






TROUBLESHOOTING THE TROUBLESHOOTING SYSTEM

*Getting Better Faster in a World
Where Speed Counts*



We live in an era where speed has become a defining variable — a major key to business success. The company that brings out a new generation of products is much more likely to win than the third or fourth to enter the market. No wonder organizations are continuously looking for ways to reduce time-to-market for new products, to shorten cycle times, and to improve responsiveness to their customers.



Speed becomes imperative as product life cycles become shorter and shorter. We've reached the point where many products are obsolete by the time they are released. R&D investments must be returned quickly. In this climate, we find companies that historically pursued product-differentiation strategies are moving simultaneously toward low-cost production tactics.

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Of course, all of these trends are fueled by the ongoing revolution in information technology. We have moved from individual productivity tools on the desktop to functional enhancements like computer-aided design and rapid prototyping and now to enterprise-wide connectivity that allows for enterprise resource planning, supply-chain integration, and e-Commerce.

In this context, it is not surprising to find that more and more companies are becoming concerned with “issue resolution cycle time.” That is, shortening the time from the moment an issue — for example, a quality problem — arises to the moment corrective actions have eliminated the problem and the possibility of its recurrence. In other words, they are recognizing the need to accelerate their troubleshooting.

Kepner-Tregoe has identified three elements that are fundamental to building world-class troubleshooting:

- **The troubleshooting system itself** — the mechanism for coordinating problem-solving and problem-prevention activities throughout functional units and the organization as a whole
- **Reactive and proactive troubleshooting processes** — the analytical methods used for finding root cause and avoiding future problems
- **Reusable troubleshooting knowledge** — the “thought-starters,” templates, and documentation that provide a head start on recurring problems

What Is the Troubleshooting System?

An organization's troubleshooting system is the way in which it handles the issues that need to be resolved in order to meet its operational goals and objectives. In other words, how it identifies issues, prioritizes them, allocates resources for their resolution, tracks progress toward their resolution, conducts analyses, and provides recognition to those who resolve them. The issues may be problems — for instance, scrap losses and equipment downtime; decisions — for example, selecting a new supplier or new equipment; or potential problems — such as those that tend to arise when major maintenance shutdowns are carried out or new equipment is installed.

The troubleshooting system also includes the set of skills and tools that are employed to find root cause, to select appropriate corrective actions, and to prevent recurrence of the presenting problem or other potential problems.

Typically, an organization's troubleshooting system is informal. It's not a clearly articulated approach governed by standard operating procedures or even organization-wide best practices. But improving the troubleshooting system — creating standard practices and building problem-prevention and problem-solving capability — pays healthy dividends. In the examples above, improving troubleshooting systems would lead to less scrap and downtime; a better, more reliable supplier or piece of equipment; and fewer implementation snarls. World-class troubleshooting systems also translate into a higher sense of achievement within the organization — a "can-do" attitude with higher employee satisfaction.

Excellence in troubleshooting means that problems are not only laid to rest quickly when they do occur, but are more often prevented from occurring in the first place. As the late quality guru, W. Edwards Deming, used to say, "If all you are doing is solving problems, you're on the way to going out of business." His message: reduce variation in all processes and thereby prevent problems.



Troubleshooting System Components

An effective troubleshooting system begins with clear standards or performance expectations that are communicated and visible. How many tons of steel are planned for this shift? How many lots of pharmaceutical production, with what anticipated yield? When standards are clear, variances quickly become evident. Of course, many minor variances can be corrected immediately, for example, with a simple machine adjustment. Others for which cause or corrective actions are not immediately apparent are logged locally at each production area. An effective troubleshooting system will also define how these issues are communicated to oncoming shifts or among functions, made visible to employees, and escalated to upper management.

Open issues are fed into a prioritization process. This may be at the department or plant level. Priority setting is important because most organizations do not have the resources to work on every issue at once. Those that attempt to do so often succumb to “initiative glut”: trying to make so many improvements simultaneously that resources are stretched thin and accomplishment suffers.

“Vital few” management is crucial, and prioritization ensures that the organization is working on the most important problems. Resources are then flexed toward high-priority issues, and a timetable for resolving each issue is put together. Of course, priorities may change at a moment’s notice, so communication — keeping priorities visible — is vital to success. The communication medium may be electronic spreadsheets or a database on a shared network. Or tracking may merely be a whiteboard or enlarged computer printout in a central location on the production floor or in a meeting room.

Once the analyses for priority issues are under way, computer systems, closed-circuit TV, or whiteboards provide the media for tracking progress. The choice of media is not as important as having information ready at hand and visible to all production personnel. Since the steps in both problem solving and problem prevention are somewhat generic, they are easily tracked to show anticipated and actual completion dates. Once again, visibility keeps accountability and attention focused.

The final component in the troubleshooting system is providing some form of recognition when issues are brought to successful completion. Many say that “what gets measured is what gets done.” But it’s more accurate to say that “what gets reinforced gets done.” Organizations have to look for ways to publicly acknowledge excellence when it occurs and to provide coaching, feedback, and appropriate sanctions when it does not. Part of recognizing



that an issue has been successfully resolved is capturing good thinking and lessons learned, as well as understanding what new issues may have been raised while working on the one just resolved. All of this knowledge, then, must be fed back into the troubleshooting system to improve the results of future issue resolution.

Troubleshooting System

Log Issues & Prioritize	Deploy Resources	Conduct Troubleshooting Analysis	Track Progress	Provide Recognition for Success
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Ultimately, success in troubleshooting depends on an organization’s analytic capability. That is, the speed at which people are able to react and find the cause of trouble when it occurs or, better yet, to think proactively to anticipate and prevent problems before they happen. This is the “Conduct Troubleshooting Analysis” step in the troubleshooting system, which incorporates both reactive and proactive troubleshooting.

Reactive Troubleshooting

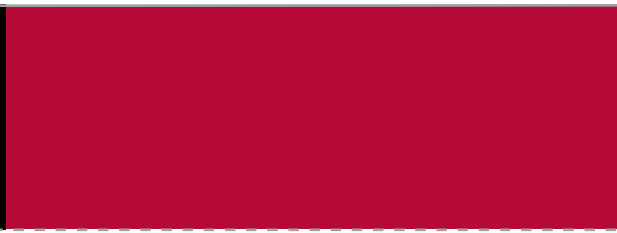
Kepner Tregoe’s approach to troubleshooting has both proactive and reactive elements. Whenever a variance occurs and the cause is not known, it triggers the Problem Analysis process.

Whenever a fire breaks out, the first order of the day is putting it out. Only after that do we turn our attention to finding its cause. Organizations that recognize trouble quickly and have the right tools at hand put problems to rest more quickly and buy themselves time to think proactively about preventing future problems.

Kepner-Tregoe suggests a five-step model for reacting to immediate problems. The first step is to delineate the precise problem you are dealing with. To simply say “fire” may result in dumping water on an electrical fire. We begin by stating the problem in terms of the specific object and its specific defect or deviation. This ensures working on one problem at a time, highlights the deviation to be contained, and targets the search for cause.

The next step is thinking about interim fixes — actions such as quarantining a defective product to make sure it doesn’t get to the customer or reworking it before sending it to the next production operation.

Once an interim fix is in place, the search for root cause begins. By requiring troubleshooters to first develop a rigorous description of a problem’s attributes, Kepner-Tregoe’s Problem Analysis process undercuts the natural tendency to “jump to cause” and start trying corrective actions. Testing pos-



sible causes logically, against this description, prevents costly — and ineffective — fixes from being implemented.

When the true cause is known, the next step is to select appropriate corrective action. If the problem is an equipment breakdown, this may mean replacing a failed equipment component and revising the preventive maintenance schedule. But the best decision may be to replace or even eliminate the equipment.

In many respects, the final step in reactive troubleshooting is the most important one. This is where purely reactive problem solving turns proactive. To prevent the recurrence of the problem, disciplined troubleshooters seek to find the cause of the cause of the initial problem. They also look for other damage that the cause could cause. Additionally, they want to know what other similar situations (equipment) may require the same corrective actions.

Reactive Troubleshooting

State the Problem	Select and Implement Interim Fix	Find and Test Root Cause	Select and Implement Corrective Action	Think Beyond the Fix/ Prevent Recurrence
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Proactive Troubleshooting

Whenever an organization is making a planned change — new equipment, new suppliers, new products, new methods and procedures — avoiding potential problems is paramount. Unfortunately, most organizations are under such an assault of current problems that they fail to take the time to think proactively.

The Kepner-Tregoe process for safeguarding change — which may be a single action or an entire project — is called Potential Problem Analysis. It entails five major steps.

Once an action plan has been developed, a Potential Problem Analysis starts with the identification of possible difficulties at each step in the plan. The priority of these potential problems is assessed by ascertaining the probability of their occurrence and the seriousness of their effects. For major potential problems, the next step is to determine what could cause the problem. Preventive actions are then defined and taken to eliminate, or at least reduce, the probability of this likely cause. If the probability is not driven to zero, contingent actions may also be put in place to minimize the effects should the potential problem actually occur. Finally, each contingent action requires a trigger to signal that the potential problem has occurred.



To make this process a bit more concrete, let's take as an example a major maintenance shutdown in which a company is installing a new piece of equipment while simultaneously conducting major rebuilds on other equipment in the area. A potential problem might be that the new equipment is not production-ready on time. A likely cause is that the disassembled equipment from the rebuild is blocking the aisle, preventing the new equipment from being moved into place. A preventive action might be to begin the rebuild on the nearby equipment only after the new equipment is in place. A contingent action might be to use a crane to swing the equipment into place rather than towing it in on the floor. Finally, the trigger for this might be a schedule review a day or two before the new equipment is due to arrive.

Proactive Troubleshooting

Identify Potential Problem	Identify Likely Causes	Take Preventive Actions	Plan Contingent Actions	Plan Contingent Actions
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Moving an organization to proactive thinking is not easy. We all know the accolades that accrue to firefighters and the relative neglect of those who quietly prevent fires in the first place.

Reusing Troubleshooting Knowledge

To help organizations reuse knowledge gained in previous troubleshooting activities, Kepner-Tregoe has developed Process Application Kits (PAKs). Each PAK is a specific application of a Kepner-Tregoe process that provides a consistent method for handling a particular production issue.

In each client situation, we help tailor a set of PAKs that detail **who** should use a particular Kepner-Tregoe process, **when** or under **what** circumstances, and exactly **how**. Each PAK delineates behaviors that become standard procedure and are incorporated into production documentation.

Each PAK contains a template of "thought-starters": decision objectives, potential problems, likely causes, and other context-specific help. Organizational objectives and procedures are also built into the template. To ensure success, we also help organization leaders define their role in implementing and monitoring the behavior changes incorporated in each PAK. The resulting custom templates represent Kepner-Tregoe's process and experience combined with the best of the client's knowledge.

Several PAKs based on Potential Problem Analysis help organizations manage the unexpected consequences of planned changes. Among these are



PAKs for run planning and run reviews for new or difficult products, for handling engineering change notices, and for new-equipment installation. A PAK for major maintenance shutdowns includes a template for establishing shutdown project priorities, as well as Potential Problem Analysis activities on the project plan and daily maintenance task lists.

Much of the troubleshooting system outlined above, in fact, is a PAK built around Kepner-Tregoe's Situation Appraisal process. Situation Appraisal is a systematic process for planning for the resolution of complex or poorly defined concerns.

Steps in Troubleshooting Your Troubleshooting System

Kepner-Tregoe's approach to reducing troubleshooting cycle time follows the following steps:

Step 1: Identify Gaps in the Troubleshooting System

Kepner-Tregoe helps conduct a detailed analysis of problems and how they are currently handled. Gaps in an organization's troubleshooting system are determined by conducting "day-in-the-life studies" of people, equipment, information, and common routines and procedures. We also study problems from the moment a variance is detected and reported, through shift and production meetings, to eventual resolution.

Step 2: Identify Gaps in Problem-Solving and Decision-Making Skills

Here we look at how actual problems are handled. What skills and tools are used, and how consistently are they used? Is there a common approach to problem solving or merely a free-for-all? Observations on the plant floor and in meetings yield recommendations for improving the organization's problem-handling capability.

Step 3: Design Troubleshooting Systems Improvements

Typically, this step entails designing and deploying some form of "issue/action register" to log issues as they arise. Together with a client implementation team, we develop shift logs, electronic spreadsheets, or databases for individual production lines, departments, and even entire sites. We also build a decision matrix for determining the priority of issues as they arise, as well as a system for defining resources and tracking progress.

Finally, we think through how to best provide problem solvers with recognition for their successes.

Step 4: Provide Troubleshooting Skill Development (as needed).

If employee skills are an issue — and more often than not they are — Kepner-Tregoe prepares internal Program Leaders to transfer problem-solving and problem-prevention skills. We also provide additional training for “Process Consultants” within each department. These individuals are given the responsibility for leading troubleshooting meetings and tracking results within their functional area.

Step 5: Install “Process Application Kits”

During our analysis of the troubleshooting system, we identified activities that require the repetitive application of one or more Kepner-Tregoe processes. Working with the client implementation team, we now tailor process templates and context-specific instructions and then develop implementation plans.

Step 6: Deploy Human Performance System Changes

We help organization leaders think through their expectations, the signals they send, and the feedback and consequences they put in place to support the institutionalization of proactive and reactive troubleshooting. In total, this is the human performance system which, when designed, carefully ensures that management truly “walks the talk.”

Step 7: Evaluate Project Results

Establishing a clear set of measures for your results at the outset of a project makes it relatively easy to determine how successful the project has been. We assist in clarifying those measures and, as the project reaches closeout, evaluate progress, identify concerns, and build plans to ensure ongoing improvement.



Advantages of Kepner-Tregoe's Approach to Troubleshooting the Troubleshooting System

No one has said that accelerating the troubleshooting process is easy. It takes leadership commitment and persistent effort over time. But the results are well worth the investment. When our clients dedicate themselves to excellence in troubleshooting through the institutionalization of Kepner-Tregoe's analytical processes, they realize significant gains on every operational measure: quality, uptime, speed, efficiency, customer delivery, and, of course, the bottom line. Our successful clients see annual reductions in actual manufacturing costs of ten percent and more the first year, and three to five percent on an ongoing basis.

During a Troubleshooting the Troubleshooting Project, clients find that:

We facilitate, not dictate, solutions so that in all of our work, we involve our clients. Solutions are theirs, not ours. We have found that ownership promotes the commitment to implement the change that we have arrived at together.

We remain involved during implementation so that we don't produce detailed diagnostic studies that end up collecting dust. Instead, we facilitate the design of troubleshooting systems that are tailored to the client environment. And we stay with the project during its implementation to ensure that our clients meet their business goals.

Our world-class project management methodology is available to our clients as they think through implementation issues.

Highly skilled internal resources have been trained to carry the troubleshooting system into the future.

We leave behind a process for continuous improvement so that as the organization changes, the troubleshooting system and related procedures can change with it.

We work closely with top management to consider the human factors associated with installing the troubleshooting system and associated analytical skills.



Troubleshooting System Overview

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About Kepner-Tregoe

Kepner-Tregoe provides consulting and training services to organizations throughout the world. We build competitive advantage using powerful, systematic processes for resolving business issues and achieving targeted performance improvements.

Since 1958, Kepner-Tregoe has studied how effective business leaders manage difficult business challenges. We incorporated their habits into logical, repeatable methods for rapidly resolving problems, making decisions, planning ahead, and managing people and projects. This world-renowned, rational-process approach helps maximize the critical thinking skills, knowledge, and expertise of individuals and organizations.

Kepner-Tregoe collaborates with many of the largest and most successful companies in the world to improve the way work is done and facilitate new approaches to quality, competitiveness, cost, cycle time, business strategy, and other issues. Many organizations integrate our systematic methods into their business processes, embedding a common language approach for identifying objectives, resolving issues, and integrating change.

At a time when organizations face multiple challenges—intense global competition, crushing growth and cost pressures, rapid technological advances—Kepner-Tregoe plays a vital role in helping them improve the clarity of their strategic thinking and the effectiveness of their operations.

Kepner-Tregoe Locations

Headquarters
United States

Australia

Canada

France
(*serving Spain*)

Germany

Hong Kong

Ireland

Japan

Malaysia

Netherlands

Singapore

Switzerland
(*serving Belgium*)

Taiwan

Thailand

United Kingdom

Also serving:
Africa, China, India,
and throughout Europe
and Southeast Asia

Affiliates

Brazil

Chile (*serving Argentina*)

Finland

Italy

Korea

Mexico (*serving Costa Rica,
El Salvador, Guatemala,
Honduras, Nicaragua, and
Panama*)

Peru (*serving Colombia*)

Philippines

Poland

Romania

Venezuela



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