
**Diffusion and Adoption of Instructional Technology**

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It must be remembered that there is nothing more difficult to plan, more doubtful of success, nor more dangerous to manage than the creation of a new system. For the initiator has the enmity of all who would profit by the preservation of the old institution and merely lukewarm defenders in those who would gain by the new ones.

*Machiavelli, 1513*

This advice sits on my desk and serves as a constant reminder of the task that faces the instructional technologist who promotes the use of new technologies and methods of instruction, not for the sake of using the new just because it's there, but for the benefit of the hundreds and thousands who will be affected by its adoption.

This quotation is also found in the now classic *Diffusion of Innovations*, by Everett Rogers (1983). For anyone responsible for the diffusion of new technologies, such as CD-ROM, multimedia, video conferencing; and new techniques, such as minimalist design, this book is a great source of ideas. Rogers provides sound guidance, and his ideas are especially applicable to problems encountered by the instructional technologist acting as a change agent. Instructional technology benefits, barriers faced by the instructional technologist, and some ways for overcoming such barriers are covered in this chapter.

*Instructional technology* for some people means the hardware and software or "technology used in education." To others it is the techniques and methods of instruction or "technology of education" (Percival & Ellington, 1984). For this discussion, instructional technology will be considered to be part of the broader view of technology described by Jacques Ellul in *The Technological Society* (1964). This view includes machines, techniques, and the whole fabric of society. I believe this broader view must be taken by the instructional technologist if new technologies are to be introduced, diffused, and successfully adopted.

**BENEFITS**

Instructional technology in its broadest sense—i.e., needs assessment, instructional design, computer use, media selection, and evaluation—can reduce training costs and improve performance. In my organization, for example, significant benefits have been realized by using a systems approach to developing training programs. The systems approach, coupled with sophisticated course development techniques and hardware/software technology, yields consistent, high-quality training programs. For years we have relied on well-designed, paper-based, self-study, and centralized instructor-led training approaches. Now, after investigating and evaluating new approaches, there is a gradual shift toward alternative delivery strategies that will allow quality improvement and/or reduction of training costs. Benefits arise from savings of travel costs, reduced or eliminated instructor costs, and conservation of learner time and cost by avoiding already mastered knowledge/skill areas through the use of computer-based testing. Since most employers pay salaries while employees are being trained, each hour of unneeded training avoided can amount to substantial savings when one considers the volume of personnel being trained. In addition, on-demand delivery ensures that learners receive training in time for actual use on the job where the knowledge or skill is relevant.

In schools, colleges, and universities, students are not usually paid to learn; however, technology can be used to individualize lessons, thus improving the quality of learning and for some students increasing the amount of education available in a given time frame. This is important when it is recognized that people have multiple intelligences (Gardner, 1989) or multiple aspects of intelligence and styles of learning (Sternberg, 1988). It is extremely difficult for an instructor of a class with 30 or more students to keep up with all this complexity, with the variety of intellectual levels, and with different learning styles. New techniques and technologies, such as collaborative learning or computer-based tutorials and simulations, must be adopted to enhance the skills of the teacher if the goal is to improve the quality of education.

Given that technology, appropriately used, can provide significant benefits to the learner, what are some barriers to adopting new education and training technologies? How can instructional technologists help organizations and institutions change and adopt new technologies?

**BARRIERS**

Major factors to be considered by the instructional technologist are people issues, including cultural traditions, risk aversion, lack of knowledge, and user acceptance. Cost and infrastructure issues must also be considered.

**People Issues**

The culture developed within an institution or within an organization can act as a barrier to change. The difficulty encountered with transplanting the open classroom approach from Great Britain to the United States during the 1960s (Garner, 1989) is a good example of this. Another example of a cultural barrier is the tradition found in most business organizations of delegating computer work to subordinates. As a result of this tradition, many executives do not regularly use computers and may even be reluctant to use them for training.

Change becomes an issue when it creates uncertainty. Under normal circumstances people are reluctant to change if things are working well. Consequently, new ideas about how to develop and conduct training may not be accepted simply because the untried seems too risky. For
example, there may be concern that converting from traditional instructor-led to alternate strategies, such as computer-based delivery, would reduce effectiveness because personal contact for networking or group discussion during the process is lost.

Knowing who and where your clients are and what they want is also important. "A change agent influences client's innovation decisions" (Rogers, 1983). For an instructional technologist to be effective as a change agent, he or she must understand that such clients are spread throughout an organization. There are many varieties of clients or "buyers" (Porter, 1985) who can make or break the adoption of a new technology. These include, but are not necessarily limited to, management, information systems technologists, subject experts, instructional designers (other than the instructional technologist acting as the change agent), and most important, learners. The instructional technologist must understand the concept of "buyer value" (Porter, 1985). Buyer value, according to Porter, involves lowering buyer costs or raising buyer performance. This includes meeting buyers' desires and expectations of the new product or technique.

Some characteristics of buyers of instructional technology follow:

- **Management**—Typically authorize and approve spending for new technology. They represent the organization or institution and are primarily interested in costs and benefits, although they may have biases about educational practices that could present barriers to adopting innovative techniques. They expect the product or technique to improve performance and to do so in a cost-effective manner.

- **Information systems technologists**—Concerned with hardware and software standards that support compatibility, connectivity, and interoperability. Experience has shown them that the introduction of technologies different from standards can raise the cost of such items as programming, training, and technical support. They will need to be shown that the benefits of using new technologies outweigh costs and that such technologies can be successfully integrated with the current installed base.

- **Subject experts**—Primarily interested in protecting the integrity of their material. They frequently believe that, since they are the experts, they know how best to teach their subjects. They will need to be won over and convinced by the instructional technologist that their material will be easier to learn using new delivery techniques and technology.

- **Instructional designers**—Specifically interested in instructionally sound approaches and may or may not have worked with new technologies of delivery such as advanced computer-based or video conferencing techniques. This group needs to be convinced that the use of new technology will be effective as a delivery strategy.

- **Learners**—As end users, learners must find the new technology acceptable if it is to be successfully adopted. Material must be interesting and motivating; technical environments must be easy to use and easily accessible. Learners may also require training in skills, such as keyboarding, to make use of computer-based training applications.

**Cost Issues**

Cost can arise as a barrier to the acceptance of any new technology. This includes development as well as delivery cost. What is frequently not understood, however, is the cost of not adopting new approaches. For example, if one hour of paid student time can be saved in a course and that hour, multiplied over hundreds or thousands of students, exceeds the cost of the technology needed to save the hour, then the use of the technology may be justified.

**Infrastructure Issues**

Availability of or access to equipment and software can be a big factor in adopting new technology. People's schedules may not permit them to use new technology unless it is readily available.

Another major barrier is the technology that is in place and working. It includes such items as standards, operating system software, and the base of machines to be used for training delivery. A technology that relies on new software and equipment will have to overcome the inertia of maintaining existing systems, and it may be impossible to introduce it only at the rate that new hardware and software replace old systems. This is not a barrier that one can directly attribute to people, although some decision makers may have the power to change the situation.

**OVERCOMING BARRIERS**

The instructional technologist striving to overcome these barriers and improve the chances for successful diffusion of beneficial instructional technologies can try a number of strategies and approaches. These approaches involve people at all levels of the organization, since any group can help or hinder diffusion depending on its perception of the value of the new technology. Approaches that address cost and infrastructure concerns should also be considered. The instructional technologist acting as a change agent should develop a plan that targets a variety of audiences and includes more than one strategy for diffusion. The plan could be considered analogous to marketing strategies used for commercial products.

**Overcoming People Issues**

Management presentations can be used to gain acceptance at the top of an organization and are important in getting strategic support for diffusion. Management is most interested in performance improvement and cost-effectiveness. In a business situation, this should lead to competitive advantage. Management wants courses to be well received by the learner, but if the first two criteria are not met, acceptance matters little from management's perspective.

The instructional technologist can present facts and figures from external and internal sources where the new technology, such as interactive video, has been successfully applied. Testimonials of favorable experience by groups within the organization can be presented to management to gain backing for further diffusion.

Demonstrations can be effective in generating interest at all levels of an organization, from learners to top management. Functions and features of the product shown in a real-life setting provide potential buyers with an opportunity to try a tangible product; the product is no longer just a description in a brochure.

Prototypes specifically designed to meet end users' needs can be effective. The buyer is heavily involved with the instructional technologist in the definition, design, and development of the prototype product. This approach helps gain commitment while minimizing risk. If the prototype proves to be successful with learners, then further development of the approach is justified. If the prototype is found to be defective, the buyer has saved a major investment. He or she still has the option of trying another approach that may be successful.

A successful pilot test can be used to gain the confidence of a larger audience with similar needs. A pilot is the tryout of a finished training product early in its life cycle with the expectation that it will be adopted by a large number of users over time. The instructional technologist will want to have any training product formally evaluated in terms of user acceptance, performance improvement, and cost-effectiveness as compared to alternative methods. Defects detected during pilot are repaired to ensure that users will accept the product. Favorable report results can be used to promote usage among other groups.
Not all innovation is diffused top-down (Rogers, 1983). In some cases instructional technologists will find themselves acting as technology transfer agents between groups. Someone interested in computer-based multimedia may want to see what other groups are doing. In this situation, the instructional technologist serves as a conduit and puts one group in contact with another to further the diffusion of the innovation.

The instructional technologist who is an expert in a given technology, such as computer-based training, can also spread that expertise to others through formal training programs or through participation as a member of a project team. The more people are familiar with a new instructional technology, the more likely it is its use in an organization.

Publicity and promotion channels can be used by the instructional technologist to disseminate the advantages and benefits of the innovation. Channels include in-house meetings, newsletters, reports, or circulating files. One-on-one selling is important, too. The instructional technologist should take advantage of informal personal contacts and establish relationships with others to spread the word about innovations.

External recognition from professional societies is important, too, because it comes back to influence decision makers within one’s own organization.

Overcoming Cost Issues

To overcome cost barriers the instructional technologist should take a life cycle cost-benefit approach to training development and delivery and compare alternative strategies. While development and capital cost may be higher for technology-based instruction, it may yield substantial delivery savings over the volume and life of the training (i.e., annual audience size times shelf-life in years) in excess of initial costs. Such savings typically arise from elimination of travel and instructor time, reduction of learner time, and/or improved job performance. The instructional technologist is more likely to gain support for new technologies when such savings and performance improvement are well documented and presented to key decision makers.

Overcoming Infrastructure Issues

The preceding discussion of cost-benefit can be a major factor in overcoming infrastructure issues. Showing the benefits of adding equipment or upgrading existing systems can help gain support for new technologies. If cost savings and performance improvement do not justify major changes in the infrastructure, there may still be justification for introducing new technologies on an incremental basis. Courseware could be built to take advantage of planned migration to new delivery systems, or there may be ways to introduce less sophisticated versions of new technology on existing systems with plans to upgrade in the future. Once a beachhead is established, further diffusion of new technology is made easier.

SUMMARY

The instructional technologist, as a change agent, has to deal with a variety of potential barriers in promoting the diffusion of innovations used in the learning process. These barriers include cultures, individuals, cost issues, and infrastructure.

To overcome these barriers, the instructional technologist must think more like an entrepreneur, work on many fronts, and be armed with a variety of alternative strategies. In the complexity of today’s and tomorrow’s world, going beyond a single approach to diffusion or promotion of new technology with just one group will increase chances for its successful adoption by other groups.

REFERENCES


