allowances, learning or teaching assistance, equipment availability, and facilities accessibility. While supports may be a reward in themselves, others, such as released time, are considered as affordances or deserved allowances for effort expended upon instructional innovation.

The culture's support system factors will facilitate or hinder instructor and student behaviors in the instructional context. For example, a longitudinal study of school teachers' use of technology indicated that their use of innovative strategies and equipment would be influenced by the planning time, on-site assistance, and shared vision provided by the support environment (Ringstaff, Sandholtz, & Dwyer, 1995). Knupfer (1988) found that teachers' main impediment to using instructional computing was the time constraints imposed by curriculum and scheduling constraints of the organization. In the initial design planning stages, the design team should determine if there are sufficient organizational supports for the strategies and media that will be employed during instruction.

TRANSFER CONTEXT FACTORS

Introduction

Transfer is not just the successful application of a learned skill to workplace contexts but rather is continued application, referred to as "maintenance of behavior" (Michalak, 1986). Transfer is promoted by activities undertaken before, during and after training (Leifer & Newstrom, 1980). We do not mean transfer in the narrow sense of task elements (identical elements), but rather of task *situations* that promote continued skill application.

Transfer has been described as a continuum between far and near transfer. Near transfer is analogous to using training-specific behavior on the job and suggests a similarity between the training task and the application task. Far transfer, on the other hand, involves generalizing the task to contexts other than those presented in the instruction (Royer, 1979).

Designers often ignore transfer of training to the work environment (Leifer & Newstrom, 1980, p. 42), even though transfer is a critical concern. Ceci and Roazzi (1994) note that "transfer from one context to another is quite limited . . ." and is ". . . pervasive across all types of learners" (p. 83). Butterfield (1988) refers to transfer as "the most important unsolved problem of education and psychology" (p. 377). Why then do learners fail to transfer?

Part of the answer lies in context. The context of transfer is as important as task and learner transfer factors (McKeogh, Lupart, & Marini, 1996). Situational factors can prevent effort from being converted to performance (Dachler & Moberly, 1973) and can affect transfer independent of the degree of actual learning (Goldstein, 1993) or learner characteristics (Peters, Fisher, & O'Connor, 1982). These factors can also mitigate effects of ability or motivation on the application of learned performance to the workplace (Schneider, 1975; 1978). Situational factors interact with individual differences and motivation to predict transfer performance (Peters, Chassie, Lindholm, O'Connor, & Kline, 1982). In organizational studies, situational effects on performance have ranged from 1 to 16 percent of explained variance (Peters et al., 1985).

Instructional designers often need to create a transfer environment that helps learners to apply their learning to a diverse range of situations. At best, however, work environments are designed to accept changes in student performance, but rarely to support it (Ostroff and Ford, 1989). To support transfer there should be

- opportunities to apply the learning in the transfer context;
- motivation by the learner to apply it; and
- cognitive and social supports to perform it.

These aspects are created by designers (a) determining, via contextual analysis, if certain factors are present in the transfer situation, and (b) cultivating these factors if they are not adequately present.

Learner Factors of the Transfer Context

Quinones, Sego, Ford, and Smith (1995) have cited the transfer literature which "suggests that individuals can actually affect their envi-

ronment through their ability, motivation, and personality characteristics" (p. 31). Their research has extended this body of knowledge by indicating that certain learner characteristics do shape the transfer context by interacting with the immediate environment. While the nature of this interaction may vary depending upon the larger organizational environment, the learner nonetheless is a critical transfer consideration. We will briefly discuss some specific dimensions of learner differences critical to the transfer process.

Perceptions of utility and applicability. Transfer is facilitated by the learner's "motivation to transfer" (Noe, 1986), which is the motivation to utilize their learned capabilities. In a survey of 297 trainees' long-term transfer, the most significant predictor of training use was personal attitude, determined by trainee's opinion of the job and the training (McDonald, 1991). This motivation was in part determined by students' perceptions that the learning can be applied in relevant transfer situations, and that its application is worthwhile. As we previously indicated, these perceptions are best established in the orienting context if they are to affect subsequent transfer (see Goal Setting, Perceived Utility and Applicability sections). As Broad and Newstrom (1986) indicate, "Barriers to transfer of training should be eliminated or reduced before, during, and after training" (p. 22).

Perceived resource availability. In addition to providing the proper tools and equipment for skill application (see next section on the Immediate Environment), learners should believe that they have the physical resources to accomplish their tasks (Noe, 1986; Peters et al., 1980). Learners who do not believe that available resources exist may not be motivated to apply learned skills. This availability includes beliefs that the resources exist and that they are accessible when needed (Tessmer & Harris, 1992). The resources may include tools, equipment, software, job aids, instructors, and other learners. The designer's twofold task is not only to insure that the resources are available, but that the learner is aware of their existence.

Transfer coping strategies. Marx (1982) offers an interesting perspective on failure to transfer. To sustain transfer in the workplace, Marx used a successful relapse prevention model for addictive behaviors. He indicated that learners may periodically "relapse" from the transfer behaviors to older habits unless they have adequate coping skills. For transfer, this equates to coping skills in diagnosing situations that will sabotage their efforts to maintain their new learning. In effect, students must have the skills to conduct a contextual analysis upon their transfer environment, to thus become aware of transfer impediments in the immediate and organizational contexts. Once identified, learners may be encouraged to use such other transfer coping skills as time management, imaging, and stress management to resolve these impediments.

Experiential Background. The ability to transfer is directly impacted by the nature of one's background and level of expertise in a field. Those with a great deal of knowledge and experience in a specific area are more likely to solve problems in a seemingly intuitive manner (Rybash, Hoyer, and Roodin, 1986). Moreover, experts, as opposed to novices, tend to rely increasingly upon their own experience as well as contextual elements of the situations they are addressing (Rose, 1985). Correspondingly, both near and far transfer have been shown to be influenced not only by the nature of the instruction but also by the amount of previous education and training experience as well as the amount of related work experience of the learner (Richey, 1992).

There appears to be a complex relationship between contextualized work and learning experiences that impact one's ability to apply knowledge and solve problems in new situations. Similar conclusions have been drawn by Perkins and Salomon (1989) when they suggest that specialized domain knowledge is a predictor of effective problem solving. For designers, identifying the level of experiential background is important to determining the amount and type of contextual supports that must be provided in the transfer environment (job aids, tools, workgroup support, situational cues).

Immediate Environment Factors of the Transfer Context

Transfer is greatly influenced by the nature of the immediate environment, be it a classroom, workplace, or home. Properly designed, the transfer environment is a source of opportunities, support, and guidance.

Transfer opportunities. One of the basic rules of transfer success is that learners must be provided with sufficient transfer opportunities, over an extended time period, to allow for long-term retention and skill habituation (Quinones et al., 1995; Noe, 1986). Thus, the designer's task is to insure that the transfer context has a sufficient amount of transfer to allow learners to frequently apply their learning over an extended time period. Opportunity for transfer has been described as having three dimensions: the number of trained tasks performed on the job; the frequency with which each task is performed; and the difficulty or criticality of the trained tasks actually performed (Quinones et al., 1995). Each dimension has implications for instructional design.

While task application opportunities are an important consideration, transfer opportunities are also determined by a lack of transfer impediments. A group of trainers ranked interference from the immediate environment as the second highest barrier to transfer, behind lack of on-the-job reinforcement (Newstrom 1986; in Broad and Newstrom, 1992). These impediments include work and time pressures as well as inadequate equipment or facilities to perform the transfer task (Broad & Newstrom, 1992; Newstrom, 1986; Peters et al., 1985).

The transfer context must be opportunistic, designed with application opportunities and a minimum of resource barriers. For example students who have learned a new word-processing program should have a number of word-processing tasks to accomplish over the next several months, but they should also be allowed some on-the-job learning curve time and be able to readily access the software when they need it.

Social support. Social support involves the degree to which supervisors or peers reward or punish trainees for adopting new behaviors (House, 1968). Studies of workplace transfer have indicated that social support can be a potent transfer factor (Marx, 1982; Quinones et al., 1995; Tannenbaum & Yukl, 1992). Research by Tracey et al. (1995) has found the social support system to "play a central role in the transfer of training" (p. 239).

Social support can be broken down into two related but separate and demonstrably effective factors—peer support (Marx, 1982; Tracey et al., 1995), and supervisor support (Baldwin & Ford, 1988; Broad & Newstrom, 1992; Marx, 1982; Michalak, 1986). Both of these social support factors are part of the transfer climate. Peer support can involve encouraging learners to apply learned skills or helping them set goals to use the new skills (Tracey et al., 1995). Its opposite is indicated by peer ridicule of new behaviors (Baldwin & Ford, 1988). Supervisor support may involve rewards or incentives for transfer behavior, verbal praise, or reminders (Tracey et al., 1995). Instructional designers should check for the presence of a supportive (or unsupportive) transfer environment and work with supervisors or coworkers to cultivate missing factors.

Situational cues. Situational cues will remind learners that they should utilize learned skills or will cue them on how to perform them. Such cues should be part of the transfer context itself (Goldstein, 1993). Job aids, for example, cue learners on how to apply new skills or knowledge. Feedback systems (via reviews, evaluations, or tests) remind and instruct learners' transfer behaviors (Tracey et al., 1995). Performance support systems may incorporate both of the preceding elements, and contain other cueing elements such as reminders to apply skills, performance models and advisory systems. Peer and supervisor support systems may provide cues and advice as well as encouragement.

Perhaps one of the most effective transfer cueing devices is that of modeling. Behavior change is often evident in keeping with the extent to which peers and supervisors model the desired behavior. This has long been acknowledged as an effective way of bringing

about attitude change (Gagné, 1985), and performance changes have also been predicted by such characteristics of the environment. On-the-job supervisors are key players in this modeling phenomenon (Richey, 1992); their support is actually demonstrated through behavior modeling.

Organizational Factors of the Transfer Context

What is the organizational environment when viewed in terms of the transfer context? For training settings, the organizational environment is typically a company culture. Such a culture is often distinct from the specific job site, which is the immediate environment. While the organizational environment is more general than the immediate one, its elements are not vague. Some environments value individual creativity; others stress conformity. Some are decentralized; others centralized. Some stress employee empowerment; others do not.

Schools, as organizations, are affected by these same factors. In addition, school-based instruction is influenced by the nature of the surrounding community (Banathy, 1991). This "organization" and its culture provides the forum for diverse practical applications of instruction.

The transfer factors that should be attended to in an analysis of this organizational environment typically are the same as those factors that comprise the orienting context. These factors, such as learning culture and incentives previously discussed, are likely to be stable, and are unlikely to change during the time in which one's orientation to learning is established and the opportunities to transfer occur. As a result, for most situations one can treat the two environments as one during the analysis phase. One of the most critical organizational factors, learning culture, bears a reexamination.

Learning (Transfer) Culture. As indicated in the Instructional Context section, a culture is established by a system of shared beliefs, which are manifest in organizational policies and actions. An organization with a learning culture will be committed to supporting the transfer of that learning. In such a culture, continuous learning is recognized at the organizational level (Tracey et al., 1995) and motivates transfer via administrative commitment (McDonald, 1991; Michalak, 1986). Such a culture provides the resources for transfer as well as the opportunities.

The cultural commitment to transfer often takes a more specific form of incentives to apply new skills, time or resource allowances to apply them, the cultivation of a supervisor or peer-support network, and clear policies on the importance of continuous learning. Work environment behaviors that send a message that learning is important, or cues that suggest the organization is innovative, encourage the application of newly trained behaviors (Tracey et al., 1995). In schools, the successful application of new learning approaches, such as cooperative learning or multimedia-based instruction, must be accompanied by organizational tolerance for errors, cost overruns, and complaints (Knight, 1992; Whitten, 1992).

Incentives. Incentives are a major indicator of organizational commitment to transfer. While incentives are often designed and applied in classroom learning contexts (e.g., Ormrod, 1995; Slavin, 1997), they are often ignored for transfer contexts. Two effective organizational transfer incentives are recognition for quality of skill transfer and social rewards. These incentives may be particularly necessary when the transfer task is not intrinsically interesting or valued to learners (Slavin, 1997). Such incentives can be phased out as learners successfully employ the activity in its intended contexts (Stipek, 193).

As part of contextual analysis, designers should work to identify the level of organizational support for learning transfer. This analysis may be targeted at peer and supervisor attitudes to topic, incentives for use, penalties for mistakes, budgetary commitments, and feedback systems. To identify influential transfer factors, designers can use data-gathering tools such as constraints surveys, Pareto Analysis questionnaires, or contextual observation (see Contextual Analysis Tools section).

CONTEXTUAL ANALYSIS PROCESSES AND PRINCIPLES

General Principles

Thus far, we have delineated the concept of context, its influence upon learning, and its various elements that are critical to the learning process. The next concern is for information gathering. How does a designer identify contextual influences in a particular project? In other words, how can a designer conduct a contextual analysis?

As indicated in the last section, the number and degree of contextual influences varies with each orienting, learning and performance context. Faced with limited time and resources for each project, the designer must know precisely which contextual factors should be investigated. The designer must also know how to expeditiously gather information on those contextual factors. To facilitate those ends we suggest some contextual analysis procedures and principles.

It is generally agreed that one attribute of experts is their ability to be guided by the context in which they are operating (Berliner, 1991; Rowland, 1993). The procedures suggested here provide structure for a contextual design process that might otherwise be regarded as tacit expertise. Contextual analysis is structured problem solving, based upon one's knowledge of the literature and one's past experience. It utilizes prescribed data-gathering techniques combined with traditional design procedures. In short, it provides a way for less experienced designers to behave as experts.

The general phases of contextual analysis are:

Phase I: Strategy Planning

In this stage the designer develops a contextual analysis plan, based on an initial front-end analysis, that contains a list of probably contextual analysis factors. The process should involve design team members and other stakeholders.

1. Determine the general parameters of the design task. This includes the need, intended outcomes, broad-based learner characteristics, resources, and constraints.
2. Identify those orienting, instructional, and transfer context factors suggested by the literature which may be relevant to this project. This paper includes a number of these sources.
3. Identify data targets. Define the sites to be visited, data to be consulted, people to be observed or surveyed, tools to be examined.
4. Select the general contextual analysis methods that match the factors, targets, and constraints of the project. Will site observation be necessary, Pareto Analysis, contextual interviewing, and so forth?
5. Locate, construct or modify contextual data collection tools and techniques for this particular contextual analysis. (See Contextual Analysis Tools section.)

Phase II: Data Collection and Analysis

This stage involves examining project-specific contextual factors from physical, social, cognitive and affective aspects.

1. Collect data on orienting, learning, and transfer context factors.
2. Pinpoint critical inhibiting contextual factors for learning and transfer (e.g., peer resistance to content, didactic teacher roles, unsupportive peer structure, uncomfortable learning facilities).
3. Pinpoint critical missing contextual factors (e.g., no incentives, no task orientation, absence of job aids, nonexistent feedback system).
4. Pinpoint critical facilitative contextual factors that can be exploited (e.g., perceived opportunity to perform, congruence between learner and instructor perceptions of learner's role, ubiquitous job aids).
5. Outline relationships among inhibiting, missing, and facilitative factors in the three contexts. Tables, concept maps, or force field analyses may be used as outliners.

Phase III: Design and Development

The purpose of this stage is to secure the activities, objects, people and events that promote orientation, learning and transfer—to create "environmental favorability" for the learner's enterprise.

1. Identify criteria for "successful" instruction. This includes measures of workplace transfer and organizational impact.
2. Mitigate effect of inhibiting factors (e.g., train supervisors to support employee transfer, change teacher role, lower room temperature).
3. Install missing factors (e.g., secure intrinsic and extrinsic rewards, provide preinstructional task orientation and endorsement).
4. Secure or exploit facilitative factors (e.g., reiterate opportunity to perform, develop AV materials that match learner/teacher role congruence).
5. Monitor the contextual factors of orienting, learning and transfer context during their continued implementation. Where the design team cannot be present, this step might include establishing a monitoring system for learning and transfer.

This three-stage model contains some of the general procedures to analyze and design effective contexts. The success of the analysis will depend upon the implementation of a design plan to exploit or mitigate various contextual factors in a given design project. While conducting the contextual analysis, it helps to bear in mind several principles:

- *Some contextual factors should be considered from several different aspects to fully identify their impact.* For example, seating has overtones of physical comfort, learner roles, and classroom politics. AV materials should be considered for their perceptual quality as well as for the learner and teacher roles they communicate.
- *The interrelationships among contextual factors should be considered during analysis and design.* A change in supervisory support strategies may necessitate (or cause) a change in feedback systems. The preinstructional task orientation that learners are given may directly impact their transfer.
- *Data triangulation may be particularly worthwhile for unobservable or systemic contextual factors.* Defining such factors as *organizational culture, peer support, incentives* or *instructor role* may require a combination of data sources. For example, instructors may be both observed and interviewed (as well as their supervisors) to clarify instructor role perceptions.

CONTEXTUAL ANALYSIS TOOLS

So far we have delineated the concept of context, its influence upon learning and performance, its various factors, and a process for conducting contextual analysis. The next design concern is information gathering: how does a designer identify contextual influences in a particular project? In other words, what contextual analysis tools can be used?

The designer needs contextual analysis tools that isolate critical elements of the orienting, learning, and transfer contexts. Since contextual analysis has not been implemented as part of the formal instructional design process, there is little information about the type or efficacy of contextual analysis tools for instructional design. We suggest several context analysis techniques that have been useful in organizational development, human factors, and personnel psychology. These tools are:

- surveys of context members or stakeholders (Pareto Analysis, constraints surveys);
- interviews with members or stakeholders (open-ended context questions, contextual interviews);
- observations of teachers and learners in context (contextual observation, contextual interview), and
- depictions of the context for interviews.

Pareto Analysis

A long-standing organizational development tool, the Pareto principle assumes that there are a "vital few" of many factors that affect production or performance (Juran & Gryna, 1988; Overfield, 1994). For instructional design, a Pareto Analysis would be used to identify the few contextual factors that contribute to the bulk of learning or performance loss. Rather than simply describe or rank contextual influences, a Pareto Analysis has respondents allocate points to "fix" contextual influences. The results indi-

cate both the rank and weight of contextual influences, for both individual and group respondents. Theoretically, a small group of contextual factors will emerge from among the choices. Caldwell (1994) and Tessmer (1995) have used a Pareto-type analysis to identify critical classroom learning factors that required replacement or redesign. In each case several select factors emerged from the analysis.

Pareto respondents are given a fixed set of points (often 100) that they allocate to changes aspects of their learning or performance context, based on their importance. Respondents are given a list of contextual influences and are told that they may allocate any or all of the points as they see fit (Table 3). It may require only 10–15 minutes to summarize a small group's results (Tessmer, 1995). To clarify and elaborate survey results, a focus group discussion of ratings can immediately follow.

Pareto Analysis is a quick and easy method for determining a contextual factor's overall priority weight for change, mean ranking, and variances from the mean ranking. It presupposes that you have already identified most potentially influential contextual factors, although respondents may add factors to their list. It also assumes that respondents are conscious of the types of factors that affect them and the degree to which they are affected. People may be unaware of contextual elements around them (Smith & Kearney, 1994, p. 33).

Constraints Surveys

For decades, organizational researchers have used surveys to identify influential organizational elements (Schneider, 1978; Peters et al., 1985). Constraints surveys have been used to identify influences in the orienting, learning, and transfer contexts (Knupfer, 1988; McDonald, 1991; Noe & Schmitt, 1986). Coupled with the critical incident method, constraints surveys allow the surveyor to construct a model of the contextual influences within the organization or upon a work group (Schneider, 1975). With the onset of computer-delivered surveys, data collection and analysis becomes quicker (Tessmer, 1994), making the survey a more feasible contextual analysis tool.

There are several types of contextual survey methods. One of the most used and validated methods is the constraints questionnaire. Lists of potential constraints are rated or ranked by students, workers, or managers on a semantic differential scale (Table 4). The response data may be analyzed to determine the most influential contextual factors or to generate a path analysis model of the relationship between contextual factors (Clark, Dobbins, & Ladd, 1993; Tracey et al., 1995).

Other contextual questionnaire methods, such as adjective checklists and semantic differential scales, are detailed in Tessmer and Harris (1992).

Historically, constraints surveys may have been too one-sided, because they have focused on contextual inhibitors and not facilitators. To identify contextual strengths, a designer should expand the constraint-survey approach or use complementary data-gathering methods (observation, interview). Questionnaires do

Table 3 ☐ Pareto Analysis Excerpt (from Tessmer, 1995)

What amount of points would you commit to fixing different instructional factors of this course? You have 100 total "fix points." The more points you allot to some factor the better it will be fixed. You do not have to commit points to all the factors.

Factor	*Points*	*Comments*
Student Participation		
Instructional Scenarios		
Instructor Explanations		
Project Guidance		
Advising		
Other		
Total = 100		