Planning an Effective Training Program

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In Quality Is Free, *Bill Corsby notes that the cost to build a product correctly (cost of conformance) is lower than the cost to fix the product after delivery to clients (cost of nonconformance). The same concept is true in training: the cost of good training is lower than the cost of not training or of training poorly. Organizations stand to lose significant amounts of money from lost productivity when there are changes in process, technology, or culture and employees are not properly trained to handle them. Some organizations report a 3,000 percent to 6,000 percent return on investment from good training [1]. By contrast, poor training or poorly planned training wastes money and time and lowers morale. A properly planned training program is required to ensure success and return on investment for training dollars.*

The first thing to ask when planning a training program is "What do people need to do their jobs?" The answers to this question usually fall into the following categories:

- Process – a way to work.
- Technology – the tools with which to work.
- Management support – a reason for the work.
- Skills – ability to do the work.

Process addresses what work to do, how to perform the task, when to do it, what resources are required, who has the inputs, and who gets the results. Without process, there is chaos. Training alone cannot establish process, but process improvement is at best transitory without good training. Also, ineffective, inconsistent, or undocumented processes require more training to overcome the confusion or miscommunication that is rife in immature organizations. Employees who attend training and return to an undisciplined environment will often not use the skills learned. The money spent on the training will have been wasted and morale will suffer.

Technology. People need appropriate tools and technology to perform their jobs. An organization and its management select, purchase, and make available the appropriate technology. The company's process indicates appropriate uses for the technology. Training tells the employee how to successfully use new technology.

Management support is needed to provide the motivation for effective organizational change. An effective reward system reinforces desired behavior and corrects undesired behavior. Although some organizations try to *motivate* through training, there is little or no lasting impact with this approach. Courses that attempt to motivate have objectives that use phrases such as "understand" or "provide an overview" or "gain an appreciation." Participants may leave this kind of training enthused, but a week later they are back to old work patterns. Training cannot be effective without management support consistent with the messages in the training program.

Skills and knowledge are where training can have the most impact in an organization. Skills that people need overlap with process and technology and are reinforced through effective management support. Training is not the solution to problems that businesses have today; however, without training, an organization will fail in its process improvement program.

This article defines effective training, discusses various means to deliver training, and suggests possible metrics to evaluate training effectiveness.

Training Goals

Effective training is integrated and consistent with many aspects of a software development group. It must be consistent with the following:

- *Organizational goals and strategy.* Although training does not define or establish business strategy, it is important to reinforce that strategy at every opportunity, including during training. Training developed and delivered within the organization should always begin with the business goals. Any training purchased from outside can be aligned with those goals if it is introduced by senior management, who reinforce the mission and vision.
- *Project planning.* The Organization Standard Software Process (OSSP) software project planning procedures need to address project training needs. For example, software development planning standards should account for training to encourage the planners to consider what skills and abilities their project team members will require.
- *Software quality assurance (SQA).* An independent SQA program must be highly involved in training. Independent SQA can perform multiple roles for a software development organization: verifying the implementation of processes, mentoring projects in the use of processes, and collecting and analyzing data on the quality of product and process. Integrating training and SQA means several things. First, some training may be delivered by the SQA organization. Second, SQA participates in the review of training materials to ensure that the messages of the training are consistent with the organization's standard software process. Third, SQA ensures that

project teams receive the training that had been planned. Finally, as SQA analyzes process and product quality, it may propose additional training or improvement of existing training.

- *Software process improvement (SPI) initiatives.* The organization's SPI program should address training in multiple places. The Software Process Engineering Group (SEPG) ensures that process training is integrated into the OSSP. It defines a process to plan, to make available, to track, and to measure quality of training. The SEPG also coordinates or delivers training on topics related to process. Examples of training that the SEPG addresses are the Capability Maturity Model, process analysis, process modeling, or using specific processes during pilots and implementation.

Theory vs. Practice

Effective training focuses on skills or competence in the software development organization. It is specific, timely, and result oriented. People learn by doing, but many trainers do not seem to realize this. Many training techniques do not include active involvement by participants; instead, participants spend most of their time listening to an expert lecture on the theory of topics like SQA or project planning. Precious little time is devoted to practicing these theories. One colleague of mine calls this the "spray-and-pray" approach: the lecturer disperses knowledge, and management hopes it will somehow be absorbed. What usually happens instead? If the participants can stay awake, they may learn something, but there is no way to test what they learned until they return to the workplace. When the real world collides with the theory, the theory will not be applied, no one is available to help the employees apply it, and old methods or habits are perpetuated. The training dollar is wasted, and the employees become discouraged.

In an effective training course, real-world experience and applying skills are more important than theory. The goal is *not* to put employees through training; the goal is for employees to learn and begin to apply new skills. Less time is spent in lecture and more time is spent practicing the skill. A good approach is the case study. For example, a course on peer reviews could provide participants with the experience of a peer review through sample materials for a simulated software inspection. A better approach is to use actual materials from the trainees' projects. For example, a former colleague of mine delivered analysis and design principles training to an entire project team using its own project rather than a case study. The training was spaced over a period of time as well: teach a little, then work a little. The skills could then be used in "real life," and the trainer could be questioned upon returning to the classroom after the trainees tried out the concepts. When the team completed this training, it had draft work products that were used as they progressed in the project.

Methods of Training

Once a careful analysis of the training needs has been accomplished, appropriate training can be developed. Several methods of delivering the training are viable in today's environment.

- Classroom.
- Teletraining.
- Videotape presentations.
- Job aids or just-in-time training.
- Mentoring.
- Computer-based training.

All have value when used appropriately. To gain the most out of training, use all the methods that make sense for the organization's needs.

Classroom training is the traditional delivery approach and may also be called a workshop, lecture, or laboratory. This approach relies on an instructor who leads a participant discussion and usually a case study or exercises. This mechanism is the most flexible and easiest to adapt. It can be developed comparatively quickly and inexpensively. Drawbacks are lost work time for the participants, scheduling difficulties, travel costs, and the lack of skilled instructors.

A close approximation to training in the classroom is **teletraining** or using teleconferencing facilities for a lecture or laboratory-type course. This is useful in the same ways as classroom-led training. Additionally, it can be delivered to isolated or dispersed locations while minimizing travel costs. This does, however, require a significant investment in technology, and it still requires that people leave their work site. Also, teletraining can present scheduling problems, especially when the participants are located in different time zones. Teletraining also is difficult to make interactive and limits the instructor's available techniques. It is best used for short, clear, and concise training.

Videotaped training is gaining popularity in some organizations. This has some of the same advantages of teletraining in that the training can be delivered to remote locations but does not require the significant investment in technology required by teletraining. It is excellent for delivering short, clear messages and can incorporate interviews or demonstrations from managers or staff, especially when used in conjunction with other forms of training. The disadvantages are the high development and production costs and the lack of participant interaction. Generally, this form has limited utility if used without on-site support.

Job aids, also called just-in-time training, are items such as cards or trifold brochures that outline a procedure succinctly. These are a useful means of training—relatively inexpensive to develop, and easily modified when needed. This form of training does not require that participants leave the job, thus minimizing costs such as lost productivity or travel. These aids can be used to supplement any other form of training, especially for topics like procedures and technology. They are not effective stand-alone, especially for complex skills like project planning. Additionally, unless carefully designed, they can be complex and difficult to comprehend.

Highly skilled people who guide the learner in the workplace perform

mentoring. This approach is inexpensive to develop because the expert already has the skills. It is provided at the time the participant needs it and does not require leaving the workplace. It does require some investment, though. The mentor's instructional skills need to be developed, and a structure for the training, such as a "lesson plan," needs to be developed. Quality control is difficult because there is usually no evaluation of it. This form of training works only when properly planned to ensure that the mentor is available, able, and motivated. To merely give training participants the name and telephone number of the expert to call if they have problems is *not* mentoring. The danger in this approach is the potential to propagate bad practices if the mentors do not apply best practices.

Computer-based training is useful in some situations. If well designed, it can be interactive, be used in dispersed geography, minimize travel costs, and reach a wide audience quickly. It is especially useful in simulating dangerous or costly situations, such as landing a jet on an aircraft carrier. However, it requires significant development costs and lead time and can have significant delivery costs when simulating complex environments. It is good for learning basic skills but falls short when used to teach advanced skills. Eventually, the "pilot" has to try to "land a real airplane." This form of training is usually difficult to maintain, update, and redistribute.

All of these forms of training have strengths and weaknesses. When appropriately integrated, they can capitalize on the strengths of each while overcoming their individual weaknesses. The result will be the development of a coherent and comprehensive training capability.

Measuring the Quality of Training

There are at least four ways to measure the quality of a training class or program: post-course evaluations, testing, follow-up surveys, and the organization's metrics program.

Most training courses end with a post-course evaluation completed by the participants. These forms ask the participant's opinion of the course materials, the instructor, and the classroom environment. But it can be difficult to know precisely what these evaluations measure. Do they evaluate whether the participants learned anything or whether they merely enjoyed the training? For example, studies show that these evaluations show high marks when the instructor tells jokes. However, studies also show that when participants enjoy the experience, they open their minds to the new process or procedure, which is a key step to change behavior. Unfortunately, post-course evaluations do not measure the effectiveness of the training in changing behavior in the workplace.

Testing is an effective means to evaluate whether a participant learned. However, this form of evaluation requires investment in developing good tests. This form of evaluation is needed in certain circumstances, such as maintaining accreditation with an organization like the American Council on Education. The tests allow employees to achieve credit for the training in a university environment. However, many organizations find the value of the credit is not worth the expense.

Follow-up surveys are an improvement on the post-course evaluation. The approach is to send an evaluation to participants some time after the training was delivered, e.g., six to nine months later. These surveys are generally more in-depth than most end-of-course evaluations and are targeted to the goals of the training course. Such a survey would ask questions such as "Have you defined and are you using the procedure for making the software project size estimates?" These surveys only secondarily seek to determine the participant's opinion of the training. The focus is on the behavioral change in the work environment. These surveys also can gather data concerning other factors discussed earlier, such as process, technology, or management support. The chief drawback to follow-up surveys is the cost to develop and conduct the survey. It also is difficult to get people to respond to surveys; those who do respond may not represent the average participant.

The best way to judge a training program is in conjunction with the organization's metrics program. Collect appropriate data before and after conducting training. Effective training will result in improvement in the data. As an example, software inspection data reveals that 75 percent of defects found in design, code, and test phases of the software lifecycle relate to defects in requirements. Six months after implementing a training program in requirements elicitation and analysis, the defect rate goes down to 35 percent, and the training can be declared a success.

Summary

Training is necessary to improve process, but it costs money. Poor training potentially wastes money, lowers morale, and reduces productivity. Good training achieves significant returns on investment. To get the most out of your training investment,

- Deliver training aligned with business strategy.
- Focus on skills that people need.
- Emphasize interactive training.
- Provide multiple forms of training.
- Reinforce through management support. ◆

About the Author

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