

**INDUSTRIAL TRAINING IN QUALITY IMPROVEMENT
PART III: A FIRST COURSE
A GROUP APPROACH TO PROBLEM SOLVING**

**S.D. Shore
Department of Mathematics
University of New Hampshire
Durham, NH, U.S.A.**

Course Description

The setting for this course, in order to be most effective, requires that the participants have an overview of what is involved in a company-wide drive to improve the quality of a service or product. They ought to be aware of the changes that may need to occur in management, in commitment and in the way that things are done. In particular, the organizational climate ought to be one in which quality is viewed as the responsibility of every worker and, moreover, that this program has the full backing of management.

The approach is to have three groups, each with five to seven employees, work their way through a four-day sequence of exercises that are described in a WORKBOOK which is designed to be used at this specific industrial site. Essentially, we expect each group to focus on a process that it will seek to improve by identifying problems and learning how to seek solutions. Throughout the sequence we will be emphasizing the importance of using data and of developing teamwork.

Finally, the course ought not to be viewed as just a "training session". More appropriately, the course will develop "quality teams" that will leave the classroom prepared and eager to work on improving the process which has received its attention for four days.

The Content

We begin with an overview of the activities which are designed to carry out the task of finding out how to improve a process. Each activity may involve several individual or group exercises aimed at developing some skill. The order of the exercises is intended to be "natural" in the sense that, as a group works its way through an exercise, it will usually encounter a difficulty which might be addressed by using the next exercise. In this sense each exercise is developed to deal with a need that already exists!

Major Activities

- (1) Choose a process to work on.
- (2) Describe the process.
- (3) Think about ways to improve this process.

- (4) Formulate a specific problem statement (and set a) measurable goal for improvement
- (5) Generate as many causes for this problem as possible.
- (6) Organize these causes and try to identify the most significant cause (as judged by the goal for improvement).
- (7) Learn the construction and use of charts.
- (8) Discuss collecting data.
- (9) Plan and make a presentation.

Observations

It is important to get off to a good start! We have noticed that it is almost always easier for a group to discuss problems and solutions than to think in terms of processes. The first session for each group is held outside of the course proper in order to gain some understanding of what the group will be working on. Hence, each group comes to the classroom with the idea that it is going to "fix" something.

The first objective is to promote the principle that, in order to be competitive, we must aim at being the best at what we do. Hence, we must first understand how things are done and then find out how we can do it better than anyone else. Thus, each group must decide what it will be able to do better if its problem is eliminated. In this way each groups begins to focus on a process that it wants to improve.

This accomplishes several things. First of all, it takes a group away from a potentially negative orientation (e.g., casting blame or already knowing how the problem can be fixed) and provides it with a positive orientation of finding out how to do something better. Secondly, since good problem solving calls for the impartiality of the problem solvers, this establishes a neutral starting point of determining how a particular process is currently working. Finally, the activity of describing how something is currently done tends to be nonemotional; this provides a good introductory team-building exercise that promotes trust and builds confidence among members of a group.

A group is usually more interested in working on something that relates to its job. For this reason, the technique of flowcharting is developed by having each group analyze the process that it has already committed itself to improving. A group almost immediately perceives flowcharting as a convenient tool for understanding the steps in a process and communicating it to someone else. (Eventually, it will be viewed as a problem solving tool as well.)

After a group has defined the steps in the process that it wants to improve, it can step back and look at the "negative effects" that are preventing it from being as good as it could be. This accomplishes two things. First, the

group can judge whether it has chosen (or was assigned) what it considers to be the most significant problem with this process and, secondly, it has noted other factors that might impact on the problem on which it will concentrate.

This also illustrates a general principle that we promote throughout the course. As a group works, it can better evaluate "where it stands" and "where it is going" by formalizing its position on something like a flipchart pad that is in full view of the entire group. In so doing, it is better able to modify its position and to continue to work as a unit.

Dealing with a problem and generating causes tends to be more emotional, has the potential for heated debates and may call for individuals to admit that they could be contributing to the problem. In general, this requires a higher level of trust than was needed for defining the steps in a process. For this reason, the exercise seems to work better after a group has developed a certain amount of its chemistry. Generally, we use a brainstorming exercise to generate the first set of causes for a problem and a cause-and-effect diagram to display and organize the causes (as well as to generate more causes).

Invariable, the next exercise of trying to identify the most significant cause of a problem pushes at least one group to the realization that it may have to collect some data in order to be sure about the leading cause. Hence, it leads to the potential use of a Pareto chart. Having seen the use of Pareto charts suggests the usefulness of other charts and leads to the development of histograms, run charts and scatter diagrams.

We develop charting skills through individual exercises with follow-up discussions with neighbors or groups. The exercises themselves are placed in the context of carefully constructed case studies that incorporate real data and relevant situations for the groups that are involved.

We have considered the possibility of having each group collect its own data that it could use in the construction of charts. However, our approach has the advantage that we can proceed with the more interesting analysis of data before a group might get bogged down in the potential drudgery of collecting its own data. Moreover, when a group understands how good data can help, it is better motivated to collect accurate and meaningful data. We also use actual case studies, as well as "flawed" data collecting scenarios, to discuss data collection and the use of surveys.

As early as possible in the course flow it must become clear what management unit "owns" each group. Each group needs to know that those who can respond to their findings are going to show up at their final presentation. How the group will continue beyond the classroom must be established during the final presentation.

The Approach

We believe that the development of a skill is facilitated with insightful examples and perfected through practice. Hence, the technical skills of

problem solving, process analysis and the use of statistics seem to be developed most naturally through the content of the course. However, the group developmental skills seem to be developed primarily through the approach. Let us illustrate how one might carry this out by looking at the exercise of Generating the causes for a problem.

As the instructor/facilitator, one might begin by reviewing "the task" which has evolved: We have identified a problem and we are interested in generating as many causes for this problem as possible. Asking the class for some direction will surely uncover the possibility of "brainstorming". In order to clarify this activity one might center a classroom discussion around a flipchart on which the class develops the answers to these questions: Why brainstorm? What are some guidelines for doing it? How is it done?

(In this way, (i) the whole class is committed to the guidelines that are established, (ii) the development occurs at a pace that the class sets for itself, (iii) a forum is available for "experts" to demonstrate or clarify their knowledge or to compare their ideas with other "experts" in the class, (iv) we establish each person as a teacher, as a decision maker and as an equal and valued member of a unit and, most important, (v) all of the group development skills can be practiced.)

This introduces the group to "the objective" of the exercise. It is almost always a good idea to illustrate the exercise – in this case, to have the class brainstorm the causes for some problem. Since a similar situation would have occurred in every exercise, we would have developed a "running case study" that we use throughout the sequence of exercises. Consequently, we would have identified a problem in the previous exercise. Usually, one would not take the time to complete the exercise. One would continue until it is clear that the groups are ready to start on their own. It is a good idea, however, to produce a good example (or two) of a finished product. This gives the groups something to improve upon.

When the groups have completed the task, they usually need to be reminded that they are not finished until they have spent some time reflecting on what they did and how they might have done it better.

A similar format can be used for each exercise.

Concluding Remarks

We have described a first course in an industrial training program aimed at developing skills that might be used by a group which is focused on process improvement. The course is designed to introduce the participants to the construction and use of flowcharts, cause-and-effect diagrams, Pareto charts, histograms, run charts and scatter diagrams as well as to some activities that develop teamwork.

Our experience suggested that introductory skills in statistical problem solving and process analysis can be learned by including appropriate exercises into the course content and that the ability to work with a group

seems to be developed through the kind of activity that is included in the course. That is, we thought that technical skills would be developed through the content while the team building skills would be developed through the approach. Unexpectedly, we sense that this "approach" (of using teams to practice team building skills) is also a superior technique for learning these technical skills (as compared to the more traditional methods of instruction). For example, in discussing what can be said about a process on the basis of an associated histogram, individuals are also enriching their understanding of what a histogram is and how it might be used. Conversely, this "content" seems to be an excellent medium for developing interpersonal skills. For example, the use of statistics tends to be neutral; therefore, it provides an avenue for open and honest communication that does not point fingers or cast blame.