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# Magnificent Seven Quality Tools Workshops

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In June 1990, the first in a series of articles on the seven tools of quality appeared in the American Society for Quality Control's monthly publication *Quality Progress*. It immediately caught our interest and caused us to think about using the series for a training class in our organization. *Quality Progress* covered a new tool in each subsequent issue until the last tool was presented in the December issue [1]. The tools are: flowchart, cause-and-effect diagram, control chart, histogram, checksheet, pareto chart, and scatter diagram. In this article we will discuss the course development and implementation process, provide brief descriptions and examples of these tools in terms of how we applied them in the process, and share some lessons learned.

When the last article of the series had appeared, we decided to develop customized statistical quality tools training workshops around the series. We felt customizing was necessary because of the considerable variation among the articles in terms of tool description, construction guidelines, benefits, and application examples.

## ■ Workshops Development

### *Planning*

In order to meet our customers' (employees) needs, we decided to conduct a workshop planning session. We distributed a flyer announcing that we were planning to conduct a series of workshops on what we named The Magnificent Seven Quality Tools, using the *Quality Progress* articles. Each workshop would be 1-1/2 hours and cover one tool. The workshops would be conducted weekly, on the same day and at the same time, except for a one-week break after the check sheet lesson to allow the participants time for data gathering. The flyer invited all interested parties to attend and stated that all participants would be expected to

attend all workshops, since the seven quality tools would be utilized on problems selected by the participants. It also announced a planning and organizational meeting to be held prior to the beginning of the workshops. The workshops were to be led by our Division Director and assisted by a staff statistician.

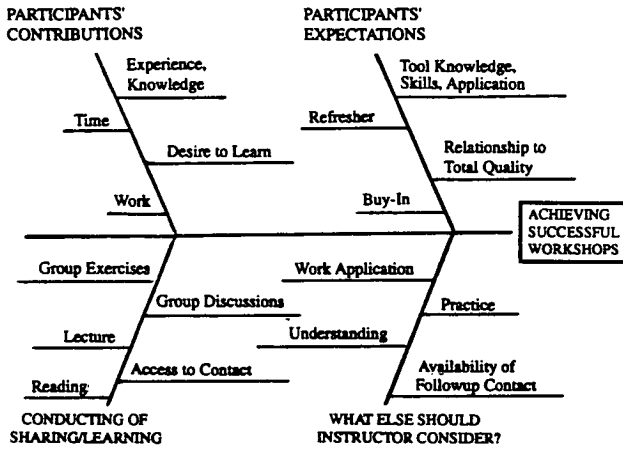
At the planning session, all attendees were asked to complete a list of expectations. We approached this activity in a manner which followed one of the tools, the cause-and-effect (or fishbone) diagram. The effect (intended result) was the achievement of successful training workshops. The causes (means of achieving the result) were participants' expectations, participants' contributions, conducting of the learning and sharing process, and expectations of the instructor(s). Figure 1 highlights the results of the related brainstorming activity.

### *Process Goals*

Some process goals were also brainstormed. The participants suggested and/or bought in to the following approach:

- Have fun;
- Work in small groups;
- Commit to attend virtually all workshop sessions to connect the seven tools together;
- Try to pick a process of interest for a small group to look at;
- Keep the amount of work "doable," such that it can be done along with everything else; and
- Learn how to do "things" like this (better and better).

**Figure 1.--Cause-and-Effect Diagram: How to Achieve Successful Workshops**



**Works Implementation**

**Structure**

We decided to limit the workshops to 20 people. The first 20 applicants were accepted; they were then divided into teams of five people each. In order to foster work application, each group consisted of people who were involved in similar activities. There were three employee groups and one manager group.

**Preparation**

Prior to each workshop, participants were reminded of the workshop through an announcement flyer with an example of the tool. They were also presented with an advance tool workshop package which consisted of the following items: agenda in the form of a flowchart, giving the step-by-step process for the workshop (Figure 2); benefits of the tool, steps in constructing the tool, examples of the tool, and reference list (sources of additional information on the tool).

**Application of Quality Tools for Improving Workshops**

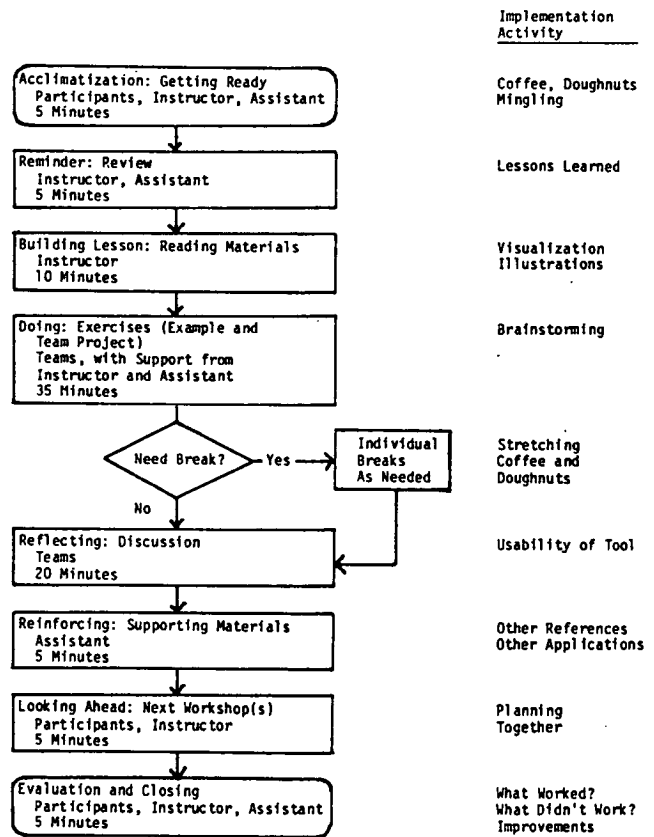
Quality tools were used throughout the workshops to assess the degree to which customer needs were being met and to remedy any deficiencies. For example, a checklist (Figure 3) was used to gather information on the time it took for the workshop announcements to reach the employee using the normal in-box, out-box

mail routing system across branches and sections. The histogram (Figure 4) shows the average routing time as well as the normal variation. Reasons for the delays were brainstormed in the cause-and-effect workshop. The pareto diagram (Figure 5) displays the principal factors causing delivery delays, in order of frequency. The scatter diagram (Figure 6) indicates the impact of one process factor on the delivery. The control chart (Figure 7) shows the delivery performance over time and the results of a major change in the process. Data in Figures 5 through 7 are part actual and part simulated to indicate possible tool application. The change to hand delivery made full actual application of the tools in this process unnecessary.

**Application of Quality Tools in Group Exercises**

Letting the groups choose their own problems for the tools application exercise proved to be one of the most successful aspects of the training course. Some chose specific work-related problems, such as identifying error sources in one of their work processes, while others opted for more personal problems, such as work

**Figure 2.--Flowchart: Agenda for Workshop**



commuting times. Group presentations and discussions enabled the participants to readily see the applicability of all of these tools in any process, and for any problem or improvement opportunity. They also quickly exposed the common tendency to try to bite off more than can be chewed. The groups felt a need to frequently break a process or problem into smaller pieces and address them one at a time.

Figure 3.--Checksheet: Inter-Office Mail Routing Time

MAIL ITEM	NUMBER OF DAYS BETWEEN FUNCTIONS (BRANCH <u>A11</u> , SECTION <u>A11</u> )					
	To Branch		To Section		To Employee	Total
	In-Box	Out-Box	In-Box	Out-Box		
1	0	1/2	1	0	1/2	2
2	1/2	0	1/2	0	1/2	1 1/2
3	0	1	1/2	1/2	1	3
4	0	0	1/2	0	1/2	1
5	1/2	1	1	1/2	1/2	3 1/2

Figure 4.--Histogram: Inter-Office Mail Routing Time

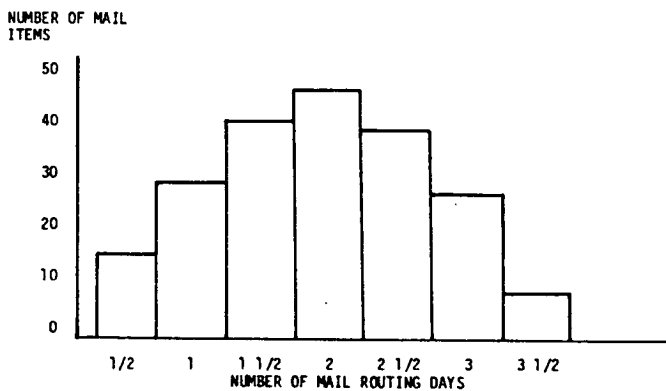


Figure 5.--Pareto Diagram: Reasons for Inter-Office Mail Routing Delays

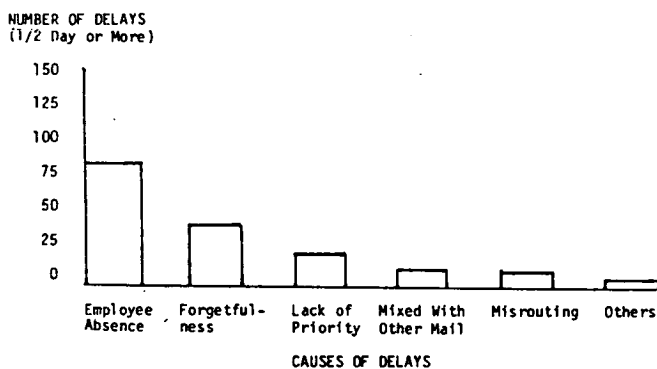


Figure 6.--Scatter Diagram: Effect on Mail Routing Time of Absent Employees

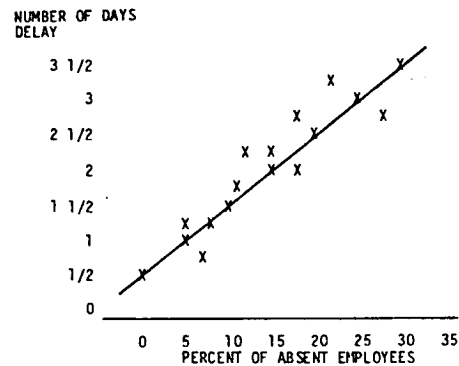
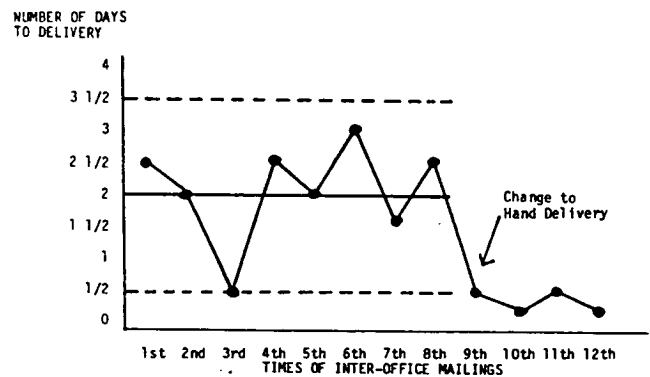


Figure 7.--Control Chart: Inter-Office Mail Delivery Times



Evaluations

An evaluation, which was requested of each participant at the end of each workshop, and consisted of "best part," "one thing learned/relearned," and "suggestions for improvement," proved very valuable in gearing the workshops to the needs of the participants. The agenda was adjusted and modified several times in response to participants' interest or disinterest in certain approaches. The "best part" of the workshops was consistently deemed to be the team activity, such as breakout exercises, presentations and group discussions. The main "one thing learned" was the need to set boundaries, to break a problem into smaller pieces and work on a piece at a time. "Suggestions for improvement" generally involved more time for breakouts, and less technicality and complexity. Per participants' desires, the times for group exercises and interaction were increased, while times for the other workshop segments were decreased.

## Process Modifications

We determined a need to include additional skills within some of the tools. For example, brainstorming was explained and utilized during the cause-and-effect diagram workshop, and sampling was introduced and a sampling exercise was conducted during the check-sheet workshop. We also rearranged the order in which we presented the tools, covering the checksheet before the histogram to allow for data collection, and moving the control chart to the end because of its complexity.

## Workshops Assessment

Following the completion of the first workshop series in the spring of 1991, a second series was conducted in the fall of that year in a similar manner (except that previous workshop participants served as instructors for some tools) and with similar results. At this point we took time out to assess and reassess this training initiative. A primary concern was that the workshops were not adequately satisfying the "just-in-time" training aspect for all participants and all tools. A recent survey of workshop graduates indicated a large variation in the use of the seven tools. Some, like the flowchart and the check sheet, have been used by most of the participants on a fairly frequent basis. Others, like the pareto chart and the control chart, have encountered sparse usage. Further, employee interest for such perceived "full-fledged" statistical training, with the entailed commitment in time, was waning. Some employees were not fully convinced that they really needed this type of training. Also, more and more employees were receiving quality tools training as part of their participation in process improvement teams.

## Where Do We Go From Here?

As we pondered how to proceed, we became acquainted with a statistics videocourse, *Against All Odds: Inside Statistics* [2]. This course, consisting of 26 half-hour lessons, covered both awareness and application for most of the quality tools, plus other statistical concepts, in a visually stimulating manner. We acquired this videocourse and decided to use it to gen-

erate additional interest in quality tools training. We are showing it regularly and repeatedly to allow any interested employees to view it. About ninety employees, including some from sister IRS organizations who heard about it through the grapevine, attended the introductory lesson. We are asking the participants to sign up for in-depth training if they need or desire additional training in any of the tools or concepts covered. Upon the completion of the video course and on an on-going basis, we will provide this in-depth training, using the course material of the Magnificent Seven Quality Tools Workshops, as well as some of the accompanying videocourse materials. Our hope is to eventually provide all interested employees with training in the seven tools.

## References

- [1] "The Tools of Quality," *Quality Progress*, June 1990 through December 1990.
- [2] *Against All Odds: Inside Statistics* Videocourse. Produced by the Consortium for Mathematics and Its Applications in association with ASQC, 1989. Available through The Annenberg/CPB Project.

Otto Schwartz is a Statistician on the Quality Support Team of the IRS Statistics of Income Division. He coordinated as well as helped plan and develop the Magnificent Seven Quality Tools Workshops, along with the Division Director, Fritz Scheuren, who is also a statistician. Dr. Scheuren served as the workshop leader and instructor. Mr. Schwartz assisted and at times also instructed.

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