

TOOLS FOR ELIMINATING ERRORS

Mistake-proofing meets creative problem solving

By A. Blanton Godfrey, Ph.D.

A variety of tools are available to any organization attempting to improve quality, reduce costs and increase customer satisfaction. Some of these tools are widely used—even overused—whereas others are used rarely. Within this latter group are a few specialized tools for specific problems, but the rest are suitable for many different applications. Why they're used so seldom, at least in the United States, is a mystery to me—especially considering their usefulness in managing quality and reducing costs. Three of these tools are creativity, inventive problem solving and mistake-proofing. The three are closely related and most powerful when combined.

Several years ago, Tim Clapp and I incorporated some of his research in inventive problem solving into a seminar on mistake-proofing. We were so pleased with the results that we created a workshop on the methods. Recently, we rediscovered Takeshi Nakajo's work at Tokyo's Chuo University. I'd first learned of his work through the paper he published with Hitoshi Kume in the June 1985 issue of *Reports of Statistical Application Research, JUSE*. They studied 1,014 examples and classified these methods into five broad categories: elimination, replacement, facilitation, detection and mitigation.

Beginning in the 1940's, Genrich Altshuller, a patent clerk and inventor in the former Soviet Union, summarized more than 200,000 patents across many different disciplines, carefully studying 40,000 of them. He noticed that most problems were solved using a small number of solutions, and he characterized these in a list of 40 solution directions for inventive problem-solving and mistake-proofing workshop, Clapp and I selected eleven of them.

Similarities exist among the methods taught in creativity workshops. By focusing participants' energy on one type of problem-solving methodology at a time, far more ideas are generated across a far wider spectrum of possible solutions. Combined with the best of brainstorming and nominal group techniques, these methods produce an incredible amount of energy and ideas. The methods we found most applicable are:

- *Trimming.* Eliminating process parts or steps reduces the possibility of mistakes. For example, symmetrical parts eliminate the problem of putting left-handed parts on the right side. Resetting counters to zero eliminates the need to subtract one number from another for accurate measurements.
- *Self-elimination.* Designing processes that correct themselves eliminates many problems. Examples include pills that roll down an incline; broken ones don't roll and, thus, eliminate themselves. Rotten berries don't bounce, so good ones move along while the others are left behind.
- *Standardization.* Eliminating part uniqueness helps reduce problems with incorrect parts. In other words, one size fits all. Perhaps the most

ubiquitous examples are the standardized electrical plugs and light bulb sockets throughout the country.

- *Unique shape or geometry.* The opposite approach is also useful. Making things that fit only in certain places reduces the chance for errors. Our computers offer great examples: only the correct cord can be plugged into a specific socket.
- *Copying.* Duplicating certain critical parts or actions can dramatically reduce errors. The names, bar codes and destinations on airline luggage tags are an example. Entering passwords twice is another. Verifying data entry by having two operators enter the same information into different machines can eliminate many data errors that plague businesses.
- *Prior action.* Many steps can be done ahead of time to reduce potential errors. Anyone visiting a DuPont or other safety-conscious plant quickly learns to hold on to the railing when going up or down stairs. Another example is the emergency room use of pre-measured medications which reduces dosage errors.
- *Flexible films or thin membranes.* Safety seals on medicines and food products can reduce tampering or contamination. Individual tea bags and coffee packs ensure that the right amounts are used. Shrink-wrapping keeps related parts together until used.
- *Color.* Widely used in safety measures, colors can instantly provide critical information or warnings. A major cause of medication errors is look-alike (and similarly named) drugs.
- *Combining.* Many process steps, parts or subassemblies can be combined to reduce the chance of errors. Medicine capsules now often contain both fast-release and slow-release drugs.
- *Counting.* Check sheets provide simple means for ensuring that repetitive operations are complete. One company put an automatic counter on a torque wrench. Unless all 18 bolts were tightened at the workstation, a bell would ring and the product wouldn't be moved along.
- *Automatic inspection.* With inexpensive microprocessors and other devices, it's easy to check everything. For example, a robot arm moving resistors to packaging automatically checks the resistance and removes any failures from the process.

None of these methods is truly new or revolutionary. However, used systematically as part of problem solving and mistake-proofing, they can significantly improve quality, costs and customer satisfaction.

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