the amazing technological advances in recent years, many simulation systems (e.g., simulators, virtual environments) have the ability to replicate detailed terrain, equipment failures, motion, vibration, and visual cues about a situation. However, some widely used simulators are less sophisticated and have less physical fidelity, but represent well the KSAs to be trained (e.g., Jentsch and Bowers, 1998). Although the first instinct of trainers would be to go to the highest fidelity, most realistic-looking simulation, with all the bells and whistles, so to speak, low-fidelity, low-cost simulations can be just as effective.

In fact, recent trends have been to use more of these low-fidelity (e.g., computer-based) devices to train complex skills. Some research even proposes that these low-fidelity simulators result in more skills transfer after training (e.g., Gopher et al., 1994). Therefore, many researchers are examining the feasibility of using low-fidelity off-the-shelf computer games for training KSAs. For example, Gopher et al. (1994) proposed that context-relevant games can be effective in training complex skills. These researchers tested the transfer of skills from a complex computer game to the flight performance of cadets in the Israeli Air Force flight school. The game was based on a skill-oriented task analysis, which used information provided by contemporary models of the human processing system as the framework. Results showed that flight performance scores of two groups of cadets who received 10 hours of training in the computer game performed much better when they were compared with a matched group with no game experience. These results support the use of lower-fidelity computer games for improving performance after the training of complex skills. Similar results may be found in Goettl et al. (1996) and Jentsch and Bowers (1998).

Similarly, Ricci et al. (1995) investigated the use of a computer-based game to train chemical, biological, and radiological defense procedures. Although not a full-scale simulation, the computer-based slot machine that presented trainees with questions about the material enabled trainees to earn points for correct answers and receive corrective feedback for incorrect ones. As hypothesized by the authors, motivation to engage in this type of presentation over text-based material (e.g., books) resulted in higher learning, indicating that reactions and retention (but not immediate training performance) were higher for the game condition.

Although simulations have become more and more prevalent in the training community, some have noted (e.g., Salas et al., 1998) that simulation and simulators are being used without much consideration of what has been learned about cognition, training design, or effectiveness. Therefore, it is up to researchers to integrate the science of training with simulator application, design, and practice. One possible solution to this dilemma is to incorporate the event-based training approach, a scientifically based training strategy, with simulations (Cannon-Bowers et al., 1998; Fowlkes et al., 1998; Oser et al., 1999b). This means that simulation training should incorporate training objectives, diagnostic measures of processes and outcomes, feedback, and guided practice. Ultimately, we can ascertain that simulators and computer games work as a training tool only when the training is theoretically driven, focused on required competencies, and designed to provide trainees with realistic opportunities to practice and receive feedback. More research must be done to verify that simulators being used today will follow the science of training.

Distance Learning It would be hard to argue that developing technology and our expanded abilities resulting from that technology is not a major driver of training methodologies and strategies in recent years. Moe and Blodget (2000) estimate that $8.2 million will be spent by organizations on technology-driven training in 2001. Although organizations have not done away with traditional or "old-fashioned" training (e.g., classroom lectures), organizations are integrating training technologies such as videoconferencing, electronic performance support systems, videodisks, and online Internet/intranet courses at an accelerated pace. The evidence of Web-based training alone can be found by doing a simple Internet search. People can get certified in programming languages, learn cultural sensitivity, and even earn a Ph.D. online. However, trainees must approach this technology-driven explosion cautiously, since it soon becomes obvious that this implementation is happening without much reliance on the science of training. With organizations expanding globally, technology evolving rapidly, and the workloads placed on employees increasingly rapidly, training has begun to go in the direction of distance learning. *Distance learning* is the result of distance training, although the two terms are often used interchangeably. *Distance training* refers to a training situation where instructors and students are separated by time and/or space. Training can be synchronous or asynchronous and utilizes

such technology as the World Wide Web, CD-ROM, e- or online learning, videoconferencing, and interactive TV.

There are many issues concerning the design of distance learning that remain to be addressed. Like all training, the application of distance learning, must be steeped in theory in order to develop principles and guidelines that will guide the instructional design of such interventions. Some research has already begun to focus on the issues surrounding this topic (e.g., Schreiber and Berge, 1998), but a science of distance learning and training must still be secured. Specifically, research must explore what level of interaction is needed when applying collaborative learning tools or between trainers and trainees, along with the nature of their interaction. Some important questions to be addressed include (1) do instructors need to have visual contact with trainees to conduct effective instruction? (2) do trainees need to see instructors, or is it better for them to view other material? (3) how do you best address trainee questions (e.g., through chat rooms or e-mail) or provide feedback to trainees? (4) should learner control be used? [Some evidence from studies of computer-based training support the use of learner control (see Shute et al., 1998), but the extent of its benefits for distance learning is not known.] Future research must address these and other questions.

Distributed Team Training With the increases in technology, organizations are quickly moving toward a more global workplace. Because of this, team training often cannot be conducted with team members physically co-located. Instead, team members are distributed, or "mediated by time, space or technology" (Driskell et al., 2003, p. 3) and rely on some technological medium to communicate (i.e., e-mail, videoconferencing, telephone, or fax machine) (Townsend et al., 1996). Because team members are dispersed, traditional training programs are not effective. The military has been most affected with the problem of training distributed teams and has made the greatest strides in designing training programs specifically for distributed teams.

Military-based distributed mission training (DMT) involves real, virtual, and constructive components to create an interactive virtual reality system that allows trainees to engage in real-time scenario-based training that requires coordination and communication with teammates both real and virtual (Carroll, 1999). After training scenarios are completed, users are given feedback on their performance, and the information from that training scenario is saved in the user's file so the next training scenario can be completed.

The development of DMT programs in the military has resulted in two training platforms that utilize simulated training scenarios and virtual teammates, or cognitive agents, and actual military personnel: Synthetic Cognition for Operational Team Training (SCOTT) (Zachary et al., 2001) and Synthetic Teammates for Realtime Anywhere Training and Assessment (STRATA) (Bell, 2003). Users are able to log in to a secure network using a user name and password from anywhere in the world and are placed into a training scenario that will develop the knowledge and skills that are needed according to their training profile. They will then complete the training scenario in conjunction with either real teammates or cognitive agents acting as teammates. Although the majority of work involving DMT is military related, the skills trained in DMT are critical for all teams regardless of type (Bell, 1999).

E-Learning Although e-learning is a related concept, distance learning is much broader and encompasses nonelectronic learning; e-learning is electronic and mostly computer-based (Kaplan-Leiserson, 2002). With the advancements in technology and a busier workforce, many organizations have turned to e-learning as a tool to train distributed and/or "time-crunched" employees. E-learning can be defined as "a wide set of applications and processes, such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration" (Kaplan-Leiserson, 2002, p. 85). E-learning offers organizations a training tool that is affordable and can be used any time anywhere. The biggest advantage of this tool appears to be the fact that not only is it cost-efficient, but it offers training developers a great deal of freedom. E-learning can be structured to be used by distributed trainees, to be collaborative from remote environments, can be used synchronously or asynchronously, can be structured or learner controlled, and can be used continuously by different employees in different locations (DeRouin et al., in press). However, research (Brown and Ford, 2002) has shown that there are a few limitations on e-learning. Workers who are ideal for e-learning as a training tool typically lack the time for formal training. Therefore, training structured in e-learning environments must be able to be offered quickly, on-demand, and should be built in a way that is accessible from multiple locations (e.g., over the Web).

Learner Control One aspect of e-learning is learner control, explored mostly in the literature in general (Steinberg, 1977; Chung and Reigeluth, 1992; Goforth, 1994; Hamel and Ryan-Jones, 1997; Brown and Ford, 2002). Learner control refers to "a mode of instruction in which one or more key instructional decisions are delegated to the learner" (Wydra, 1980, p. 3). The structure of e-learning makes it ideal for the opportunity of learner control. Research has found both benefits (e.g., improved learning outcomes, increased satisfaction with training, and an increased amount of time trainees choose to spend training) (Ellermann and Free, 1990; Shyu and Brown, 1992; Freitag and Sullivan, 1995). However, conflicting evidence has also been found supporting negative results of learner control (Tennyson, 1980; Murphy and Davidson, 1991; Lai, 2001). DeRouin and colleagues (2004) suggest that this is due to the training offered and the relevance of the instructional material to trainees.

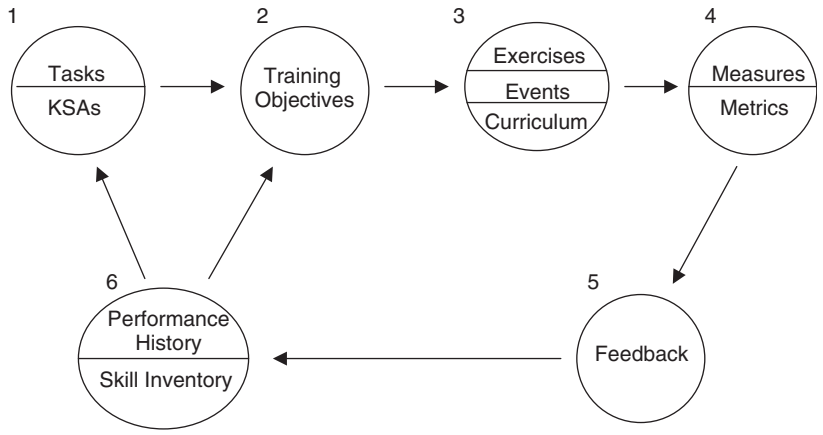

Figure 4 Components of scenario-based training. (From Cannon-Bowers et al., 1998.)

Scenario-Based Training *Scenario-based training* (SBT; Figure 4), also known as *event-based training*, is one instructional strategy that can be used to train both individuals and teams (Fowlkes et al., 1998). Unlike most traditional instructional strategies, there is no formal curriculum to scenario-based training. Rather, the scenario acts as the curriculum. This strategy uses embedded "trigger" events (i.e., learning events) to elicit targeted knowledge and skills through structured and guided practice scenarios (Karl et al., 1993; Dormann and Frese, 1994; Ivancic and Hesketh, 1995). Scenario-based training, when applied appropriately, is an effective training strategy because it is practice-based and provides trainees with a meaningful framework by which to learn (Fowlkes et al., 1998; Salas and Cannon-Bowers, 2000b). These events are defined a priori, determined from critical incidents data, and provide trainers with up-front knowledge of what competencies should be demonstrated and when. This allows for more effective and accurate performance measurement. Feedback is then provided immediately following the completion of practice to improve trainees' performance in future practice and on the job.

In addition to being practice-based, there are several additional benefits to using SBT for training individuals and teams. First, scenario-based training has a flexible architecture that can be adapted to a wide variety of situations that require different responses from trainees. By providing trainees with different opportunities to learn, they can build templates of what to expect and how to react in these situations (Richman et al., 1995). These templates or mental models will allow trainees to recall more rapidly the correct actions and decisions to make when similar situations are faced in the future (Klein, 1997). This is critical for teams and individuals operating in complex decisions where timeliness is of the utmost importance. Finally, scenario-based training is a broad instructional strategy that can be combined with other instructional strategies. For example, scenario-based training can be used in conjunction with assertiveness training to train junior team members to assert themselves to more senior members. Scenarios requiring that junior members assert themselves could be devised allowing these team members to practice speaking up to their superiors (e.g., a junior flight crew member letting the captain know that he or she skipped a step on the before-takeoff checklist). This combination of training not only benefits junior team members, but also creates an awareness to higher-ranking team members of the consequences of not considering the concerns of others, regardless of rank.

Collaborative Learning Additional research has focused on the development of collaborative tools to facilitate training. *Collaborative learning* is defined as situations where trainees are trained in groups. It should be noted that this should be distinguished from team training, in that the latter refers to training focused on training competencies necessary for performance of team tasks, and the former is not necessarily focusing on training for tasks performed as a group. Support has been found for the idea that certain features of group interaction facilitate the learning process (e.g., interaction with peers can facilitate learning. Specifically, Arthur et al. (1996, 1997) showed support for the ongoing use of innovative dyadic tools in training for both military and nonmilitary pilots and navigators. However, they found that the effectiveness of these collaborative tools with computer-based training is moderated by trainees' level of interaction anxiety, with only low-interaction-anxiety trainees benefiting from dyadic protocols. In addition, Shebilske et al. (1992) reported evidence that collaborative protocols have also been shown to reduce required instructor time and resources by half and found supportive evidence for the social learning theory that observational learning opportunities compensate for hands-on practice efficiently and effectively (Shebilske et al., 1998).

Error Training Error training, although relatively neglected in the literature, has in recent years gained

more attention. Error training is especially critical as we move further into the technological age, in which workers switch their roles from active members to passive observers. The premise behind error training is that trainees will experience errors, see the consequences of such actions, and receive feedback to improve their learning (Frese and Altman, 1989; Karl et al., 1993; Heimbeck et al., 2003; Lorenzet et al., 2003). Once feedback has been received, trainees are taught strategies for avoiding or minimizing the consequences of errors and are provided with opportunities to practice them. Findings in the literature indicate that providing error training improves performance on the job more than when error-free training is provided (e.g., Dormann and Frese, 1994; Ivancic and Hesketh, 1995).

There are two key components of errors used as a part of training that need to be considered: error occurrence and error correction (Lorenzet et al., 2003). *Error occurrence*, how or whether errors occur, can be approached in four different ways: (1) avoid, (2) allow, (3) induce, or (4) guide. First, errors can be avoided by designing training to prevent errors from occurring. For example, trainees are provided only with the information that they need to know; no other information (e.g., errors) is included in training. Although this improves trainee learning and motivation, it does little to help trainees who may be faced with errors on the job. Second, errors can be allowed to occur by chance. This type of approach allows trainees to make errors if such a situation should occur but can be challenging for trainers in that it is unclear what errors may occur and when (Gully et al., 2002). Next, errors can be induced or evoked by making changes in the training program (e.g., increasing complexity) with the hopes of errors occurring (Dormann and Frese, 1994). Although there may be benefits to trainees experiencing errors, approaches such as allowed and induced can have negative consequences if trainees make internal attributions about why errors are occurring rather than assuming that it is a part of the training program itself. Finally, guided error occurrence takes an approach in which trainees are intentionally guided to errors to encourage learning. Guided error occurrence has benefits over the other approaches because training becomes more standardized (i.e., all trainees experience the same errors).

The second component of error training is *error correction*, how trainees correct errors that occur during training. There are two subcomponents to error correction. First, trainees can work through the errors alone without the aid of an instructor or other mechanism (i.e., self-correction) (Frese et al., 1991). This approach is beneficial to trainees in that they can learn their own strategies for dealing with errors (i.e., self-discovery). On the other hand, trainees can be offered support and feedback to help them correct the errors (i.e., supported correction) (Carlson et al., 1992). Support can be provided in the form of a computer-based training aid or instructor intervention (Lorenzet et al., 2003).

Taking this together, Lorenzet et al. (2003) suggest that guided error training in conjunction with supported correction may be best at improving the skill development of trainees. Results of their research indicate that trainees given error training performed more accurately and in a quicker manner than those provided with error-free training. In addition, these trainees also reported higher levels of self-efficacy following error training, due to their ability to practice what they learned. These findings lend further support to the importance of providing practice and feedback to trainees.

Stress Exposure Training Another instructional strategy used to train people to deal with the uncertainties often associated with technology is stress exposure training (SET). The purpose of SET is to provide trainees with the abilities and tools necessary to maintain effective performance when operating in high-stress environments (Driskell and Johnston, 1998). This training is especially important in environments where the consequences for errors are high, as stress increases the likelihood of errors. There are three phases of SET training. The first phase involves providing information regarding different types of stressors that may be encountered on the job and the effects of those stressors on performance. Once a basic awareness and knowledge has been created, phase two follows with trainees acquiring skills (behavioral and cognitive) that are necessary to effectively manage and adapt to the potential stressors. Phase three concludes SET with trainees applying and practicing the knowledge and skills acquired during the previous phases in an environment that gradually approximates a high-stress situation followed by feedback on their performance. In addition to preparing trainees to perform effectively under a particular stressor on a specific task (e.g., time pressure while landing at an airport), SET has proven to generalize from stressor to stressor (e.g., time pressure to high workload) and task to task (e.g., landing an aircraft to handling an emergency situation) (Driskell et al., 2001).

On-the-Job Training On-the-job training (OJT), one of the most widely used instructional strategies in organizations, can be implemented in isolation or in conjunction with an off-the-job training strategy (such as those discussed throughout this chapter) (Goldstein, 1993). OJT, as the name suggests, takes place in the actual physical and social environment where the tasks being trained are performed and consists of experts or supervisors training specific job-related tasks (e.g., what to do, how to do it) (Wehrenberg, 1987; Sacks, 1994; De Jong and Versloot, 1999). Unlike most other training programs, OJT offers several benefits to organizations. First, trained skills will more likely transfer to the job following training because they were learned and practiced in the work environment. Additionally, the fact that trainees practice the trained skills while under supervision will result in incorrect behaviors being trapped and corrected before the trainee is allowed to conduct tasks without supervision.

There are two types of OJT: apprenticeship training and mentoring. *Apprenticeship training* has typically been associated with training trade skills (e.g., blacksmithing); however, more nontraditional trade organizations have begun to show an interest in this type of OJT (Goldstein, 1993). In general, apprenticeship training involves both classroom-based instruction and supervision on the job by an experienced employee. Once a predetermined amount of time has past and the necessary skills have been acquired, an apprentice is advanced to a "journeyman," where he or she is able to perform the learned tasks without supervision (Goldstein, 1993; Lewis, 1998; Hendricks, 2001).

The second type of OJT is *mentoring*. Mentoring, similar to apprenticeship training, involves creating a relationship between a less experienced person and an experienced person (Wilson and Johnson, 2001). In this relationship, the experienced person trains and develops the trainee such that he or she can perform the job accurately and effectively. Studies indicate that building a mentoring relationship fosters communication, job satisfaction, and success on the job (Mobley et al., 1994; Forret et al., 1996). Like apprenticeship training, mentoring allows trainees to practice the learned skills under supervision, allowing appropriate behaviors to be encouraged while inappropriate behaviors are discouraged (Scandura et al., 1996). A final benefit of mentoring is that it provides the mentor (in addition to the trainee) the opportunity to improve his or her skills that may have deteriorated with time (Forret et al., 1996).

5.6.3 Internationalization

With global markets expanding to over 10,000 companies across the world, the interaction between cultures in the business world and in daily life is increasing (Adler, 1997). In addition, teams are becoming a more integral component of organizational goals within all companies, increasing the presence of interdependent, multicultural teams. At the same time, new technologies are emerging that enable team members to engage in teamwork while being temporally and geographically distributed (Bell and Kozlowski, 2002). As a result, more individuals and teams are interacting with others from different cultures. However, despite the application of multicultural interactions, an understanding of how those interactions affect employees and the organization is still in the early stages. Although this multicultural training is still in its infancy, a great deal of training research has focused on the strategies of multicultural training, mostly with a focus on preparing expatriates for foreign jobs. However, with the global nature of the modern organization, cross-cultural training is a necessary intervention with employees of varied backgrounds in team settings, not just for employees going to foreign destinations. Therefore, the following section outlines some cultural implications important to individuals and teams, and describes a number of individual and team strategies being applied as a result.

Training for culture has been called many things in the literature: intercultural training, diversity training, multicultural training, and cross-cultural training. Although these titles are often used interchangeably, it may be argued that there are differences. However, this is not the forum to explore this differentiation (see Gudykunst et al., 1996). Therefore, for the current purpose, we refer to this type of training as *multicultural training*, to reflect the nature of training across different cultures. Multicultural training has been defined by researchers (Landis and Brislin, 1996; Morris and Robie, 2001) as the process of educating individuals or teams on behavioral, cognitive, and affective patterns that promote successful interaction across cultures. The goal of multicultural training is not just the acquisition of information, but the changing of trainee attitudes toward different cultures, which ultimately affect their behaviors (Bhagat and Prien, 1996). Research has also provided additional support for this type of training as a major technique in improving managers in multicultural environments (e.g., Deshpande and Viswesvaran, 1992; Bhagat and Prien, 1996; Bhawuk and Brislin, 2000).

Individual Cultural Training Strategies Traditionally, multicultural training was focused on two broad categories of learning focused on the individual: didactic or information-giving and experiential learning activities (Deshpande and Viswesvaran, 1992; Kealey and Protheroe, 1996). However, recent methodology has expanded to include seven approaches to multicultural training: attribution, culture awareness, didactic, experiential, and cognitive behavior modification, interaction, and language training (Bennett, 1986; Befus, 1988). The most popular and often used methods are as follows:

1. *Attribution training*. Attribution training is an intervention that aims to teach expatriates and others to make attributions for behaviors more similar to the point of view of members of other cultures (Befus, 1988). Ultimately, this training will help people from one culture learn about other cultures so that they can interpret behaviors they observe in a similar manner. This not only provides trainees with knowledge, but serves to deepen their understanding of culture perspectives (Bhawuk, 2001).
2. *Cultural awareness training*. Cultural awareness training operates on the assumption that by knowing their own culture, trainees can better understand the differences between their own culture and other cultures they may encounter (Befus, 1988). This general approach employs many strategies, including T-groups, which involves trainees learning about their own feelings, concerns, emotions, and unconscious responses (Bennett, 1986). The ultimate goal of awareness training is to learn about your own culture, as well as others, to better recognize the differences and improve the successful interactions you have with those from other cultures (Bennett, 1986).
3. *Didactic training*. Didactic training involves information-giving activities, including factual information regarding working conditions, living conditions

of the other cultures, and cultural differences, travel, shopping, and appropriate attire. This approach focuses on cognitive goals, culture-specific content, and traditional education (Bennett, 1986). In addition to the foregoing topics, trainees receive information regarding the political and economic structure of other countries (Kealey and Protheroe, 1996; Morris and Robie, 2001). The information provided is designed to enable trainees to identify differences between their own culture and others, the ultimate goal being to enhance cognitive skills so that trainees can better understand and evaluate cultures other than their own (Morris and Robie, 2001). When done properly, didactic training provides trainees with a frame of reference when they encounter new situations (Kealey and Protheroe, 1996; Morris and Robie, 2001).

Didactic training can be applied in a number of ways (e.g., informal briefings, cultural assimilators) (Brewster, 1995), which can take several forms. For example, informal briefings can be used which take the form of casual conversations with experts or past trainees who have interacted successfully in other cultural environments (Brewster, 1995; Kealey and Protheroe, 1996). Informal briefings can also include lectures, videotapes, workbooks, and Q and A sessions (Grove and Torbiörn, 1993; Kealey and Protheroe, 1996). Another example of didactic training involves cultural assimilators. According to Bhawuk (1998, 2001), cultural assimilator training requires trainees to read scenarios or critical incidents and choose one of four options of how they would react. After they make their choice, an expert's view is provided as the most appropriate response (Kealey and Protheroe, 1996; Bhawuk, 1998, 2001; Morris and Robie, 2001). All of these can be classified as didactic training because they involve information giving.

4. *Experiential training*. Experiential learning involves learning by doing where trainees are put through scenarios, often in the form of simulations, so that they can practice their responses to realistic situations. This method provides trainees with knowledge (i.e., cognitive tools) and attribution skills for working and interacting with people from different cultures (Kealey and Protheroe, 1996; Morris and Robie, 2001). When applied appropriately, experiential training will result in an improvement in multicultural communication skills and the application of knowledge about what to do in certain situations (Kealey and Protheroe, 1996; Morris and Robie, 2001). The development of cognitive skills also enables trainees to see the perspective of people from other cultures (Morris and Robie, 2001). In addition to simulations, role-playing (discussed later as a multicultural team training strategy) and workshops are often used to promote experiential training (Grove and Torbiörn, 1993; Kealey and Protheroe, 1996; Morris and Robie, 2001).

An example can be found in simulations. A simulation game often used for multicultural experiential training is BAFA BAFA (Bhawuk and Brislin, 2000). This simulation revolves around two hypothetical countries: alpha (i.e., masculine and collectivistic culture) and beta (i.e., feminine and individualistic culture). After being assigned to one of the two cultures, each participant is required to "go to" the other country and come back and explain their experiences to their group. Following the exercise, trainees are debriefed and told that the purpose of the simulation was to show them the differences that they may encounter in different cultures (Gudykunst et al., 1996).

Although these strategies are useful in training multicultural issues, there is some concern in the literature (Black and Mendenhall, 1990; Deshpande and Viswesvaran, 1992; Morris and Robie, 2001). Specifically, empirical results are lacking to support claims that this type of training is effective (Selmer, 2001). In addition, it must be noted that a number of moderating factors could explain the positive results found following multicultural training. As a result, the field of multicultural training is in need of more empirical, quantitative support for the implementation of training, which appears to work at the anecdotal level. Ultimately, it is not an exaggeration to say that empirical studies are the most drastically needed aspect of research in this domain (Black and Mendenhall, 1990; Selmer et al., 1998; Morris and Robie, 2001; Selmer, 2001). It is necessary to decrease the theoretical, anecdotal arguments and begin performing empirical investigations to provide stronger support for multicultural training techniques. In addition, variables that may influence the relationship between multicultural training effectiveness and performance must be included in these analyses (Black and Mendenhall, 1990; Morris and Robie, 2001). These moderators include organization-level attributes, job-level attributes, and individual-level attributes (Bird and Dunbar, 1991; Bhagat and Prien, 1996).

Multicultural Team Training Strategies With the increase in teams, multicultural team strategies have been developed or adapted to target the complexity of team interactions. Building on traditional team training strategies, these three strategies can be used to promote effective performance in multicultural teams involving both team leaders and members. There are generally five common components present in multicultural team training strategies: (1) a goal to enhance teamwork within specific settings with a focus on general team objectives, (2) a reliance on a traditional team performance framework, (3) the application of appropriate tools and feedback, (4) the combination of more than one delivery method (i.e., information, demonstration, and practice), and (5) a short duration to deliver their message (e.g., 2 to 5 days) (Salas and Cannon-Bowers, 2001). Although a number of the team training strategies can be adapted to fit multicultural team training, the following are three examples of multicultural team training strategies that have been applied within organizations:

1. *Team leader training*. Poor management has been identified as a reason that multicultural teams fail (Moore, 1999). Leaders of multicultural teams

must confront a number of challenges not encountered within homogeneous teams (Salas et al., 2004). Although team leader training does not consist of a formal training technique, organizations can apply a number of guidelines to identify what role team leaders should play within multicultural teams. One role often associated with multicultural training is that of leader as coach. For example, process losses, such as communication, have been identified as a major contributor to poor multicultural team performance (Thomas, 1999). If the leader is able to act as a coach to multicultural team members, they can help in the development of strategies to overcome this process loss (Kozlowski et al., 1996). Therefore, it can be argued that coaching is an effective team leader role within multicultural teams. There are several strategies that can be used to promote effective coaching by leaders (see Martin and Lumsden, 1987). One strategy involves the leader offering praise for appropriate or desirable effort or processes exhibited by team members (e.g., openly communicating). A second strategy entails rewards for team members who exhibit the desired behaviors. A third strategy would be to have the leader encourage positive interactions among the team members (e.g., avoiding stereotypes). Team leaders can helps motivate team members, inspire them to work together, and help them overcome differences by following these coaching guidelines.

2. *Team building*. While team building is a general team training strategy, it may also be used to target multicultural team issues. At the core of team building, teams are allowed to be a part of the planning and implementation of change rather than having it forced upon them (Salas et al., 1999). The literature provides a number of sources to guide team building. Specifically, organizations typically rely on one of four team building models: goal setting, interpersonal relations, problem solving, and role clarification (Dyer, 1977; Beer, 1980; Buller, 1986). No single model is more appropriate than another across the board. The model or combination of models that an organization selects should be determined by organizational goals and team tasks (Salas et al., 1999). Goal setting provides team members with opportunities to set their own individual and team goals, develop team objectives, and develop strategies for achieving set goals and objectives. This allows them to show a greater range of perspectives (Watson et al., 1993) and promotes more comprehensive goals. Interpersonal relations models can be used to promote team skills, develop confidence, and increase trust among team members. This can be helpful because multicultural teams have been shown to possess less trust, which can lead to decreased performance (Distefano and Maznevski, 2000; Triandis, 2000). The problem-solving model can be applied to identify problems that may exist within the team. This enables team members to develop strategies for solving these problems as a cohesive unit and then to evaluate these strategies. In this way, teams can better define the problems they may encounter (Adler, 1997) and generate more solutions to problems (Daily et al., 1996), which leads to better solutions are better than are available from homogeneous teams (Hoffman and Maier, 1961). Finally, role clarification models focus on an increase in team member understanding of members' roles and increases their ability to communicate. This can be particularly helpful in multicultural teams since they have been shown to have communication difficulties (Steiner, 1972; Thomas, 1999) and differences in role classifications (Hofstede, 1980).

3. *Role playing*. Role playing is another strategy that can increase effectiveness in multicultural teams. In role playing, members are given scripted scenarios that they must act out together. The goal of role playing is to create awareness and can be adapted to fit any cultural interactions. To apply this strategy appropriately, two types of exercises should be implemented: (1) learning about one's own culture and biases (i.e., enculturation) (Roosa et al., 2002), and (2) learning about other cultures (i.e., acculturation) (Bennett, 1986). *Enculturation* is a vital part of the multicultural training process. Many of us are not aware of how our own biases, beliefs, and customs affect our behaviors and influence how we decide to treat others. Without an understanding of our own tendencies, we cannot truly understand other cultural tendencies, which is a very important step in the functioning of multicultural teams. The second component of role playing is *acculturation*, which focuses on providing team members with awareness of other cultures. When applying this two-faceted approach, role-playing can serve to promote awareness of their own and other cultural biases, customs, traditions, and tendencies by allowing team members to act out both dimensions. Furthermore, to promote an understanding of the different perspectives in multicultural settings, team members should be required to play multiple roles within the scripted scenarios. An additional benefit of role-playing is that it provides team members with practice for skills that can help them overcome the differences between cultural biases and tendencies. To ensure that this awareness and practice are effective, team members should be provided with feedback regarding their performance and additional training when necessary following these scenarios.

5.7 Program Content

The final step in the training design phase is to lay out the program content. This step entails determining the sequence and structure of the training program (Clark, 2000). The sequence should be logical and easy to follow by trainees and should be structured such that all training objectives are met. Furthermore, each learning activity (or practice) should have a definite purpose and be provided in a meaningful context. This process will also provide standardization of the training program from one implementation to the next as the material to be covered and when will be clearly specified.

5.8 Summary

The research exploring the how training systems need to be designed is abundant. It is important to remember

that there is more to training than just the training system itself and its content. Rather, designers must also consider factors external to the training system (e.g., organizational and individual characteristics) that may influence its effectiveness. This is a requirement if the training system is to be a success.

6 TRAINING DEVELOPMENT

The third phase of the ISD model involves the actual development of the training program. As a part of this phase, course materials, including lesson plans, should be developed, learning activities (i.e., practice) should be specified, and tests and performance measures should be developed.

6.1 Practice Scenario Development

Critical to the success of training is the availability of practice opportunities during training. These opportunities will not only help to identify deficiencies in individual and team performance, but will help trainees with the transfer and retention of learned competencies. Practice scenarios, however, must be laid out carefully and storyboarded prior to training. This provides trainers and researchers added control over the practice portion of training by standardizing what competencies are being training, how the competencies are being presented to trainees, and when. It is often believe that practice scenarios should have all the "bells and whistles" of the real-world environment. Although realism is important and the small details should not be ignored, low-fidelity simulations (such as role-playing) offer trainees benefits similar to those of high-fidelity practice (e.g., full motion simulators). The level of realism will undoubtedly be related to what is being trained and what trainees are to get out of training. In addition to being realistic, practice scenarios should be developed so that they challenge trainees by varying in their levels of difficulty. Next, scenarios should be scripted such that they allow trainees to respond during practice in different ways (i.e., there should not be one right or wrong answer). Finally, multiple practice opportunities should be made available to allow trainees to practice the trained knowledge and skills on multiple occasions (Prince et al., 1993). By developing scenarios that engage trainees, they will build confidence (Richman et al., 1995) and be more likely to transfer and apply what they have learned on the job—and this can only benefit organizations.

6.2 Performance Measures

Performance measurement is a must; without measurement and feedback, there are no opportunities for learning. It is well known that diagnosis is critical for learning. It can be argued that training will be effective only to the extent that trainee competence can be assessed. For this to be true, three criteria must be met. First, measurement opportunities must be provided that ease the burden on those responsible for performance measurement. In other words, the use of prescripted, learner-focused scenarios ensures that the significant competencies are being prompted. In this way instructors know a priori when these "trigger" events will occur and can observe and record performance.

Second, a basis for diagnosing performance trends and providing feedback must be established, and this is more challenging than one would expect. For example, automated technology as a part of a simulation is a great way to capture performance outcomes (e.g., time, errors). This technology is limited, however, in that it cannot easily capture data related to the real-time processes that trainees progress through to attain these outcomes (e.g., communication, decision making). This is especially true when assessing team performance, as teams are very dynamic in nature and teamwork processes are difficult to capture. For example, during periods of high workload (such as those experienced by trauma teams), teams will often communicate and coordinate implicitly, which is impossible for a simulation-based system to detect. A human observer, on the other hand, will be more able to make inferences from observing the behaviors to diagnose teamwork issues using checklists or observation forms (e.g., TARGETS) (see Fowlkes et al., 1994). It is recommended that training programs utilize several (at least two) observers or evaluators, who can more readily diagnose performance and provide strategies for improving future performance (Brannick et al., 1995). The use of evaluators to provide ratings, unfortunately, is not free of error and bias. Thus, training designers must focus on improving the reliability (i.e., are evaluators' ratings consistent with each other, and are each evaluator's ratings consistent over time?) and validity (i.e., are evaluators rating the right things?) of evaluators through training to ensure consistency and accuracy (for a description, see Brannick et al., 2002; Holt et al., 2002; O'Connor et al., 2002). A final challenge faced by training designers is ensuring that multiple measurements are taken throughout the simulation to gather a truly representative picture. Again, this is especially important when one is interested in obtaining process-related data.

6.3 Summary

The development of practice scenarios and feedback are critical to the success of a training system. It is with these opportunities to practice applying the knowledge and skills learned and receiving feedback on one's performance that long-lasting learning can occur.

7 TRAINING IMPLEMENTATION

At this point, the training program has been developed and the organization should be ready to implement the training program. As a part of this stage, an adequate training location needs to be identified that has the necessary resources for training (e.g., Internet access for Web-based training). In addition, instructors need to be trained, training should be pilot-tested, feedback should be received from trainees, and necessary revisions should be made (Clark, 2000). Once this is completed, delivery of the full-scale training system is ready to go.

8 TRAINING EVALUATION

Just as important as events that occur before and during training, posttraining conditions can significantly influence the effectiveness of training. The evaluation of training, the environment following training, and the effective application of KSAs acquired in training to work environments (i.e., transfer of training) continue to be of interest to training researchers. The most significant progress has been made in the areas of training evaluation and transfer of training. Furthermore, within these areas of study there are theoretical, methodological, empirical, and practical advances. Although not all issues have yet been addressed, meaningful advances have been made in the last decade. In the following sections we document the advances made in the last few decades and the suggestions for steps that may still need to be taken. We first look at training evaluation and the prevailing theories that have driven it.

8.1 Evaluation Design Concerns

Once the instructional strategy has been chosen and the training program has been implemented, it is imperative that the training be evaluated. Few organizations conduct systematic evaluations of their training programs. Although we acknowledge that evaluation can be resource intensive, it is the only way to truly assess training's effectiveness. *Training evaluation* refers to a system for measuring the intended outcomes of training. It is concerned with issues of measurement, design, learning objectives, and the attainment of desired knowledge, skills, and abilities. Ultimately, training evaluation asks, "Did the training work?" and effective evaluation models are necessary to inform trainers and researchers of the added value of their training program.

Everyone can agree that training evaluation is a good idea, but it also becomes apparent as one begins to tackle it that the evaluation process is labor intensive, costly, political, and often gives the organization bad news. Furthermore, some training evaluation procedures must be conducted in the field or on the job, which is always a difficult undertaking. The process, however, has benefited in recent decades based on some empirically tested thoughtful, innovative, and practical approaches to aid the evaluation process. General evaluation research includes Sackett and Mullen (1993), who proposed other alternatives (e.g., posttesting only, no control group) to formal experimental designs when answering evaluation questions. They suggested that each evaluation mechanism needed, which is driven by the evaluation questions, requires a different design. Furthermore, Haccoun and Hamtiaux (1994) proposed the *internal referencing strategy*, which tests the implicit training evaluation notion that training-relevant content should show more change (pre−post) than training-irrelevant content. This is a simple procedure for estimating effectiveness of training in improving trainee knowledge. This method was based on an experiment that tested an empirical evaluation using internal referencing strategy vs. a more traditional experimental evaluation Findings suggested that the internal referencing strategy approach might permit inferences that mirror those obtained by more complex designs.

It is hopeful that more evaluations are being reported in the literature. This is a much needed and valuable addition. This literature allows us to learn from past evaluations and ensures that the design and delivery of training will continue to progress. Training evaluation research has also spanned numerous training areas, including team training settings (e.g., Leedom and Simon, 1995; Salas et al., 1999), sales training (e.g., Morrow et al., 1997), stress training (e.g., Friedland and Keinan 1992), cross-cultural management training (e.g., Harrison, 1992), transformational leadership training (e.g., Barling et al., 1996), career self-management training (e.g., Kossek et al., 1998), workforce diversity training (e.g., Hanover and Cellar 1998), and approaches to computer training (e.g., Simon and Werner, 1996). All research reinforces what we already know: Training works. What is not decided is the best way to go about evaluating training in general. Unfortunately, several surveys of public and private organizations (e.g., Catalanello and Kirkpatrick, 1968; Ralphs and Stephan, 1986) indicate that high-quality multifaceted evaluations of training programs are rarely conducted. To date, the best accepted evaluation "model" was that proposed by Kirkpatrick (1959, 1976, 1987) (see Section 8.3).

8.2 Costs of Training Evaluations

There are also practical considerations in training (e.g., organizational resources, costs). Recent research has begun to address the costs of training evaluation. Yang et al. (1996) examined two ways to reduce costs: (1) assigning different numbers of subjects to training and control groups, and (2) substituting a less expensive proxy criterion measure in place of the target criterion when evaluating the training effectiveness. First, an unequal group size design with a larger total sample size may achieve the same level of statistical power at lower cost. In addition, using a proxy increases the sample size needed to achieve a given level of statistical power. Furthermore, the authors described procedures that examined the trade-off between the savings from using the less expensive proxy criterion and costs incurred by the larger sample size. See Arvey et al. (1992) for similar suggestions.

8.3 Kirkpatrick's Typology and Beyond

While there are numerous methods of assessment that can be applied to training, Kirkpatrick (1976) discussed evaluation in terms of four steps or criterion types: (1) trainee reactions (i.e., what trainees think of the training), (2) learning (i.e., what trainees learned), (3) behavior (i.e., how trainees' behavior changes), and (4) organizational results (i.e., impact on organization) (see Table 4). Reactions are assessed by asking trainees how well they liked the program. Learning is measured by examining the extent to which trainees have acquired the principles, facts, and/or skills trained. Changes in behavior are assessed by evaluating trainees' performance back on the job. Finally, organizational results that are assessed include

Table 4 Kirkpatrick's (1976) Multilevel Training Evaluation Typology

Level	What Is Being Measured/Evaluated	Measurement	Sample Questions
1. Reactions	• Learner and/or instructor reactions after training • Satisfaction with training • Ratings of course materials • Effectiveness of content delivery	• Self-report survey • Evaluation or critique	• Did you like the training? • Did you think the trainer was helpful? • How helpful were the training objectives?
2. Learning	• Attainment of trained competencies (i.e., knowledge, skills, and attitudes) • Mastery of learning objectives	• Final examination • Performance exercise • Knowledge pre- and posttests	• True or false: Large training departments are essential for effective training. • Supervisors are closer to employees than is upper management.
3. Behaviour	• Application of learned competencies on the job • Transfer of training • Improvement in individual and/or team performance	• Observation of job performance	• Do the trainees perform learned behaviors? • Are the trainees paying attention and being observant? • Have the trainees shown patience?
4. Results	• Operational outcomes • Return on training investment • Benefits to organization	• Longitudinal data • Cost–benefits analysis • Organizational outcomes	• Have there been observable changes in employee turnover, employee attitudes, and safety since the training?

Source: Adapted from Childs and Bell (2002) and Wilson et al. (2005).

reduced turnover, reduced costs, improved efficiency, and improved quality.

Kirkpatrick's (1976) multilevel approach has been applied numerous times in recent years and has been shown to be effective (Cohen and Ledford, 1994; Field, 1995) as a framework for evaluation efforts in both individual studies (e.g., Noe and Schmitt, 1986; Wexley and Baldwin, 1986) and meta-analytic reviews of training literature (Burke and Day, 1986). However, most studies have elicited measures at only a single level, typically trainee reactions (e.g., Catalanello and Kirkpatrick, 1968; Bunker and Cohen, 1977) or trainee learning (e.g., Alliger and Horowitz, 1989), exposing some problems with not only the original typology, but in how it is applied: namely, a lack of multilevel diagnostic measures.

One example comes from Salas and colleagues (2001), who examined the success of crew resource management (CRM) training. Researchers examined the available literature and found that whereas 41% of the studies collected information at multiple levels of Kirkpatrick's framework, a majority of those only collected information pertaining to two of the levels, usually reaction/learning or reaction/behavior. Findings support the suggestion that CRM has been successful in improving safety in the aviation community, but the results are ambiguous and incomplete, further emphasizing the importance of organizations to evaluate their training programs at all levels.

These problems have led to a reevaluation of the original typology and its application. It should be recognized that Kirkpatrick's typology was written for a relatively unsophisticated audience, with respect to measurement. Consequently, there are conceptual flaws and ambiguities in the model (Snyder et al., 1980; Clement, 1982; Alliger and Janak, 1989). In addition, this model ignores other potentially relevant trainee outcome measures such as trainee motivation and self-efficacy (Gist et al., 1988; Gist, 1989; Tannenbaum et al., 1991), as well as other indications of the value of training, such as the program's content validity (Ford and Wroten, 1984) and cost-effectiveness or utility (Schmidt et al., 1982; Cascio, 1989). More critically, Kirkpatrick's typology did not anticipate later developments in learning theory. The typology discusses learning primarily as a function of increased declarative knowledge and thus ignores modern theories of cognitive skill acquisition (Anderson, 1982; Ackerman, 1987). Accordingly, the model has little value as a conceptual heuristic.

In an effort to begin to address these issues while building on Kirkpatrick's framework, several researchers have reviewed and revised Kirkpatrick's original typology. Kraiger and colleagues (1993) outlined three similar outcomes: (1) affective (i.e., reactions), (2) cognitive (i.e., learning), and (3) skill-based (i.e., behavior) outcome. These three levels were similar to what Kirkpatrick proposed, but addressed the cognitive dimension as well. The first level, reactions, measures trainee affect or how well they like the program, as well as program utility or how useful the trainees thought the program was. This last addition

is based on the findings that a significant problem with training evaluation was its overreliance on self-report measures of trainees' reactions to the training. Although self-report measures are popular because of their ease of use, self-report alone do not give evaluators a full picture of training effectiveness. How well the training was conducted and the competencies that it targeted are often not reflected in whether or not trainees "liked" the training. In fact, researchers found that "liking does not equate to learning or to performing" (Alliger et al., 1997, p. 344). Therefore, the utility aspect was added to at least in part combat this fallacy. The trainees' opinions of whether or not what they learned will help them in their jobs are referred to as their *utility judgments*. However, the researchers still included the trainees' affective reactions to measure how much the trainees liked the training. This was done because while liking, as noted earlier, does not necessarily translate into desired outcomes, evaluators can gain valuable information about organizational factors (e.g., organizational support for training) based on the trainees' feelings toward the training. Therefore, within this model, affective outcomes were referred to as attitudinal outcomes and motivational states (i.e., motivational disposition, self-efficacy, and goal setting) that were produced by training.

Learning evaluates the principles, skills, and knowledge gained from training. The learning level is used to determine whether or not the trainees actually learned the targeted KSAs presented in the program (i.e., training validity), while not evaluating whether or not their behaviors changed due to training. The behavioral evaluation level assesses the changes in behavior exhibited by trainees following the training program in their actual work environment (i.e., transfer validity). Finally, organizational outcomes of the training (e.g., reduced costs, improved quality), the highest level of evaluation, are assessed. This final level of evaluation determines two types of training validity: (1) intraorganizational validity (i.e., are the performances of multiple groups of trainees consistent?), and (2) interorganizational validity (i.e., will the training program in one organization or department be effective in another?). Therefore, it is disappointing that this last level is rarely evaluated, out of necessity based on the difficulty of collecting such data.

Another incarnation of Kirkpatrick's original typology was proposed by Alliger and colleagues (1997) (see Table 18.5). The researchers reviewed Kirkpatrick's approach through meta-analysis of 34 articles used in an earlier study (Alliger and Janak, 1989). Their findings led to an augmented framework, shown in Figure 5 compared to the Kirkpatrick model, which further expanded and clarified Kirkpatrick's original method of evaluation. Alliger and Janak classified different types of reactions and learning and focused more on transfer of training to the work environment rather than the more general behavior category.

They did this by dividing the learning phase into three categories: (1) immediate knowledge, (2) knowledge retention, and (3) behavior/skill demonstration. Immediate knowledge involves trainees indicating

Table 5 Alliger et al.'s (1997) Augmented Kirkpatrick Training Taxonomy

Step	Definition
1. Reactions	
a. Affective reactions	Measures emotional self-report of trainees given immediately, with little if any thought; impressions.
b. Utility judgments	Evaluates trainee opinions or judgments about the transferability and utility of the training; behaviorally based opinions.
2. Learning	
a. Immediate knowledge	Assesses how much trainees learned from training (i.e., how much they know about what they were trained). Uses multiple choice, open-ended questions, lists, etc.
b. Knowledge retention	Used to assess what trainees know about training, much like immediate knowledge tests, but are administered after some time has passed, to test retention. Used in combination with or instead of immediate knowledge tests.
c. Behavior/skill demonstration	Measures behaviors/skills indicators of performance exhibited during training as opposed to on the job. Uses simulations, behavioral reproduction, ratings of training performance, and performance-centered scorings in classes.
3. Transfer	Measures output, outcomes, and work samples to assess on-the-job performance. Measured some time after training to assess some measurable aspect of job performance. Assess transfer of training to job setting.
4. Results	Assesses what organizational impact training had after the fact. Uses measurement of productivity gains, customer satisfaction, any change in cost, an improvement in employee morale, and profit margin, among others. Measurement is often difficult, due to organizational limitations and because results are the most distal from training. Caution should be used, however, because results are often regarded as the basis for judging training success, but judgments are often based on false expectations.

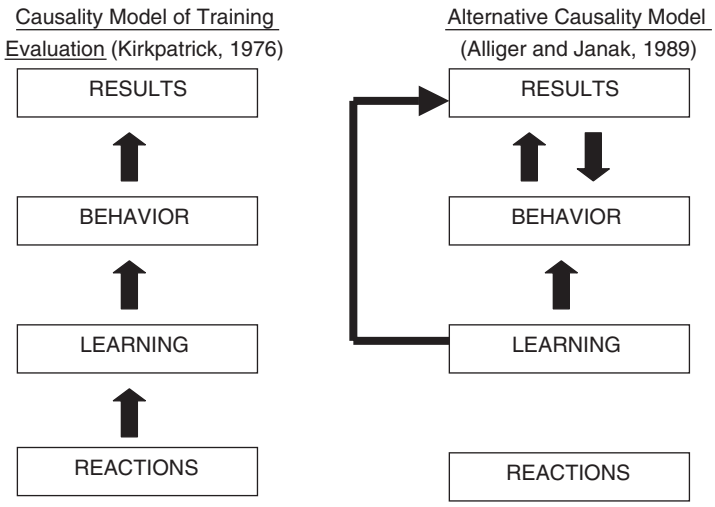

Figure 5 Comparison of two training evaluation models.

how much they know about the training content (i.e., what they were taught during training). Furthermore, Alliger and Janak (1997) applied multiple methods of evaluation (i.e., multiple-choice tests, open-ended questions, listing of facts). Knowledge retention, the second category, involves the same types of tests that would be given to test immediate knowledge gain, but trainees are given these assessments after more time has elapsed. Evaluators can use both immediate knowledge assessment and knowledge retention tests to provide a more in-depth evaluation.

Finally, behavior/skill evaluation involves the trainees' performances within training, as opposed to their performances on the job. Methods such as simulations, SME ratings of team performance, and behavioral role-plays are used to measure behaviors and skills obtained in training. These three components are used to assess trainee learning. When combined with trainee reactions, these assessments of trainee learning provide a stronger evaluation of training and give reactions a more predictive power of performance (Alliger et al., 1997). The last two ingredients for the revised typology proposed by Alliger and Janak (1997) are transfer and results. Regarding transfer, measurements are given some time after training when trainees are back on the job. Transfer evaluations differ from knowledge retention measures since they are more behaviorally based and focus on on-the-job performance, outputs, outcomes, and work samples. The last component of this model focuses on the bottom-line variables, typically referred to as *training outcomes* (e.g., measurement of productivity gains, customer satisfaction, changes in cost of production, employee morale, and profits). However, the final assessment of results should be viewed cautiously. Evaluators must keep in mind that these variables can be difficult to capture accurately and can be a result of factors other than training. In addition, management can have inflated expectations of the impact of training on bottom-line results, leading to disappointment and harsh judgment of training. Therefore, caution should be used when dealing with result variables.

Although the foregoing models represent major strides in fixing the problems inherent in Kirkpatrick's typology, other recent work has either expanded it or pointed out weaknesses, such as the need to develop more diagnostic measures. For example, Kraiger and Jung (1997) suggested several processes by which learning outcomes can be derived from instructional objectives of training. Goldsmith and Kraiger (1997) proposed a method for structural assessment of an individual learner's knowledge and skill in a specific domain. This model has been used with some success in several domains (e.g., Kraiger et al., 1995; Stout et al., 1997).

Despite all the controversy, Kirkpatrick's (1976) typology continues to be the most popular framework for guiding evaluations. Clearly, the original typology has served as a good foundation for training evaluation for the last several decades and it will probably continue to do so (Kirkpatrick, 1976). Although it has been both used and misused extensively, serving as a jumping-off point for effective evaluation, research must continue to find better, more rigorous diagnostic assessments for training evaluation. Especially as technology evolves and becomes more and more a part of the training environment, researchers must strive to improve the ease and utility of evaluation both during and after training (e.g., Ghodsian et al., 1997).

8.4 Summary

At the conclusion of any training program, it is critical an organization evaluate its effectiveness. Furthermore, organizations must look beyond the reactions of trainees, as research suggests that positive attitudes do

not necessarily indicate that learning has taken place or that behaviors will be exhibited on the job. As training evaluations take time and resources, the benefits of understanding the impact of training will be crucial to its future success.

9 TRANSFER OF TRAINING

Transfer of training can be defined as the extent to which competencies targeted in training are applied, generalized, and maintained over some time in the work environment or on the job (Baldwin and Ford, 1988). Many studies and a great deal of theoretical musings have focused on the transfer of training (see Ford and Weissbein, 1997). Based on research emerging in the recent past, several conclusions and propositions have been laid out. For example, researchers have concluded that context matters (Quinones, 1997). Context helps determine trainee motivations, expectations, perceptions, and attitudes toward transfer. Furthermore, it is possible to measure the organizational learning environment, which can vary in meaningful ways across organizations (Tannenbaum, 1997). In addition, several studies have proposed that the transfer "climate" can have a powerful impact on the extent to which newly acquired KSAs are used back on the job (e.g., Thayer and Teachout, 1995; Tracey et al., 1995). Ultimately, factors found to affect the transfer of training include opportunities provided to trainees to perform KSAs (Ford et al., 1992; Quinones et al., 1995); delays between training and actual use on the job, which can create significant skill decay (Arthur et al., 1998); situational cues and consequences, which predict the extent to which transfer occurs (Rouiller and Goldstein, 1993); and social, peer, subordinate, and supervisor support (e.g., Facteau et al., 1995; Tracey et al., 1995). Conclusions also suggest that training can be generalized from one context to another (e.g., Tesluk et al., 1995) and intervention strategies can be designed such as to improve the probability of transfer (e.g., Brinkerhoff and Montesino, 1995; Kraiger et al., 1995). Regarding teams and their leaders, informal reinforcement (or punishment) of transfer activities by team leaders can shape the degree of transfer (Smith-Jentsch et al., 2000).

To design training effectively and ensure the transfer of competencies, training transfer needs to be conceptualized as a multidimensional construct, meaning that it differs depending on the type of training and closeness of supervision on the job (Yelon and Ford, 1999). Ford and Weissbein (1997) pointed out that there are more studies using complex tasks with diverse samples that actually measure transfer over time. Although the study of transfer of training has come a long way, much more needs to be done. For example, more research should be done that actually manipulates the transfer climate as opposed to observing one climate and making assumptions that findings will generalize across organizations (e.g., Smith-Jentsch et al., 2000). Since a majority of studies still utilize surveys as the preferred method of measurement, many problems still exist. Additional methods, which tap other measurement points, should be developed. For example, vertical transfer of training (i.e., upward transfer across different levels of the organizational system) should be examined further. Individual outcomes can have implications at the higher level (i.e., the organization). Therefore, the construct of vertical transfer may be used as a leverage point for strengthening the links between learning outcomes and organizational effectiveness (see Kozlowski et al., 2000).Although a great deal still needs to be done, these studies, taken together, emphasize the importance of the organizational environment in training. Therefore, a focus of transfer of training research needs to include environmental factors in posttraining. In the next section we address some of the issues inherent in posttraining environments.

9.1 Posttraining Environment

Another important aspect following training, which is essential in encouraging the transfer of training, is the posttraining environment. Whether or not a training program is effective depends heavily on the trainee's ability to use the competencies in their real-world job. Environmental factors helps determine whether trainees will exhibit learned behaviors when transferred back to their work settings. Even when a program is designed well and implemented effectively, without an environment that encourages transfer of the targeted competencies, their will be no positive outcomes. This variable helps determine whether or not competencies learned during training will transfer to the actual job. Although supporting empirical evidence is limited, there are several characteristics of posttraining environments that seem to contribute to training effectiveness: (1) supervisor support, (2) organizational transfer climate, and (3) continuous-learning culture (see Baldwin and Ford, 1988; Rouiller and Goldstein, 1993; Tracey et al., 1995; Ford and Weissbein, 1997). Furthermore, the transfer of training can be enhanced or hindered by some elements of the transfer climate(e.g., rewards; positive transfer climate; lack of peer or supervisor support; lack of resources) (Tannenbaum and Yukl, 1992; Rouiller and Goldstein, 1993). The effects on transfer of supervisor support organizational transfer climate, and continuous learning environments will be explored next.

The transfer of training has been linked to supervisor support. Several studies have provided evidence that the transfer of trained skills is a result of discussions with supervisors prior to and following training, as well as supervisor sponsorship (Huczynski and Lewis, 1980; Brinkerhoff and Montesino, 1995). Further research has suggested that opportunities to perform learned skills provided by supervisors also encourage the transfer of training (Ford et al., 1991). However, Baldwin and Ford (1988) found that there may be some misunderstandings regarding what constitutes supervisor support (i.e., what behaviors are perceived as supportive by workers). However, some supportive behaviors suggested by researchers

include goal-setting activities (e.g., minimize number of accidents), reinforcement (e.g., error reporting), and modeling of trained behaviors (e.g., safe behaviors) (Tannenbaum and Yukl, 1992). While this list is helpful, further research is required to adequately define supervisor behaviors that are universally perceived as supportive.

Even more than supervisor support, organizational transfer climate has been shown to affect the transfer of training significantly. Organizational climate is defined by the interaction between elements within the organizational setting that are observable as well as those that are perceived by trainees (Hellreigel and Slocum, 1974; James and Jones, 1974). Specifically, when trainees perceive a positive organizational climate (e.g., organizational support, rewards, safety policies, nonpunitive error-reporting systems), they appear to apply learned competencies more readily on the job (Baumgartel et al., 1984; Rouiller and Goldstein, 1993; Tracey et al., 1995).

Finally, when organizations promote a continuous learning culture, an aspect of the work environment, competencies are transferred more readily to the workplace. Researchers define a continuous-learning work environment as an environment that encourages the acquisition of knowledge, skills, and attitudes with opportunities to practice, achievement that is reinforced, and the encouragement of innovation and competition (Rosow and Zager, 1988; Dubin, 1990; Tracey et al., 1995). This climate is entrenched in an organization that recognizes that learning is part of their daily work environment. Support of this is found by Tracey et al., who observed more posttraining behaviors in trainees who perceived a continuous learning environment. Therefore, it can be concluded that to reduce errors and encourage improved performance from training, employees must perceive that a continuous learning climate is intrinsic to their organization, thus encouraging the transfer of learned competencies and safe behaviors to the actual workplace.

9.2 Job Aids

Another tool that organizations can utilize to foster transfer of training is job aids. Job aids are developed to assist the user in the actual performance of a job or task (Swezey, 1987). Benefits to the use of job aids include a reduction in the amount of time that employees have to spend away from their job in training and improving performance by minimizing the cognitive load required to memorize various aspects of the job. For example, checklists are a type of job aid that can be provided to employees which will walk them through the steps necessary to complete a task without requiring that the employees have these steps memorized. Job aids can be especially critical in stressful environments where critical items might be omitted from a task. There are several types of job aids, including informational, procedural, and decision making and coaching (Rossett and Gautier-Downes, 1991) (see Table 6). After describing the types of job aids and the process of developing job aids, we discuss how job aids can be used in training and provide examples of both job and training aids that organizations can utilize.

Table 6 Types of Job Aids

Type	Description	When to Use
Informational	Provides access to large amounts of information, such as telephone directory or online database.	During task
Procedural	Provides step-by-step instructions for completing a task, such as directions for installing a faucet.	During task
Decision-making and coaching	Provides a heuristic to guide the user through a thought process to choose the best solution.	Before, during, and after task

9.2.1 Informational Aids

Informational job aids are similar to on-the-job reference manuals. These manuals are provided to employees to reduce mental workload (e.g., recall of memorized information) or in situations where it would be impossible for an employee to remember this information (e.g., an aircraft maintenance manual). Informational job aids may include facts about names, places, dates, and times that would be relevant to the job (Rossett and Gautier-Downes, 1991). Traditionally, these informational job aids have been in paper form, but more recently, informational job aids have been created as computer databases. As technology advances, laptop computers and personal data assistants (PDAs) can augment one's performance on the job by making this type of information readily available.

9.2.2 Procedural Aids

Procedural job aids provide step-by-step instructions for completing a task (Swezey, 1987). Procedural job aids tell the user which actions to take in sequential order and often provide feedback for what the result of that step should look like. The aviation community, for example, uses procedural job aids frequently (in the form of checklists) to assist aircrews with their required tasks. Like informational job aids, procedural job aids have traditionally been produced on paper; however, some companies now provide procedural job aids online to assist employees in completing their tasks. Procedural job aids can also be provided to consumers. For example, the Home Depot provides step-by-step directions online for installing various household items, such as faucets, doorknobs, and locks.

9.2.3 Decision-Making and Coaching Aids

The third type of job aid is decision making and coaching job aids. Also referred to as *heuristics*,

decision-making and coaching job aids provide a reference for employees to consult that will help an employee think along the right lines to determine the best decision or solution to a problem (Rossett and Gautier-Downes, 1991). Decision-making aids differ from procedural aids in that they do not provide steps in a sequential order. Instead, they provide ideas or questions that will simply keep the user along the path that will lead to the best solution while allowing the order of steps to vary.

Traditionally, job aids have only been used during the time that employees are unsure about a piece of information or the next step to take on a task. With the advent and development of decision-making and coaching aids, employees are also able to use job aids prior to and after the specific time they are needed. Decision-making and coaching aids are tied much more closely to training aids than are the other types of job aids because employees can learn different decision-making processes that can be used if similar problems arise on a future task. More specifically, Rossett and Gautier-Downes (1991) provide guidelines for situations in which job aids should be used. These situations are shown in Table 7.

9.2.4 Development of Job Aids

Once you have determined that a specific task requires a job aid, an appropriate and effective job aid must be developed. The first step in developing a job aid is to perform a task analysis, which results in a set of knowledge and skills necessary for the task, equipment necessary to perform the task, technical data required to perform the task, and discrete and critical steps required to perform the task as well as the sequence of those steps (Swezey, 1987). The information garnered from the task analysis will allow development of the type(s) of job aids necessary for the task. Once the job aid is developed, it should be tested and modified to produce the best results. After modifications and revisions are made, job aids should be updated as information, procedures, or decision-making processes change (Rossett and Gautier-Downes, 1991).

Table 7 Situations When Job Aids Should Be Used

- The performance of a task is infrequent and the information is not expected to be remembered.
- The task is complex or has several steps.
- The costs of errors are high.
- Task performance is dependant on knowing a large amount of information.
- Performance depends on dynamic information or procedures.
- Performance can be improved through self-correction.
- The task is simple and there is high turnover volume.
- There is not enough time for training or training resources are not available.

Source: Adapted from Rossett and Gautier-Downes (1991).

Over the last decade, some researchers have suggested that job aids can be used in training and knowledge acquisition (Tillman, 1985). Spaulding and Dwyer (2001) found that the use of job aids is useful for instruction and knowledge acquisition although not all types of job aids are equally useful. These findings have prompted a great deal of research on the use of training aids.

9.2.5 Training Aids

Some job aids can also be used or modified to serve as training aids. Training aids are different from job aids in that they aid in skill and knowledge acquisition and are not used specifically to complete a task while on the job. Training aids are considered to be papers, documents, manuals, or devices that are designed to assist the user in learning the appropriate skills and/or knowledge that is associated with a task or job (Swezey, 1987). Training aids come in many different forms but have generally been associated with manuals given to trainees to supplement the normal training program that companies offer new employees and aid in knowledge acquisition. However, the technological advances of the last decade have provided organizations with the means and opportunity to produce computer-based training aids.

9.2.6 Examples of Job Aids

A number of job aids are available and are used in organizations. We discuss two commonly used job aids: manuals and decision support systems.

Manuals Both informational and procedural job aids can be organized into a manual. Manuals can provide information that is too long or too technical to be memorized, or can provide information on subjects that are not often encountered by an employee. For example, most organizations provide a directory listing employees' phone extensions. This allows people to look for contact information without having to bombard their memories with perhaps hundreds of four-digit numbers. In addition, manuals can be provided that offer procedures for tasks that are not completed often, such as steps in creating posters for presentations. Many organizations are now creating databases or other computer documents with the same information, as it is generally more convenient to use than are large paper manuals.

Manuals have also often been used as training aids. As newly hired employees sit down for their first day of training, they were inevitably handed a large bound notebook entitled "Training Manual." Inside, employees could find all the information they needed to know about the company and information on how to perform their job. Although the training program was designed to teach the major components of the job, the manual was provided as a supplement to classroom training so that the employee could learn the nuances and finer details of the job on his or her own. As technological advances have been made and classroom training programs replaced by other learning strategies discussed earlier (i.e., simulation,

Table 8 Steps in Designing, Delivering, and Evaluating Training Systems

Step	Outcome
	Training Analysis
1. Organizational analysis	Identifies: • Where training is needed • When training is needed • Resources and constraints • Support for transfer
2. Job/task analysis	Identifies: • Task specifications (e.g., what tasks, under what conditions) • Task characteristics (e.g., equipment needed for task) • Competencies (KSAs) needed to perform task
2a. Cognitive task analysis	Identifies: • Cognitive processes and requirements for the task
3. Person analysis	Identifies: • Who needs training • What they need to be trained on
	Training Design
4. Develop training objectives.	• Desired outcomes/goals are identified. • Assumptions about training are identified. • Objectives are documented. • Competencies are established.
5. Consider individual characteristics.	Identifies trainee characteristics that may affect training: • Cognitive ability • Self-efficacy • Goal orientation • Motivation
6. Consider organizational characteristics.	Identifies organizational characteristics that may affect training: • Organizational culture • Policies and procedures • Situational influences • Prepractice conditions
7. Establish practice opportunities.	• Practice opportunities are specified (e.g., when they will occur during training, number of opportunities provided, levels of difficulty).
8. Establish feedback opportunities.	• When feedback will be provided (e.g., immediately after training) and at what level (e.g., individual, team, both) are specified. • Trainees know how they did. • Trainees know where improvements are necessary.
9. Select an instructional strategy.	• The best instructional strategy or combination of strategies will be selected to train competencies of interest based on the needs of the organization (e.g., teams, technology, internationalization).
10. Outline the program content.	• Sequence and structure of the training program is laid out.
	Training Development
11. Develop practices scenarios.	• Realistic practice scenarios are scripted that engage trainees. • Scenarios of varying difficulty are scripted.
12. Develop performance measures.	• The measurement plan is identified. • Criteria for success are developed. • Performance measures are established. • Tools for assisting performance measurement are developed (e.g., observation checklists).
	Training Implementation
13. Select the instructional setting/location.	• Available training site is identified. • Training environment is prepared.
14. Train instructors.	• Instructors are adequately trained to conduct the instruction. • Instructors are knowledgeable in terms of the program content to handle questions and/or problems that may arise.

(*continued overleaf*)

Table 8 (*continued*)

Step	Outcome
15. Conduct a pilot test.	• Issues or concerns with training are identified. • Feedback is received from trainees. • Necessary adjustments are made to the training program.
16. Conduct the instruction.	• Developed instructional materials are put into practice. • Training program is live and functional. • Training program is completed.
	Training Evaluation
17. Consider evaluation design issues.	• Experimental plan is laid out (e.g., posttest only, control group vs. no control group). • Where evaluations will be conducted is specified (i.e., in the field, on the job, both).
18. Consider costs of training evaluations.	• Low-cost alternatives are explored (e.g., unequal sample sizes between trained and untrained groups; low-cost proxy criterion measure selected).
19. Evaluate training system at multiple levels.	• Data on training's effectiveness are collected at multiple levels and analyzed. • Data on job performance are collected and analyzed.
	Transfer of Training
20. Establish a positive posttraining environment.	• Organization and supervisors support competencies on the job. • Continuous learning climate is established. • Trainees are rewarded. • Behaviors that contradict those that are trained are discouraged.
21. Use job aids.	• Performance on the job is enhanced.

scenario-based training, e-learning, distance learning, etc.), the use of manuals as training aids has become less common.

Decision Support Systems Because computers can be found at nearly every workstation in many companies and thus a switch from classroom to computer-based training, companies have developed computer-based job and training aids such as decision support systems (DSSs) and intelligent tutoring systems (ITSs) to replace paper-based job aids and to complement computer-based training programs.

DSSs are designed to improve and support human decision making (Brody et al., 2003) and can be used as both job aids and training aids. As job aids, DSSs are provided to aid in making better decisions during an actual task. For example, the design and implementation of the Navy's DSS associated with TADMUS provided much needed guidance for decision making during training and resulted in increased situation awareness, lower workload, more confidence in the decisions made, and more effective performance (Zachary et al., 1998). Zaklad and Zachary (1992) provided a set of general standards and principles around which a DSS should be designed. A company's specific needs can then be included with the general principles they outlined.

As training aids, DSSs are provided in conjunction with simulated scenarios to aid in teaching better critical thinking and decision-making skills and are just one element in the overall training program. Organizations that use scenario-based training could be particularly benefited by a complementary DSS. During each of the simulated exercises, the DSS could aid the trainee in the decision-making process and provide feedback for each decision that is made. This strategy has been implemented most recently in the military with the development of Synthetic Cognition for Operational Team Training (SCOTT) (Zachary et al., 2001) and Synthetic Teammates for Realtime Anywhere Training and Assessment (STRATA) (Bell, 2003). These distributed-based training programs offer real-time strategy training and feedback via DSS in a secure networked training environment.

Another more specific type of DSS are intelligent tutoring systems (ITSs) (Ong and Ramachandran, 2003). Woolf and colleagues (2001) discuss some of the abilities of various ITSs and how ITSs can be improved to increase the number of people who can use them. ITSs can teach a variety of knowledge domains; however, they require an extensive knowledge of the subject as well as strategies for error diagnosis and decision making and examples and analogies of relevant topics. This requires a great deal of time and work to design and program, but the benefits for organizations of running training programs without the need for a facilitator to be there physically are worth many times the cost. It allows trainees to be trained at their own pace, which should facilitate better transfer of training. The development of ITSs as job aids does not require the same amount of time because the user has already acquired the basic knowledge and normally needs only small amounts of specific information to complete the task or to make a decision.

The job and training aids discussed above are being upgraded and improved constantly by further advances in technology: specifically, cognitive modeling, simulation, and the ongoing development of more realistic and humanlike cognitive agents. Developments in the area of job and training aids give employees the opportunity to acquire knowledge and skills and put that information to practice while being directed by a DSS or an ITS. As the technology develops and further research is conducted, the costs associated with developing and implementing technologically based job and training aids will be driven down.

9.3 Summary

Once training has been evaluated, the training system is not complete. Rather, a climate for transfer must be established and tools (e.g., job aids) provided to help trainees apply what they have learned on the job. Without transfer of the learned competencies on the job, training will not be a success, even if trainees liked the training, learned from the training, and applied what they learned in practice.

10 CONCLUSIONS

Without a knowledgeable and skillful workforce, organizations are likely to suffer. With that in mind, training in organizations should be of the utmost importance. The purpose of this chapter was to provide the human factors community with guidance on designing, delivering, and evaluating a training system (see Table 8). Throughout the chapter we argue that training designers must take a systematic approach to training by considering carefully all aspects of the training program (e.g., individual and organizational characteristics). Organizations must remember that training is more than just a program. Rather, there is a science of training that has been developed by human factors, industrial/organizational, and educational scientists that needs to be exploited. By doing so, organizations can reap the benefits of what the science has to offer.

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engage in systematic empirical evaluation of student judgments about the courses as well as how. the courses actually generate desired learning outcomes.Â delivery and evaluation. Some of these include the need for ubiquitous access to the network, absolute predictability, the need for network pedagogy anchored in an instructor-set â€œnetwork.Â Systems Analysis & Design course the context is the masters degree in information systems. Individual courses must obviously â€œfitâ€ within a larger program objective and the evaluation of. the courseâ€™s effectiveness should extend to assess the role the course plays in the degree (or. certificate) program of which it is a part. Our Training Delivery and Evaluation test measures your knowledge of the training process from pre-training planning through post-training evaluation of results. Designed for experienced trainers and instructional designers, this test covers the following topics: Direct Laboratory Exercises, Instructing Slower and More Capable Learners, ISD Process Stages, Learning Styles, Lesson Plan Development, Managing Learning Environment, and Test Question Construction. 3.8 Evaluation. 4 Systems analysis and design. 5 Object-oriented analysis. 6 Life cycle.Â A systems development life cycle is composed of a number of clearly defined and distinct work phases which are used by systems engineers and systems developers to plan for, design, build, test, and deliver information systems.Â This includes evaluation of the currently used system, information gathering, feasibility studies, and request approval.