A pharmaceutical company produced a compound using three ingredients. One of them, call it Substance A, had a tendency to stick to the machine that grinds it up, causing shut-downs and costing money for maintenance and clean-up. The producer decided that if they ground Substance A finer, they could stop it from sticking. The change was within the process specifications, so they made it, and all their headaches went away. Shortly afterward, across the street, at the sister facility which blends the three substances together, they opened the barrels of Substance A and found it caked solid, only removable with a hammer and a chisel. The finer grind solved the problem of sticking, but led to a new problem—caking.
As a consultant, a major component of my job involves working directly with client companies to help them analyze the root causes of problems and decide how to correct or prevent them. Kepner-Tregoe has been engaged in this for over 48 years, and I have been doing it for over 20 years. We train people in our analytical rational process methodologies; we train trainers to train others; we train facilitators to run investigations; and we consult around problem-solving processes, systems, and the human performance system factors that drive them. Occasionally, a problem comes up that is just too hot for the client’s resources to handle – often for political reasons – and we get called in to do the facilitation ourselves.

Recognizing Solution-Caused Problems

Many of the tough problems our clients ask us to facilitate can be characterized as solution-caused problems. That is, they have a problem, they find the cause, they put a corrective action in place to make the problem go away, and all of a sudden, they have a different problem, and often a much bigger one.

Like the caking problem, the following examples, revised and disguised to protect client confidentiality, are typical solution-caused problems:

**The switch:** A chewable tablet failed a hardness test and became too hard at 12 months of ageing. Speculation in the company lab focused on how the winter weather’s low-humidity might have caused excessive hardness. But the weather was no drier than previous winters, begging the question of why the hardness started when it did. It was finally discovered that, unknown to the drug manufacturer, a supplier had changed the starch content of one of the tablet’s excipients—with no thought to the affect on the final product—increasing it by over 25%. The increase of the starch content, combined with the low humidity, caused the hardness failure.

**The fix:** When ‘black specks’ appeared in an ingredient, the manufacturer’s analysis identified them to be small pieces of shredded gasket material. These findings were sent to the supplier of the ingredient, who quickly responded that they had corrected the problem by inserting a 704 stainless steel mesh filter to separate out the black specks. The black specks disappeared, and everyone was happy. But a month later, the client began noticing ‘shiny specks’ in the same ingredient from the same supplier. When analyzed, these shiny specks turned out to be . . . 704 stainless steel.

**The improvement:** A billion dollar-a-year drug failed appearance tests for color, suddenly putting patient safety, company revenues, and shareholder value at risk. This top-selling tablet was supposed to be white, but instead it was coming out dark yellow. While safety and efficacy were determined to be uncompromised, the pills “just didn’t look right,” especially to patients who had already been using them. As a result, the manufacturer suspended production for over six months. The cause was traced to a supplier who unilaterally decided to remove a substance with some potentially toxic effects from their part of the blend. They thought they were being “good corporate citizens,” but unknown to them, the “bad ingredient” had a key role in stabilizing the color; without it, color varied unacceptably.
Types of Solution-Caused Problems

These kinds of issues are expensive, disruptive, and more common than may be suspected. When discovered and analyzed, they lead to embarrassment, some finger-pointing, and a lot of head-wagging. If we deconstruct them, we can see that they are different types of problems.

Containment-Caused Problems

The ‘stainless steel specks’ problem is an instance of failing to find the root cause in the first place, and of adopting an interim action instead of a permanent corrective one. Think of it as a containment-caused problem. The unasked question up front is clearly, “Why was the gasket material getting into the blend in the first place, and how could this be prevented?” Perhaps the gaskets have changed in size or shape or composition; perhaps the recommended replacement period has been exceeded; perhaps some change in the process – in speed, temperature, or pressure – has subjected the gaskets to unexpected wear. The supplier never found the root cause – the cause of the cause – and implemented a fix that did not act against degrading gaskets, but merely filtered them out after they had broken down.

And, when installing the filters, the supplier never asked what might go wrong in specific enough detail to prevent the problem.

Problem-Relocation Problems

In the ‘caking problem,’ the change did solve the local problem of sticking, but caused a downstream problem of caking. Again, the failure to consider potential problems with the corrective action led to the new problem. Perhaps some were considered, within grinding, but the range did not extend to mixing, which later asserted that it would have immediately vetoed the change if they had been aware of it. In addition, it seems clear that the specifications for grinding were set too broadly, allowing the product that was technically within specifications to fail.

We see this often in process re-engineering or Six Sigma, where it goes by the name of sub-optimization. In the problem-solving sphere, it looks like the old carnival game of “Whack-a-Mole” – each time you hit a symptomatic mole, it pops up again somewhere else. What is needed here is not more or harder whacking, but rather a better, more precise hammer that gets past suppressing the symptoms to attacking the root cause.
Solution-Caused Problems and How to Prevent Them

Often, issues of problem relocation have organizational foundations. Incentive systems that are too locally based, the pressure to show quick results, and the isolation of different parts of the process from each other, all contribute to the creation of issues like this.

I experienced one client situation in which, in the course of tracking down a problem, we happened to notice that they had a severe back-order problem in their shipping department. But here’s the catch – the products that were slowest in going out were high-volume products, things they made three shifts a day, 24 hours a day, not the low-volume products which typically can lag in shipping. The cause was an incentive program run amok which favored the production and expediting of low-volume onesie-twosies, and favored them a bit too much. The folks in the warehouse were letting the rewards drive their performance, and drive it right into the ground.

Opportunity-Caused Problems

The ‘hardness failure’ and ‘appearance failure’ cases might better be labeled as opportunity-caused problems. Someone changed a variable without thinking that it would affect the final product. Once again, no one asked what might go wrong if they did this; after all, they were trying to improve the process/product, not degrade it. But when you are taking advantage of an opportunity, you are taking an action, and actions can have unintended consequences.
‘Failure-to-Communicate’ Problems

All solution-caused problems are compounded by communication problems. As the guard in the movie, Cool Hand Luke was fond of saying, “What we have here is a failure to communicate.” In the cases cited above, someone failed to communicate a change that could affect the process one or more steps down-stream. Communication can fail within supplier relationships and within the same organization.

Failure to Understand Change Problems

Anytime you introduce a change into a process, you are potentially introducing variation. It does not matter whether the change comes from trying to solve a deviation, from expected performance, or trying to optimize a process. Changes cause problems, and change is change; it needs to be analyzed and managed.

How to Avoid Solution-Caused Problems

Solution-caused problems are surprisingly pervasive, but they can be avoided. There are three elements required to minimize the occurrence of solution-caused problems and, if a problem does occur, to reduce its impact without creating more problems.

1. An Analytical Approach

Asking ‘What could go wrong?’ all by itself is a start, but just asking the question, and even listing a few potential problems, will not by itself minimize the chance of something going wrong. Our experience tells us that you have to be quite detailed about the potential problems, specific enough to be able to hypothesize some likely causes for each potential problem.

Causes are crucial because any preventive action you take must be directed at the causes, not just at the effects. Of course, not all attempts at prevention will succeed perfectly. To be an effective preventive action, an action simply needs to significantly reduce the probability of the potential problem’s occurrence. Should the potential problem actually occur, despite our attempts to prevent it, we need contingent actions, aimed at the effect, to reduce its impact.

2. A Change Management System that Builds-In an Analytical Approach

In the heat of the moment, like trying to get a costly line back up and running again, people may skip some steps in order to speed up the process. One of the first steps skipped is asking, “What might go wrong?” As a result, we find that building a Potential Problem Analysis step into the SOPs is required to channel behavior. It may sound cynical to say it out loud, but most people are not rational unless they have to be and will tend to avoid painstaking analysis if they can.

Many corrective and preventive action systems—whether in the cGMP world of pharmaceuticals, the ISO world of heavy manufacturing, or in other regulated industries like nuclear power generation—exist under applicable guidelines which require a change management system. Minimally, all changes need to be logged.
in a central registry, described, and dated. More stringent systems should require a full experimental or manufacturing validation of the new component or new process before proceeding.

Such a system is an optimal place for potential problem analysis; requiring that all changes be submitted to such analysis makes clear sense.

3. A Learning Culture

Finally, to apply potential problem analysis, the company must build a culture that accepts the fact that unanticipated problems will occur, and believes that it is better to consider them in advance than to try to react to them after they occur. It is curious to me that most people would not even consider going on a family vacation without doing some informal potential problem analysis, and acting upon it (have the newspapers and mail held, have the neighbors feed the pets, convert cash to traveler’s checks, keep one credit card separate in case of robbery). Yet when faced with applying the same kind of thinking to the launch of a new product or the upgrade of an existing one, they resist mightily.

One subtle cause of this is in the human performance systems that companies structure to reward employees. When it comes to problems and potential problems, there is a built-in structural asymmetry. Specifically, it is easy to see if someone has solved a problem – all you have to do is look to see if the product or the processes associated with it are up to spec again. On the other hand, it is close to impossible to ascertain whether someone has successfully prevented a potential problem from occurring. All you have to examine is the fact of non-occurrence, and that can be explained by assuming that there never was a potential problem in the first place, or that some other unplanned event prevented it from occurring. In short, you cannot prove that your preventive action minimized the probability of the problem occurring, or that your contingent action minimized the effects.

We have all met people who take great pride in their problem-solving skills, and we may have been struck by the notion that these folks would have fewer problems to solve if they just thought ahead. But if they did, then they wouldn’t have any fun problems to solve, and would lose the acclaim and regard that go along with such heroic actions.

There are, in fact, ways to reward people for anticipating and preventing future problems. They require some clear thinking and not a little creativity, and their administration requires consistency and clarity. But if addressing potential problems is not seen as a valued activity by employees and managers, they will tend to avoid doing it.

End Note

Solution-caused problems are all too common and are an indication of an incomplete approach to resolving issues. Companies can quickly earn back multiples of the time and money that they invest in installing the skills needed to attack problems, systems to track them, and a mind-set that values preventing them.
About the Author

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Kepner-Tregoe, Inc. has earned a worldwide reputation for improving business results through people. A global leader in effecting successful change and improvement, KT helps clients achieve lasting results through a proven approach of process, facilitation, and transfer. Focusing on the needs of the organization’s people—their skills, capabilities, and performance environment—KT continues to find innovative ways to integrate human resources into an organization’s strategy, structure, and systems, and the processes in which goals are accomplished.
Kepner-Tregoe, Inc. (www.kepner-tregoe.com) provides rapid operational and strategic results through consulting and training solutions. KT’s renowned rational thinking processes are the basis of logical and consistent approaches that address tough business issues. For nearly 50 years, KT has helped individuals and organizations meet everyday business challenges with improved processes and new approaches to quality, competitiveness, cost, cycle time, business strategy, and other issues. Many clients embed the systematic KT methods into the way work is done, transform their organizations, and achieve quantum leaps in performance.

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