It is difficult to overestimate the importance of software training to commercial end users. An increasing percentage of both large and small retail businesses use microcomputers in their daily activities, for example, and recent studies suggest that this trend will continue [Nazem and Price, 1989]. Similarly, in a nationwide survey of 1,481 MIS executives, the Olsten Corporation found that computer literacy requirements have skyrocketed (since 1991) in almost every end-user category, and that over seventy percent of companies now require computer competency in their middle and senior management positions [Olsten, 1993]. The requirements were even higher for secretaries and support personnel—averaging over ninety percent for both categories in the survey.

There are many reasons why businesses are likely to use computer-based training (CBT) to meet these end-user competency requirements in the late 1990s. With disk-based tutorials on microcomputers, for example, users learn at their own pace and during times of their own convenience. Microcomputers have also been a positive CBT force through lowered hardware costs and improved software tutorials.

CBT enjoys many other organizational advantages. Additional benefits mentioned in the literature include (1) standardized presentations and teaching contents, (2) professionally-prepared presentations or training guides, which are often delivered in colorful, eye-pleasing formats, (3) consistent skill levels guaranteed by common unit-mastery chapters or tests, (4) an opportunity to use readily-available microcomputers for training purposes, (5) ability to tutor employees at remote or geographically-disbursed office sites, (6) less demand for onsite teaching assistance and other instructional resources, (7) teaching tools that remain in place even though instructors may change, (8) the ability to acquire important computer skills without taking semester-long college or technical school courses, and (9) the ability to deliver important training without taxing limited training personnel [Adams, 1993; Allan, 1993; Bragg, 1988; Ganger, 1989; Kirrane and Kirrane, 1989].

Training magazine’s annual survey indicates that about 66
percent of all U.S. organizations with 100 or more employees use computers in training, and about 41 percent use formal CBT applications [Oberla, 1990]. One reason for this may be the fact that entry-level employee skills are often disappointingly low, and that computer-based training, provided either inhouse or through professional training bureaus, enables employers to teach remedial skills cost-effectively to new hires. The incentive to utilize some CBT will also continue to grow as better technology becomes available and labor-intensive training sessions become increasingly expensive. In fact, CBT may soon become best known for “on-demand training”—for example, when a mechanic uses an animated, multimedia reference manual to learn how to install a new part.

**Effectiveness of CBT**

It is reasonable to ask whether the *convenience* of CBT is purchased at the cost of learning *effectiveness*. The problem in answering this question is that “effectiveness” is often difficult to measure. For example, it is useful to distinguish between those CBT applications that are clearly superior to lecture-based formats, and those CBT applications that are merely adequate for the training tasks at hand. An interesting anomaly is that CBT applications can simultaneously “inferior” (to lectures) and “cost-effective.”

Unfortunately, formal assessments of CBT are difficult to secure and generalize because of continual changes in hardware and software, a diversity of experimental subgroups, and a wide variety of evaluative techniques for measuring CBT effectiveness [Yellen, 1989]. In non-academic settings, there is certainly some evidence to suggest that—under the right circumstances—CBT is more cost-effective than traditional classroom training and can help people learn at least as well as they do in lecture environments [Gerber, 1990]. Pilot training for airlines and weapons handling for the armed forces are two notable examples. But there have also been a number of less-well-publicized, multimillion-dollar failures as well [Bovier, 1993].

Private businesses conduct their own, mostly unpublished, studies of CBT training, and appear less willing to share their results. If it is true that “training is the ultimate competitive weapon” [Gerber, 1990, p. 29], firms may be understandably reluctant to report large successes for proprietary reasons. What evidence is available suggests that effectiveness rates in commercial environments vary, but successful applications are not guaranteed and users not always satisfied [Carliner, 1989; Wehr, 1988]. A study by Gingrich and Honeycutt, for example, found that retailers rated their long-term satisfaction with “training” dead last as a support function [Gingrich and Honeycutt, 1989]. In general, however, the impact of the CBT in commercial environments has often gone unassessed.

The effectiveness of CBT has been analyzed more carefully in grade school and high-school educational settings, but the results are also somewhat unsettling. For example, an early study focusing on software for the disabled found that commercial software was seldom evaluated, and that most vendors did not know about the evaluations when their software was evaluated [Krass, et. al., 1972]. This situation also appears to hold today for other disciplines and application areas.

Past studies of CBT in lower-education applications have attempted to determine whether there were significant differences between treatments. These so called “box score summaries” have had limited value since most experimental studies have yielded insignificant results and used highly-subjective measures of performance [Slavin, 1984]. In general, reviews of the overall available research conclude that (1) there are no significant differences between approaches [Florida Dept. of Education, 1980], (2) CBT may be a good supplement to traditional instruction [Jamieson, et. al., 1977], (3) CBT saves time [Edwards, et. al, 1983], (4) the higher the grade level, the more effective the training [Kulik and Kulik, 1980], and (5) completion rates can be improved with encouragement, monitored progress, and penalties for non-performance [Wilson, 1991].

The practice of employing computers to help teach university students has accelerated with the availability of microcomputer-based software and self-teaching tutorials [James, 1988]. To many, therefore, the evaluation of CBT in higher education has been disappointing even though the utility of CBT continues to be of major consequence. Some questions include “Is student learning improved through CBT usage?” “Do students like it?” “Which students benefit most from CBT training?” “What forms of sequencing, questioning, stylistic presentation, and learning objectives are most usefully addressed with CBT?” Roblyer, et. al. [1988] note that “although computers have been used in instructional roles since the early 1960s, the answers to these questions remain largely unanswered—and the questions themselves are often unasked.”

Several authors provide reasons why CBT has not been studied more actively, comprehensively, and expertly at higher educational levels. Roblyer, et. al [1988], attributes the lack of greater university interest to the placement of many CBT programs in kindergarten through 12th grade, leading in some cases to unsophisticated evaluations by lower school personnel. Schlecter [1991] suggests that inadequate funding, inadequate software, poor planning and preparation, and unrealistic expectations also play a role. McClintock [1988] indicates that computing is still an “immature technology,” and needs more time to develop successful CBT applications.

Finally, Reeves [1991] suggests that (1) the reigning view of university teaching is a traditional flow of information from a live teacher, (2) the existing faculty reward structure does not generally support quality instruction of any type, much less the development and implementation of effective CBT, (3) there are “rampant misunderstandings” of the benefits and findings.
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