Cost Comparison: Instructor-Led Vs. E-Learning
By Paul T. Walliker

To help managers better understand the relationship between cost and delivery methodology, Caterpillar University has constructed a mathematical model to better calculate the key cost components.

Of the many factors that come into play when determining the proper training delivery approach—efficiency, timeliness, consistency, and appropriateness of delivery method—the key driver is typically program cost. Program cost, which includes among other factors, the cost of initial development, instructor’s time, material, travel, and opportunity cost of the learner, can vary widely for similar programs depending on the delivery method.

To help its managers better understand the relationship between cost and delivery methodology, Caterpillar University constructed a mathematical model to better calculate the key cost components. Its key finding: even when similar programs are compared, e-learning is less expensive to deliver almost regardless of learner population. For example, in all cases where there is a learner population larger than 100, e-learning has a clear cost advantage. As the population increases, this difference becomes more pronounced. Even with a population as small as 100 and a class as short as one hour, e-learning was still more than 40 percent less expensive than instructor-led training ($9,500 vs. $17,062 or $76/learner). When large populations are modeled (40,000+), the cost advantage of online learning is even greater, with savings as high as 78 percent ($1.1 million vs. $5 million or $99/learner).

Costs per development and delivery hour

A number of factors should be examined when comparing the respective costs of learning delivery methods. These factors include course development costs, salaries, time required to prepare for and conclude each class, the cost of outside instructional material, travel costs, learner opportunity costs, and the allocated cost of the classroom or conference room. Beyond these factors, there are the very real costs of instructional efficiency and learning velocity—or how quickly a program can be delivered across an organization, learning efficiency, timeliness, consistency, and ease of updating material.

E-learning has an advantage in nearly every area, including efficiency and velocity. According to a Brandon Hall article in Forbes (“Benchmark Study of Best Practices,” 2000), online learners enjoy an efficiency advantage in being able to cover the same material in
approximately half the time of a traditional class. In addition, e-learning has a velocity advantage by being able to reach a large number of learners in a short amount of time. This advantage becomes even more pronounced as the number of learners increases or when learners are geographically dispersed.

A factor that Caterpillar University did not include in its analysis is the allocated cost of a learning management system. Almost every organization uses an LMS—whether they realize it or not. Systems range from basic pencil-and-paper files to sophisticated enterprise web-based systems, such as SABA, Docent, or Aspen. Regardless of the system used, there will be system costs associated with scheduling, tracking, and delivering both instructor-led and e-learning classes, and these costs will essentially cancel each other out.

**Factors affecting costs**

Here's a look at the values and the rationale behind several of the factors Caterpillar University uses to calculate costs. While this list is not exhaustive, it does cover the major areas that can influence the cost of training delivery.

**Development Cost Per Hour of Instruction**

- **Instructor-led:** 33 hours @ $135 per hour = $4,455
- **E-learning:** 100 hours @ $135 per hour = $13,500

Caterpillar uses a 3:1 ratio between instructor-led training and e-learning development time. Costs can vary depending on complexity of material and whether developers are already familiar with the material. In general, internal developers are able to develop instructional material in less time than external developers. However, external developers may sometimes be seen as a less costly option, especially if project management and SME time is excluded.

**Instructor Cost Per Hour of Instruction**

- **Instructor-led:** $150/hour instructor burden rate
- **E-Learning:** n/a

Caterpillar uses a formula of $150/hour instructor burden. One caveat: There is an often-voiced perception that initiatives using a train-the-trainer approach are either delivered free or at the average burden rate. This factor is a variable that can be adjusted easily.

**Prep Time and Post-Class Activity**

- **Instructor-led:** $150/class
- **E-Learning:** n/a

At Caterpillar, there is approximately ½ hour of prep time both before and after each class. Prep time includes room set-up and material gathering. Post class activity includes not just tear down but entering class completions into the LMS.

**Material Cost**

- **Instructor-led:** $280/14 person class
- **E-Learning:** n/a

At Caterpillar, material costs approximately $20 per student, per class. This includes development, duplicating, printing, collating, binding, and storage.

**Instructor Travel Costs**

- **Instructor-led:** 10 percent of instructor cost
- **E-Learning:** n/a
Travel can add to the cost of any program, especially for facilities that do not have instructors on site.

**Learner Opportunity Cost**

- **Instructor-led:** Length of class + 15 minutes before + 15 minutes after
- **E-Learning:** ½ length of equivalent instructor-led class

This is the cost to an organization when learners are away from their job. According to a 2002 *Learning Circuits* article by John Moran, this cost doubles if learners' position must be covered during class. In general, e-learners will cover the same course material in half the time (Hall 2000 and Moran 2002). This means that, on average, an e-learner can cover one hour of classroom material in ½ hour online. Because e-learning usually occurs at the employee’s desk, there is little or no interference time before and after class.

**Physical Classroom**

- **Instructor-led:** Overhead allocation
- **E-Learning:** n/a

In most cases, e-learning does not require the use of a dedicated classroom. (Learners who do not have access to a computer will have to use a computer lab.) A more complete cost comparison would include the allocated cost of a conference room or classroom.

**Efficiency**

- **Instructor-led:** Much less efficient
- **E-Learning:** Very efficient

Moran defines training efficiency as “gained knowledge or skills” divided by “all information delivered.” If only 15 minutes of an one-hour class is relevant, the class was 25 percent efficient because the learner had to sit through 45 minutes of unnecessary material. If an e-learner is able to skip 45 minutes of material, or pass a pre-assessment test, allowing them to focus exclusively on the 15 minutes of new material, the efficiency of the online class would equal 100 percent. It is this efficiency that gives e-learning the 2:1 time advantage it enjoys over instructor-led training, according to Brandon Hall. In general, a learner will need half the time to cover the same material in an online class as they would in an instructor-led class.

**Velocity**

- **Instructor-led:** Lowest
- **E-Learning:** Highest

A key e-learning driver is velocity. In October 2004, for instance, more than 1,500 Caterpillar employees took the half-hour Office Safety (08C1208) e-learning course. Had this class been delivered as instructor-led training, Caterpillar would have scheduled 107 one-hour classes (1,500 divided by average ILT class size of 14). A task that could not have been completed in a single month under the best of circumstances.

Consider the following scenario: The 20 most popular e-learning titles that same month accounted for 14,000 successfully completed classes. If those classes had been delivered via traditional ILT, it would have required 1,000 one and two-hour instructor-led classes, or approximately six months worth of non-stop 40-hour work weeks. By comparison, there are 365 ILT classes delivered at Caterpillar in an average month. Also, because e-learning classes are web-based, they are taken by learners in nearly every business unit worldwide during the same month.

**Timeliness**

- **Instructor-led:** Lowest
- **E-Learning:** Highest
Timeliness refers to the immediacy of the instruction. Namely, how relevant is it to the task at hand. Instructor-led training has been referred to by Hall as training that is delivered just-in-case while e-learning is delivered just-in-time. Instructor-led training requires the coordinated scheduling of the instructor, facilities, and students at some future date. E-learning, on the other hand, can be delivered anytime it is convenient for the learner.

Consistency

- Instructor-led: Lowest
- E-Learning: Highest

One of the e-learning advantages noted by Hall is consistency, or the ability to deliver the same message every time. This can be especially important for such topics as government regulation.

Ease of Updating

- Instructor-led: Lowest
- E-Learning: Highest

Because e-learning material typically is delivered from a central database, it enjoys the flexibility of being easily updated. New material can be added, old material can be updated, and mistakes corrected in a single location.

Constructing the model

In constructing the model to compare the development and delivery costs of instructor-led and e-learning, Caterpillar University has by necessity included certain factors and excluded others. The factors that it has included are both easily quantifiable and generally understood. The ones excluded from this model, while important, and maybe even the most important depending upon the circumstances, require more research to quantify and enjoy less of a consensus as to their relative importance. The factors included in the model are

- development cost per hour of instruction
- instructor cost per hour of instruction
- instructor prep time and post class activity time
- instructor travel costs
- learner opportunity costs.

Caterpillar has chosen not to attempt to quantify the allocated cost of the physical classroom because this can vary widely by business unit along with the availability or unavailability of dedicated classrooms. These calculations also exclude efficiency, although this aspect is somewhat addressed by learner opportunity cost. Additionally, Caterpillar has omitted velocity, timeliness, consistency, and ease of making updates to current calculations. A strong case can be made for each of the excluded factors under the right circumstances. The value of training velocity during a new product introduction or the timeliness of software application training would have great value to a specific program but may not be as important as a general rule.

Key findings

The key finding for Caterpillar University is that when similar programs are compared, e-learning is less expensive to deliver almost regardless of learner population. Even with a population as small as 100 people and a class as short as one hour, e-learning was still more than 40 percent less expensive than ILT when learner opportunity costs were taken into account ($9,500 vs. $17,062). When large populations and longer programs are modeled, the cost advantage of online learning is even more pronounced, with savings as high as 78 percent (Figure 2). In the model, the per student cost for e-learning is less than the comparable instructor-led cost with a population as small as 21 students (one-hour example) and no more than 83 students (four-hour example).
In all cases where there is a potential learner population larger than 100, e-learning has a clear advantage in the overall cost of development and delivery. As the learner population increases, this difference becomes pronounced and holds true even if the value of the learner’s time is not included in the calculation. Beyond the factors used in the model, many other factors such as consistency, velocity, and timeliness, affect the cost and quality of learning delivery. While this model does not consider them, they would be fertile ground for future research.

E-learning is not the appropriate delivery method for all training. Programs that require role playing or close observation by the instructor may not be candidates for an online program. On the other hand, the total cost of delivering an instructor-led class to thousands of potential students cannot be ignored and needs to be recognized whenever an organization is in the planning phase of a large training initiative.

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