# Continuous Improvement and Training

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## Introduction

Training is critical to the success of most continuous improvement (CI) efforts. When processes are improved, maximizing the benefits of the improvement requires that those interacting with the process understand and can work within the context of the improved process. This may require a simple briefing or more extensive training, but training concerns are often overlooked and the costs of training ignored as improvement efforts are initially funded and undertaken. Are those costs then avoided? Not likely. It may be necessary to find funding later, when the need for training becomes an obvious requirement for implementing the changes.

CI is basically an attempt to reduce the inherent variability of a process, as well as to incorporate breakthroughs and innovations. Training can be an important factor in reducing the variation of the human performance component of a process. Continuous improvement has two distinct implications for training.

1.  Personnel who are affected by the improved products and processes will require training on how to do their jobs/tasks differently given the improvements/changes made to the process.

2.  Those who are to be involved in the efforts to make continuous improvements to products and processes will require training on how to do so. To create an organizational culture that embraces continuous improvement, training must give people the appropriate skills.

This chapter focuses on the issues and strategies for addressing these implications. First, it is important to establish a common understanding of what a training product is. Later, the process for creating a good training product will be addressed.

## Training Products

Training is a product or service that is created to improve human performance by reducing its variation within work processes. As a human capital improvement effort, training investments should hold the same promise of sufficient return as any other capital improvement effort. Failure to ensure that return is an irresponsible use of an organization's limited resources. Determining that a training need exists does not by itself justify meeting that need. An analysis is required to determine if the investment in training will yield adequate return to justify the expenditure. The return can include costs avoided, increased revenues, and enhanced employee motivation and satisfaction.

Like any other product or service, training is best defined by the customer's requirements. Training formats extend beyond the typical notion of classroom education. The appropriateness of the training delivery method can only be judged based on the stakeholder requirements. Common delivery methods include

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- Unstructured OJT (on-the-job training)
- Structured OJT
- Job performance aids
- Self-paced reading or exercises
- Group-paced, instructor-led reading or practice
- Computer-based training (CBT)
- Interactive video

The list is not all-inclusive. The best method for packaging and delivering training products depends on the needs and constraints of the target audience, as well as the requirements of those groups that have a stake or interest in the training. Effectiveness of the method must be assessed against its costs. If total costs of both development and delivery are considered, the most expensive to develop may be the least expensive to deliver. Therefore, given a large enough audience and stable enough content, it may very well be worth the extra initial cost.

Good, high-quality training will present concepts and develop behaviors that lead to improved job or task performance as measured by the appropriate metrics. The activities or behaviors of people in a process must be in control, just as any other process variable must be in control. Training can be thought of as the vehicle to optimize human performance or minimize the variations in overall performance. Tighter process performance will lead to improved process output.

Good training has no gaps in content and no excess content ("nice to know" versus "need to know"). Good training focuses on performance (what people need to do) rather than subject matter and maintains a balance between providing information, performance demonstration, and skills development practice with feedback.

Good training is the result of a series of systematic processes analogous to any product development effort.

Good training does not just happen, it is engineered.

Who should be involved in engineering good training? It cannot be the sole responsibility of those in the training organization, although they may assume the lead role. Others need to be involved to influence the design and content of the training. The training organization must work in conjunction with representatives from the intended target audience(s) and their management, to understand the critical training requirements. Master performers, subject matter experts, and managers/supervisors of the target audiences are the best partners, teamed with professional trainers to define and build the training product. Without this teamwork, the training created may just be somebody's best guess at what is really needed and its support of continuous improvement may be negligible.

There are three different levels at which improvements may occur. These can be classified as

- Job
- Process
- System

Observe a chemical process in a plant that creates a cooling agent. In this process, an operator at a reactor combines specific chemicals to create the cooling agent. From the operator's perspective, anything that makes the job easier is an improvement. Most people performing any type of job will look for ways to improve the job by eliminating wasted efforts. This is the most basic level of improvement. Training to support these improvements could be accomplished through informal discussions on-the-job or captured in formal procedure manuals. The training requirements are typically minimal.

The chemical engineer who has the responsibility for the process may be searching for ways to improve the efficiency, quality, reliability, etc., of the process. The engineer may decide to institute statistical process control (SPC) measures on the process and take intermittent samples to be tested to determine if there are any early warning signs of a bad batch. Or, perhaps another chemical could be used in the process, which would not be subject to the same OSHA and EPA restrictions as a chemical currently used. These improvements change the process, which means that new tasks and skills may be needed for the people working in the process. Formal training may be the best way to adequately transfer this knowledge and skills.

If a company's culture supports continuous improvement efforts through empowered teams, improvements can also be the result of specific team efforts at the system level. For example, a team consisting of operators, chemical engineers, and industrial engineers could have been formed to investigate the entire chemical process to find and implement improvements. Perhaps they discovered that is was possible to begin different phases of the reaction procedure in parallel so that there was less wasted operator time and an overall reduction in cycle time. This would be an example of a specific team effort directed at improving a process. These teams need training to enable them to work through the CI process effectively as a group. They need to understand how to work together, and they need to understand all of the elements of the CI process. Many different types of training content may be required to support this level of continuous improvement.

It is important to understand the different levels of improvements. Any of these efforts can lead to incremental or breakthrough improvement. Formal training may not be required with every slight modification to the process. Training is, however, likely to be required to support major modifications to the process and the efforts of an organization trying to turn itself into an organization that embraces continuous improvement.

## Training as a Result of CI Efforts

Continuous improvement efforts are typically not undertaken without a clear reason or goal for expending the time and effort. CI is usually driven by at least one of the following:

• Product changes that require changes in the process
• A need or desire for incremental process changes to achieve tighter process control
• A need or desire for breakthrough changes to increase competitiveness
• A desire to alter an organization's values and approaches to work—that is, culture

Regardless of the original stimulus leading to the CI effort, CI will inherently change how the work gets done within a process. It may seem obvious that, as improvements are implemented within a process, the changes themselves will require that the people in the process do something different or new, and that some level of new awareness, knowledge, or skill will be required to support the new behavior requirements.

Too often, the training requirements and resources are not considered in the decision-making and planning processes for an improvement. This can lead to a situation where the change does not achieve optimal results. To counteract this, training issues need to be planned for and integrated into the overall CI process.

There are aspects surrounding any process improvement that need to be understood before training can be instituted. Important points are

- What has changed and how much?
- Who is affected and how much?
- What is the best, most robust approach to meet the needs of the situation?

## What Has Changed and How Much?

Assessing the extent of the change is done within the context of the CI effort. To improve any process, one needs to understand how it works currently. A detailed map of the process should be created and used as the basis for analysis. Any suggested improvements can be mapped, and a new process flow created that will show the extent of the changes. These maps can be used to identify training requirements.

How does one determine whether training is necessary when a process is changed? Look at the extent of the change. When an evaluation of the process is conducted, determine whether the tasks are simply rearranged or whether new methods or equipment are employed. For example, if a new step is added to the process, but it is a common procedure (such as taking a measurement using familiar tools and equipment), the person performing the step need only be made aware of the change. On the other hand, if the measurement is taken using a new type of tool or instrument, the very least that must happen is that the performer should be shown how it is done and should have the opportunity to practice if that is required to perform reliably.

If the learning required for awareness, knowledge, or skill levels is classified, then one can better estimate the difficulty of the change from the performer's perspective. This will help decide how critical the training piece is and later, the best training approach for the situation. Figure 4-1 describes the levels of learning that training can be developed to handle. Because each level has a different goal for learning, the training for each level would most likely be approached differently.

| Category | Definition | Example |
|---|---|---|
| Awareness | Convey the idea of the change or impacted process to the performer | The order of the steps performed is changed.<br><br>A step in the procedure is deleted (e.g., eliminating a test or measurement).<br><br>A step with standard procedures is added (e.g., waiting for QA approval before proceeding). |
| Knowledge | More detailed level of information given, often accompanied by examples or demonstrations | Decision-making criteria are changed (e.g., the operators are now allowed to inspect their own work). |
| Skill | Allow the performer to build skill through practicing the desired behavior | New methods are employed (e.g., a new machine is purchased or a manual procedure is automated). |

*Figure 4-1: The levels of learning that training can be developed to handle*

## Who Is Affected and How Much?

Determining who is affected by the process improvement and who may require training at some level is extremely important. The most obvious group is the employees working in the process—the process participants. But are there other audiences that should be targeted for training? Will other processes be affected by the changes made in the process? To answer this question requires a closer look at several groups—suppliers, customers, and management. Any changes or modifications that impact these groups need to be examined carefully for training implications.

For example, if a Design Team decides to use a concurrent engineering approach to reduce project cycle time and downstream rework, that will move a larger percentage of the costs into the initial phases of the effort as organizations, such as Production, participate earlier in the process than they normally would. If management personnel are not "trained" on how to manage budgets differently in a concurrent engineering effort, they may resist supporting the required up-front spending. Inadequate resourcing will cause the concurrent engineering effort to be less than successful.

Within each audience group, people also need to be aware that training needs to address two types of people in the target audience, incumbent employees and new employees. Their specific needs will differ. The incumbents need training only on the specific changes resulting from the CI effort. There is only a short-term need for this type of training. Any new employees for this targeted job will need training on the entire set of tasks inherent in the job they are assuming. The need for this training will be dependent on the future plans of the organization. Moreover, it is important to remember that new employees will need an orientation to the organization's approach to CI.

The method used to bring everyone up to speed will vary, depending on the process changes and the level at which they impact employee behavior. The training will potentially have to provide some level of awareness, knowledge, and skill to multiple target audiences. There might be a core element of training that is common to all audiences, and beyond that some unique training. Specifics need to be derived from an understanding of the changes in the required behaviors to support the process change. The old and new process maps can be compared to gain insight.

## What Is the Best, Most Robust Training Approach to Meet the Needs of the Situation?

When defining the training delivery strategy (for example, formal classroom training, self-paced learning materials), "robustness" should be a primary consideration. Continuous improvements to processes require continuous changes to training, as well as changes to documented practices, policies, etc. Ensuring the robustness of the training concept and designing the training system to facilitate these anticipated future changes is a challenge. The costs of training to meet identified needs must be viewed well beyond their initial costs; they must be considered in terms of their "life cycle costs." Considerations should be made for issues such as the ongoing maintenance costs of one training design concept compared to another.

As with any product designed and manufactured for robustness, the designers and developers of training need to understand the total picture and be duly influenced by all the stakeholders before committing to a design, development, or delivery concept. Training must be designed to contend with its own "-ilities." Table 4-1 relates training "-ilities" to manufacturing "-ilities." Effectiveness is related to the level of interaction required in the training on the actual task. A video and a workbook will not be as effective in teaching interpersonal communications skills as a classroom environment with the opportunity for skill practice with coaching and feedback.

| Training "-ility" | As related to the "ilities" of Manufacturing |
|---|---|
| Effectiveness | Fitness for use |
| Deliverability | Useablility/flexibility |
| Updateability | Serviceability |
| Affordability | Internal cost/life cost/return on the investment |
| Development ability | Manufacturability |

*Table 4-1: Relating training "-ilities" to Manufacturing "-ilities"*

Deliverability focuses on the issues surrounding the delivery of training. For example, if training is being developed for a small audience that is widely dispersed throughout the United States and needs the training at various points in time, classroom training may not be the recommended alternative.

Designing for updateability means that training covering topics that change frequently must be designed in a modular fashion so that the changes can be more easily incorporated prior to each delivery. Training must change as processes, procedures, and policies change.

The delivery strategy selected for training will always be governed by resource constraints—primarily budget constraints, but also including limited facilities (such as machinery, equipment) or resources (such as instructors). Training costs must be viewed in terms of total costs—not just the costs incurred to develop or acquire the training. That means delivery, support, and maintenance costs should be included (see Figure 4-2). All aspects of investment costs need to be considered.

| Method | Cost to Develop | Cost to Deliver* | Cost to Update | Best for | | |
|---|---|---|---|---|---|---|
| | | | | A | K | S |
| Classroom | M-L | H-M | L | | | X |
| Self-paced, text | H-M | L | M-L | X | X | |
| Self-paced, video | H-M | L | M-L | X | X | |
| CBT, interactive | H | L | H | | | X |
| CBT, noninteractive | M | L | L | X | X | |

*Assuming facilities/infrastructures (such as VCRs or computer hardware) is available

Key:
H=High    A=Awareness
M=Medium  K=Knowledge
L=Low     S=Skill

*Figure 4-2 Costs associated with delivery strategies*

Other factors to be considered include the target audience size, geographic location and stability, and the level of risk associated with the failure for the training to "take." The training needs of a small target population with low turnover at a single location might be best met with structured OJT (a supervisor or leader is assigned to walk a trainee through the changes based on a checklist or other OJT guide). But if a mistake could cost lives, something more formal and substantial, with testing and certification, may be required. Table 4-2 will help assess the situation.

| Delivery Method | Can Be Used When | Considerations |
|---|---|---|
| Unstructured OJT | • Performance is not critical<br>• Target audience is very small<br>• Target audience is widely dispersed | • No control over learning |
| Structured OJT | • Target audience is small<br>• Target audience is widely dispersed<br>• Learning must be guided<br>• Need for guided skill practice | • Training is required for those responsible for "coaching" the learners<br>• Need for process documentation to manage consistently |
| Job Aid | • Static content<br>• Higher risks associated with the tasks<br>• Tasks are nonrepetitive/ nonfrequent so reference is required | • Job aids are usually used in conjunction with another form of instruction |
| Self-paced, Text or CBT, Noninteractive | • Static content<br>• Medium to large target audience<br>• Widely dispersed target audience<br>• Only limited skill requirements | • Some audiences dislike reading<br>• No feedback given during instruction; no place for learners to go with questions<br>• Not the best method to use when skill practice is necessary |
| CBT, Interactive or Noninteractive Video | • Large target audience<br>• Fairly stable content<br>• Requirement that skill proficiency be demonstrated<br>• Widely dispersed target audience<br>• When simulated performance is needed but using actual equipment is prohibitive | • Cost prohibitive for smaller target populations<br>• Equipment requirements to administer training |
| Classroom, Instructor-led | • Medium to large target audience<br>• Need for opportunity to practice skills<br>• Group interaction aids learning<br>• Complex content<br>• Target audience is concentrated in a few geographic area<br>• Higher risks associated with not comprehending content<br>• Content changes frequently | • Expensive method for training— must include student time plus travel and living expense when necessary |

*Table 4-2: Training Delivery Strategies*

After a thorough assessment of the training needs, the instruction can be designed to help workers understand the changes in the process and learn the new skills required. A training solution, just like any solution to any identified problem, should be tested before being fully implemented. A pilot test of the training materials allows those who developed the training to get input and feedback from a selected group of participants on how well the training worked and whether it met the stated learning objectives. Prior to being broadly deployed, the training should be updated to reflect the changes and improvements suggested by the pilot group evaluation.

Training products should be looked at as dynamic products. Business and work environments are changing and the training that people receive should reflect whatever they are currently facing. Outdated training, manuals, or other job aids add little value. The same philosophy of continuous improvement that is applied to other products and processes in an organization should be applied to training products. If CI is *not* applied to the training product, the chances of decreasing the return on the training investment are greater.

## Training to Support CI Efforts

The other major implication of CI to training is that people will require training to enable them to support the efforts to make CI happen in an organization. To create a culture that both embraces and is capable of continuous improvement, efforts to provide training and support must be proactive.

Whether the players are a homogeneous work team or pulled together in a cross-functional improvement team, they will need to be trained in the methods that will help them uncover opportunities for improvement and find solutions to current work problems. To understand what training will be required in an organization, one needs to begin by asking the following questions:

• What is the current plan and schedule for CI implementation?
• Is the company on schedule?
• What processes are targeted for improvement?
• Who is involved (what groups of employees) and to what extent?
• What methods should the people employ?
• Do they possess the skills to employ those methods, or is there a need to provide a way to give them those skills?

An analysis of the job tasks and requirements for CI implementation should be conducted to uncover training requirements. It is best to look at a company's training requirements as a collection of training products—a training Curriculum Architecture. A Curriculum Architecture provides a method for organizing the training requirements into logical segments that clarify the "big picture" of what pieces of training are required by various target audiences. A curriculum might be thought of as a work breakdown structure for training—it contains all of the pieces needed to put a sound training system in place.

When thinking about the training required to implement a CI effort, most people think of common skill elements such as

• How to work in a team environment
• How to gather and analyze process or product data
• How to conduct team-based, systematic problem solving

These elements are crucial to the success of continuous improvement efforts. But a culture that plans to support continuous improvement for all levels of employees must look beyond, and conduct the necessary analyses of the target audiences to be involved in the processes. Depending on a company's CI process, the specific knowledge and skills required can be quite complex. For example, the training modules of the Curriculum Architecture to support CI could include the following courses or modules:

• The Quality/CI Story and Plans of the Company
• The Quality/CI Story and Plans of a Function or Department
• Team Leadership Training
• Team Membership Training
• Business and Quality Metrics
• Financial and Economic Analysis
• Quality Function Deployment (QFD)
• Value Engineering
• Basic Statistics
• Concurrent Engineering/Integrated Product Development
• Design for Manufacturability/Reliability/Serviceability/Etc.
• Design of Experiments (DOE)
• Process Modeling/Mapping
• Variability Reduction Methods
• Cycle Time Reduction Methods
• Process Capability Studies
• SPC
• Benchmarking
• Diversity
• Brainstorming
• Problem Solving
• Risk Analysis and Decision-making
• Communication and Interpersonal Skills

The list could go on, but one thing is certain: nothing should be included in the list if it has not been identified as necessary by a thorough analysis of the intended target audiences.

Ideally, the training that is provided to staff will be delivered just in time (JIT). To do that, a company needs to determine what the right training is, for the right people, at the right time. If that is done, then the modules of the total training architecture could be configured into unique learning paths appropriate to the specific target audience(s).

The ultimate goal is to link the training to the requirements of the performance situation. That involves specifying what will be done, by whom, where, and when. Any plans for training should be linked to the organization's plan for implementing CI, total quality management (TQM), etc.

## The Training Development Process

It is necessary to use a systematic approach to develop the training required to support a CI or TQM effort. This is not something that can be approached in a random fashion with bits and pieces of training assembled when the need arises. Training should be in place to support the start-up efforts of deploying a new methodology. If the organization is serious about wanting to implement changes, it has to have the support systems in place to allow people to do what is asked of them. In other words, teach them the things they need to know so that they can succeed.

Good training does not just happen; it is engineered. The training development process offers a logical series of steps designed to create good training. Many models exist that portray the training development process. The model in Figure 4-3 is one example.
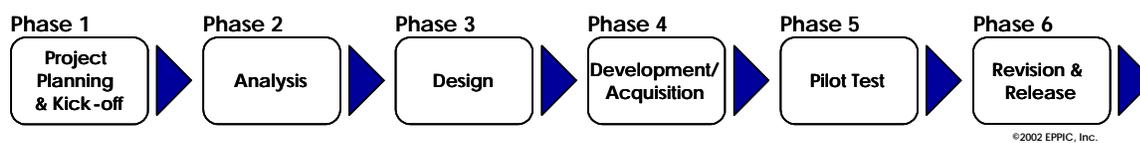


*Figure 4-3: An example of a training development process*

It is useful for the individual or individuals responsible for providing training, or the customer of the training providers, to understand the process of training development. That is the only way to assess the present status of the process, what comes next, and what roles are assigned to whom.

A model is only valuable if it is understood by all involved parties and used consistently, but with a degree of flexibility. If the situation dictates, this model can be used as a platform to customize a process view. An overview of each of the six phases of the model follows.

### Phase 1: Project Planning & Kick-off

#### Purpose
The purpose of Phase 1 is to get the project defined, agreed to by all those who need to support the project, and off to the right start. If the up-front planning is done poorly, everything that occurs downstream will be subject to constant change, schedule slippage, and cost overruns.

Before planning any training efforts, determine the overall rollout and implementation plans/ schedule for CI (or TQM/TQC/etc.), and segment the effort into phases if that has not been done already. A company's plan for training must reflect its plan for CI.

In every effort, crawling comes before walking, and walking before running. It is assumed that there will be a phased implementation approach to CI, which results in a phased implementation of the training to support CI. For example, the CI effort may initially focus on getting people to work as teams and getting the processes in control. Once they have mastered those skills, they can move to incremental or breakthrough improvement, and then on to integrated product design and development to influence the product design to better accommodate the manufacturing process constraints.

Using the phases and rollout schedule as a guideline, determine which processes, functions, departments, or work centers will be targeted for change and the order in which that will happen. This gives a broad picture of the training needs and the time frames in which training must happen.

## Key Roles

The project manager (or Management Team) and the Project Steering Team are the key players in Phase 1. The project manager is responsible for laying out a detailed draft Project Plan that outlines all the tasks, roles and responsibilities, and the schedule for completing the proposed project. The Project Plan must identify all of the major outputs and review points.

The Project Steering Team should be composed of representatives from all key groups that require training. They should represent their areas and be capable of making decisions on behalf of their groups. Depending on the project and its importance, the representatives may have to be fairly high-level managers from the various stakeholder organizations.

## Things to Know

Although this phase is critical, it is often ignored or shortchanged in the desire to get things moving quickly. This shows very poor thinking, such as, "We don't have time to plan to do it right the first time; however, we are willing to find the time later to do things over and over again." This runs counter to the concepts of the quality movement.

Plans lacking detail often do not provide the sufficient level of visibility required for an honest assessment of the plan's logic and feasibility. Reviewing the plans with all of the parties who have a stake in the project is a good idea. It is certainly better than having them disagree later with what has been done. Remember, any training plans must be integrated into the overall CI implementation plans.

Make certain the right people serve on the Project Steering Team. These people must be able to make decisions for the organizations they represent and have enough influence so that the decisions are not continually challenged. The Project Steering Team decisions must represent the interests of all critical target audience areas.

## Phase 2: Analysis

### *Purpose*

The purpose of Phase 2 is to gather and analyze data in order to understand

• The target audience(s) to be trained

• The performance to be affected by the training

• The knowledge, skills, and personal attributes required of the target audience(s) for successful performance

• The acceptability of any existing training as a part of or as the whole training solution

It is necessary to understand the populations that will be part of the CI effort: who they are in terms of their function in the CI process, their role in the CI effort, and their role in helping the organization satisfy customer requirements. Once it is understood who will need training, it must be determined exactly what training they will need. An analysis, to derive the required knowledge and skills for the target audiences based upon performance requirements, will lead to the content to be addressed in the training. However, training of a different nature may be necessary to achieve breakthrough improvement.

Figure 4-5 provides a way to capture the data required and prioritize the training needs appropriately. This will indicate which skills need to be developed or acquired most immediately. Priorities can be assigned by looking at those tools or techniques that are highly critical to success in each phase of the CI implementation.

| CI Tools/ Techniques | Department/Jobs | | | | | | | Tool/Tech Criticality | CI Phase | | | Priority |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | | | B | | C | D | | 1 | 2 | 3 | |
| | 1 | 2 | 3 | 1 | 2 | 1 | 1 | | | | | |
| • SPC | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | High | ✓ | ✓ | ✓ | |
| • Design of experiments | ✓ | ✓ | | | ✓ | | | Medium | | ✓ | | |
| • Pugh | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | Low | | ✓ | ✓ | |
| • Cause/effect diagrams | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | Medium | ✓ | ✓ | ✓ | |

*Figure 4-5: Capturing required data and prioritizing training needs appropriately*

## Key Roles

An Analysis Team for this effort could include the following people:

- Master performers to provide job/task knowledge and application of the content
- Subject matter experts to provide content knowledge
- Supervisors/managers of the target audience(s)
- Novice performers
- Training specialists

Building a common understanding and framework for the diverse members will help them share in the decisions and ownership of the outputs of this phase, and more importantly, the outputs of the phases that follow.

## Things to Know

Facilitating an Analysis Team requires a strong facilitator who can deal with conflicting views and language that different groups may have. Group-based analysis is a tough approach, but well worth the effort in the long run. The dialogue between Analysis Team members will establish a more common understanding of the performance situation and the associated training requirements, and should ease downstream participation and project decision-making.

## Phase 3: Design

## Purpose

The purpose of this phase is to create a design for the training that meets the desires, demands, and constraints that exist as a company implements its CI program. Of course, training has to be effective in preparing people to meet the performance requirements of their jobs, but not at any cost.

## Key Roles

A Design Team should be assembled from the membership of the Analysis Team. The actual design work should be accomplished by skilled training designers with influence from the Design Team. The design will explain how the training will look and feel conceptually, the criteria to be used for evaluation, and the methods and approaches to consider.

The training design should be based on design concepts, criteria, and considerations embraced by the Design Team. Training must be designed with the company's culture and target audience groups in mind. For example, if the target population typically has poor reading and comprehension levels, self-paced reading would not be a good training strategy for teaching employees about SPC.

The design should also be flexible. If there are a number of different audiences who need to receive similar training on the same subject matter, chances are that pieces of one training event could be used in another.

Ideally, the design would also include an evaluation system for the training, including all five levels of evaluation.

1. Reaction to the training experience
2. Mastery of the stated learning objectives
3. Application on the job after the training is over
4. Return on Investment calculating the returns compared to all the expenses incurred
5. Customer satisfaction with the total training experience (registration, scheduling, availability, length, etc.)

The training design must provide a level of information sufficient to enable the developers to produce the training effectively and efficiently. The evaluation system design must produce feedback that can be used to continuously improve the training program.

### Things to Know

The design for training must focus on performance first and subject matter second. "Nice-to-know" content must be eliminated, and time must be allocated for opportunity to practice the "need-to-use" content.

Training must be designed to contend with its own "-ilities:" effectiveness, deliverability, affordability, etc. Prerequisite knowledge and skills must be determined and addressed by the overall design.

## Phase 4: Development

### Purpose

The purpose of this phase is to create drafts of the training materials.

### Key Roles

The key roles in Phase 4 include the developers, the master performers (MPs), and the subject matter experts (SMEs). Developers provide the expertise in constructing good learning materials while the MPs and SMEs provide in-depth knowledge of the subject matter and its on-the-job application. For example, workers from the manufacturing line might share process knowledge with the developer for a process capabilities course.

The key outputs are the training material drafts. The developers create the units or lessons of the training, and the MPs and SMEs review and provide feedback. The process is very similar to a shop creating a prototype unit. The unit is created and tested and then adapted based on the test results. Training materials go through the same process.

### Things to Know

It should be expected, as with any product development effort, that multiple drafts may be required. The number of drafts will typically be dependent on the skills of the developers, the complexity and familiarity of the content, the amount of undefined content, etc.

It should also be expected that some amount of design change may be required as new information is learned during development. Changes during the development of a training product must be managed much like changes elsewhere. The more complex the training product, the more a formal change management system may be required.

## Phase 5: Pilot Test

### *Purpose*
The purpose of the Pilot Test Phase is to field test the training as it is intended to be delivered in the future.

### *Key Roles*
The key roles in this phase include the learners and the instructors or facilitators. There are two types of learners who should be present in the pilot session: those who represent the target audience and those who represent management. Target audience members help assess whether learning takes place, and management representatives can help determine whether the material presented is accurate and comprehensive.

The pilot session is the time to test all of the materials developed, to see whether they are effective and accomplish the learning objectives. Extensive evaluations should be conducted during the pilot test and used as input and feedback for finalizing the training materials. A report of the pilot results and recommended revisions is usually created to be reviewed by the Project Steering Team for final revision and approval. Revision recommendations become the revision specifications used to guide activities in the next phase.

### *Comments and Lessons Learned*
Forewarn all pilot-test participants of the nature of the session, including the length of the day and the need to conduct extensive evaluations. Management may have viable concerns about this training, so allow management representatives to participate in the pilot session and evaluate the course. Their feedback is also valuable.

Try to eliminate any passive observers in the session. Everyone in the room should be an active participant in all exercises and discussions and, therefore, share any risks that may be associated with the experience.

## Phase 6: Revision & Release

### *Purpose*
The purpose of Phase 6 is to revise the training according to the agreed-to revision specifications and release it into the training system. Depending on the formality of the training system, it may be necessary to have certain course data entered into various systems, such as the materials system, registration system, scheduling system, evaluation system, personnel system, etc.

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### Key Roles

The developers play the key role in making the updates, but the designers may be required to redesign aspects of the training. If the overall training development process was run correctly, changes in this phase should be kept to a total of 10-15 percent of the entire course.

### Things to Know

Anyone who has experience with training development may have experienced the typical pain associated with this phase. If not done properly, it can be a nightmare of extensive rework requirements. The best way to minimize the rework (not eliminate it) is to conduct the activities in the first two phases with diligence. Consider the rework required to product and/or process designs if the up-front work has not been done properly; training is subject to the same rework requirements.

All of the phases are important to do a quality job of defining and acquiring the right training for the right people at the right time. The story of GPT Manufacturing shows how one man, Lee Moore, used the phased approach to training development to determine successfully the training required to support continuous improvement teams in his organization.

## The Story of GPT Manufacturing

Lee Moore, a lead project engineer at GPT Manufacturing Company, was assigned to put the training in place to support continuous improvement teams. The directive came from his plant manager. Lee was told that the program he implemented must work not only in his plant, but in the nine other plants owned by GPT Manufacturing Company. Lee had worked on continuous improvement teams at his former company and could draw on some of his experience from that. He understood the need for training; after reading material on continuous improvement and training, he found a logical process that would lead to the training that the people would need to operate effectively on teams.

Lee decided that in order for this project to be a success, he needed to put together a Project Steering Team to get agreement and support for the project. He put together a Project Plan for the project and determined who had a stake in the training and needed to be a part of his Project Steering Team. He definitely wanted representation from each of the ten production centers, so he included a mix of senior hourly workers and supervisors. He needed a person from Safety Engineering, Quality Engineering, and Environmental Engineering. The Employee Relations person in his plant would eventually be responsible for the training, so she was invited to participate. Lee knew that the plant foreman should be behind this project 100 percent in order for it to succeed, so he made certain that he could be a part of the team. At the kick-off meeting, he explained the project and the team discussed the implications of continuous improvement for the employees of GPT Manufacturing, giving their opinions on where the most support would be needed to get the CI program off the ground. The Project Steering Team discussed the need for eventually having their own trainers at each of the ten production centers and the need to minimize the time taken away from people's jobs for training. The plant foreman was adamant about this for Lee's plant.

Lee received the green light from the Project Steering Team to move forward with his project. He had asked the Project Steering Team to appoint representatives from each of the ten production centers along with subject matters experts (SMEs) who had worked on CI teams in the past. Together, the people in this group looked at the tasks of the continuous improvement teams and identified the knowledge and skills they would need to do their jobs effectively. The analysis uncovered high-priority needs for training in team building, problem solving, interpersonal skills, and SPC. The Analysis Team decided that Lee ought to concentrate his initial efforts on finding a vendor with a team-building course that would fit the needs of the target audiences at GPT Manufacturing.

Lee understood that even though GPT Manufacturing would not be developing the course, he would have to create a general "design" for the course so that he could evaluate the materials available on the market against what they needed internally. He and a selected group from those participating in the analysis formed a Design Team. They specified the learning objectives for the course along with the criteria for evaluation and selection. The Design Team focused on three key issues: affordability, the delivery method of the training, and the availability to customize the training to fit the GPT environment. The training acquired cannot exceed the allocated budget; it must be transferable to internal trainers so that they may deliver it at each of the ten production centers, and it must be relevant to GPT Manufacturing.

Acquisition of course materials required as much work as development would have. Lee had to contact training vendors to see what they had to offer. He found that he had many to choose from but had to keep going back to the selection criteria to see whether the courses actually fit the need. He narrowed the choices down to three final vendors who sent complete sets of their training materials for evaluation, along with plans for transferring the course to GPT. Lee evaluated the materials and prepared a summary of his findings for the Design Team. The vendor, Total Team Trainers (TTT), was chosen to supply the course to GPT Manufacturing because they were able to demonstrate a better understanding of the customization needs that GPT Manufacturing had.

Lee assembled a group of target audience members, both experienced and inexperienced, to participate in the pilot session. The session was conducted by experienced trainers from TTT, and two trainer candidates from GPT Manufacturing participated in the pilot session. The materials and training experience were evaluated on two levels—reaction to the experience and mastery of the stated learning objectives. The results from the extensive participant comments revealed that the terminology in some of the lessons needed to be changed to reflect the language more common to GPT Manufacturing and that the participants needed an introduction to the plant's policies and goals for improvement teams. These findings, along with other comments and suggestions for improvement, were reviewed with the Project Steering Team to arrive at the revision specifications for TTT.

TTT took responsibility for adapting the materials to accommodate the required changes. The release to the field was to be handled by the trainer candidates who participated in the pilot session, but GPT Manufacturing realized that the initial train-the-trainer session should be conducted by TTT instructors. Lee assumed responsibility for coordinating the training release efforts. This meant ensuring that all of the administrative tasks, such as getting the course into the GPT registration and scheduling system, were handled.

Lee found that his project was successful because of a number of key things. He planned the effort properly, got the right people involved and in agreement with the effort at the start, and he used the right mix of people from the target populations to make certain that the training would address their real needs, not the needs the population was assumed to have. Lee found out how important it was to communicate with all the people who have a stake in the training so that he understood their concerns and considered them when developing and acquiring the course. Lee drew this analogy: a training investment must be handled in the same manner as any capital equipment investment.

## Summary

Good training is engineered following a systematic development process analogous to any good product development process. Identifying critical issues and resolving them as early in the cycle as possible is key to achieving high-quality training.

Regardless of whether CI is causing a need for training or training is being done to promote CI, one must understand the CI process and the performance requirements of the target audiences in order to provide the right training to the right people at the right time. Training needs to be based on these performance requirements to eliminate wasteful training.

When the goal is to improve process performance, there is always a human component that contributes to the potential variation. Training may offer a way to reduce variation of the human performance in a company's processes and can give people the tools they need to participate effectively in the continuous improvement effort.

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