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managing the unpredictable

What can we learn from the Seattle Symphony and hospital pediatric emergency wards? For starters, they can teach us how to handle a crisis.

by Robert Bea

Like many people, I struggled to play an instrument as a child. Perhaps this helped me appreciate the Seattle Symphony Orchestra many years later. Yet listening to the orchestra also provided an important insight into how even the most structured organizations can change to deal with the uncertainties that characterize a crisis.

A symphony orchestra is the very model of hierarchical organization. At the top is a conductor, who sets strategy (choice of music, how fast and loud, who gets solos) and directs the performance. The musicians surround the conductor. The top performers sit nearest to the conductor, so the first violinists are followed by second and then third violinists. The musicians implement, using their skill to play the notes of the score according to the conductor's wishes. Everything is so structured that the word "orchestrated" has become synonymous with the harmonious blending of disparate elements.

After the performance I attended, the conductor asked several orchestra members to come forward for "jazz improv time." The musicians improvised jazz that was as beautiful as the



symphony. And they did it without any written music, while taking turns as leaders and followers.

As I listened, I began to wonder: How could people who ordinarily worked within a carefully rehearsed structure dispense with top-down

leadership? Did they start with a number of basic routines? How long did they need to practice together in order to trust one another? What kind of skillful interactions and subtle communications enabled them to move from one non-routine event to another?

I had already spent decades investigating failures of complex engineered systems. There are two classical approaches to preventing failure. The proactive approach attempts to eliminate or mitigate potential failure modes and their consequences through design and training. The reactive approach seeks to learn from previous failures.

Yet as I studied near-misses—crises averted by successful interventions—I realized something was missing. It was, quite simply, the knowledge of the future. Many crises were triggered by events that were just plain unknowable. They were real surprises for which no one could plan.

However, some communities often succeeded in managing these surprises. For two decades, I studied groups ranging from commercial and military aviation, nuclear power, and emergency medicine to firefighting, law enforcement, chemical refining, and offshore oil and gas production. I interviewed experts, observed operations, conducted accident and incident investigations, and reviewed literature.

The goal of this work was to develop and test a third approach to crisis management, an interactive approach. It worked very much like the musicians who had stepped out of the highly structured orchestra to improvise jazz. It started with proactive planning to keep systems

functioning and reliable. But it also supported crisis teams with a wide repertoire of experiments and experiences so they learned to communicate, interact, and trust one another when faced with the unknown.

Think of the interactive approach in the context of quality assurance and quality control (QA/QC). Quality assurance is proactive, done before an activity to realize quality goals. Quality control is interactive, undertaken during an activity to ensure that plans achieve the desired result. We can envision interactive crisis management as life-cycle quality control processes that help achieve target quality (serviceability, safety, compatibility, durability) and reliability (likelihoods of realizing acceptable quality) in engineered systems.

Saving the Baby

After recognizing the interactive approach in jazz improvisation, I began studying pediatric emergency management teams. They deal with crises every day, and they have learned to keep babies alive even though babies cannot tell them what is wrong. The experience of successful teams (as measured by very low mortality rates) highlighted some important aspects of managing unpredictable crises.

Successful teams transitioned seamlessly from their highly structured everyday organization into loosely structured teams during emergencies. Their members continually challenged and revised diagnoses of developing conditions as more information became available. Decisions migrated rapidly to the people and points at which the best information and skills were available to take action. Authority gradients were absent. The search was for what was right, not who was right.

Heedful and respectful interactions characterized the pediatric teamwork. Because they had worked together so long, team members could almost read one another's minds. Subtle clues indicated what needed to be done next and who needed to do it. Members constantly scanned for things that didn't look right.

As a crisis evolved, teams reorganized to support the operating teams treating the patient. Strategic command focused on maintaining situational awareness. Tactical command focused on proper deployment of resources. Operating teams used a variety of routines and techniques, experimenting through uncertainties while

constantly looking for clues about outcomes.

Communications were nonstop, accurate, timely, and appropriate. Leadership constantly changed in a respectful ballet with highly skilled and caring followership. Like jazz artists, their basic underlying melody—keep the baby alive—kept the process flowing. Yet clinicians remained on high alert for early warning signs of failure. And when the crisis had passed, they knew how to relax and have fun.

This was not so different from how NASA reacted to the potential disaster aboard Apollo XIII. By 1970, NASA had learned to staff its ground support teams with experts, and to drill them and the astronauts relentlessly.

These preparations yielded impressive payoffs aboard Apollo XIII. After the oxygen tank explosion, the astronauts could not tell what had happened and started to panic. But then they did something really important. They sat down and started thinking about what the real problem might be and how they could address it to keep flying.

NASA divided the problem to conquer it, by forming different teams to consider various views and actions. Like the jazz players, they changed their organization and operating procedures to match the challenges they faced. Like the pediatric team, they migrated decisions to the person with the most expertise and ability to implement that action. They communicated nonstop. And, especially important, they stretched time, delaying decisions as long as possible so they could continue to receive input from all possible points of views and avoid radical over-reactions.

Pushing Too Far

A study of recent crises shows that some organizations are more vulnerable to failure than others. Today's relentless focus on productivity—doing more with less to become better, faster, cheaper—can lead to pushing the envelope. This may encourage managers to intentionally depart from safe operating procedures to save time or money. Many times, these aggressive actions trigger a sequence of events that escalate into an accident or failure.

The loss of core competencies, especially in science and engineering, has also contributed to system failures. Many companies have downsized and outsourced to create

leaner, more cost-effective organizations. Often, they replace expensive in-house experts with outsourced expertise. Yet without deep, in-house knowledge, they cannot adequately manage what they can no longer understand.

perceptual roadblocks

Many factors can create perceptual roadblocks that keep organizations from seeing a crisis evolving. We have identified some key issues:

- + Treating dynamic situations as static.
- + Assuming a single general principle accounts for all observations.
- + Seeing different entities as more similar than they are.
- + Treating multidimensional phenomena as unidimensional.
- + Treating continuous parameters as discrete (univalued).
- + Treating the whole as the sum of its parts.
- + Treating highly interconnected elements as separable.
- + Failure to revise assessments based on new information.
- + Wishful thinking (believing the desired outcome is likely when it is not).
- + Overestimating your control over developments and their outcomes.
- + Overestimating the predictability of the sequence of events.
- + Garden path problems, which involve reacting to strong signals that suggest plausible but incorrect answers while ignoring or not detecting weaker signals that suggest plausible and correct answers.

My study of near-misses shows that the vast majority of crises are triggered by acts of commission: People perform an action on purpose, and it either comes out wrong or is performed incorrectly. The factors most likely to contribute to those triggering events are organizational malfunctions that grow out of poor communications and productivity-at-any-cost cultures.

At the same time, the vast majority of factors that rescue a crisis from failure involve organizational interactions. In other words, some organizations know how to snatch victory from defeat by providing the right stuff at the right times in the right places and ways.

How do they do it? These organizations are constantly alert for the early warning signs of crises. They select personnel and develop highly functional teams based on demonstrated capabilities and talents. They invest in hardware to provide early warnings. They also invest in people, protecting them physically and mentally to avoid overloading and distractions.

These organizations have a strong, top-down, strategic commitment to "quality first." They demonstrate real, long-term care, concern, and action throughout the organization, both from the top down and from the bottom up. They create specific norms, rules, and procedures to remove conflicts between quality and production or service.

They do not take the health of their systems for granted. They reflect, audit, critique, and listen to feedback on the health of their systems and their people, and they promote continuous improvement. And they practice timely, effective, thorough, and honest communications that effectively bind together the individuals, teams, and organizations.

The best companies prepare by creating hardware and human systems robust enough to tolerate damage and defects, and resilient enough to bounce back from trauma. Such systems embody four important elements.

Appropriate configurations: They put the right stuff in the right places at the right times.

Excess capacity: They can carry excessive demands when one or more elements become overloaded.

Ductility: They stretch and deform without breaking or losing capacity.

Appropriate association: They morph to fit the situation, turning independent or high-associative when required.

It takes all four elements, and they must be present both in their engineered hardware and in their organizations.

lessons learned

Other important lessons learned from the successful crisis management communities include:

- + Start by keeping the airplane flying.
- + Keep questioning, anticipating, and taking initiatives.
- + Avoid radical response; be moderate in seeking gains.
- + Capitalize on the opportunities offered by the crisis.
- + Look for anything that may add flexibility and slow escalation.
- + Avoid irreversible commitments.
- + Don't forget the postcrisis period (recovery, rescue).
- + Keep all communications channels open and working.
- + Finish by keeping the airplane flying.

Failure of Imagination.

Even organizations with strong crisis management capabilities can fail in a crisis. About 60 percent of people ignore or misjudge the early warning signs of a crisis. Another 30 percent investigate, but only 10 percent evaluate properly and take appropriate action.

For example, take a slowly evolving crisis. It is often difficult to detect because signals of growing degradation are drowned out by the noise of normal daily operations. Our first response to outlying data is to try to fit it into our mental beliefs about how our system operates.

A rapidly developing crisis is easy to see but difficult to manage because its surprises undermine our beliefs about our system. Time pressures and new doubts can lead to cognitive lockup and produce tunnel vision. In such crises, the challenge is to survive by rapidly finding and implementing a workable solution.

How can people and organizations do a better job of perceiving early warning signs? First, they monitor their own assumptions. All models of engineered systems have boundaries and limitations. Understanding those limits prevents inadvertent violations.

Try to avoid simplifying to make a complex event

comprehensible. Engineers, for instance, may be looking at the largest numbers, which may not necessarily be the most significant numbers.

Emotions also distort perceptions. Denial, wishful thinking, lethal arrogance, hubris, an inability to tolerate ambiguity, and the fear of making mistakes or looking bad all block accurate perceptions.

Culture may create additional hurdles. Engineers, for example, may downplay intuition and demand overly rational explanations rather than investigate an issue immediately. Some lean organizations may combine high levels of distraction with low levels of reflection. Other organizations may rely on tradition and authority, avoid taboo subjects, or lack cooperation, support, and trust.

Crisis teams counter perceptual blocks with fluid, flexible, and original thinking. To encourage this, challenge mental models, invite constructive deliberation and dissent, brainstorm, increase the number of inputs to match the variety of crisis issues, and delay judgment.

Be prepared for false alarms. False negatives (we think we have a problem when we don't), especially if they occur often enough, encourage lackadaisical responses in the future. But setting alarm levels too high will create false positives (all looks okay even when it is not) that reduce the time given to evaluate and respond to an emergency.

Organizations that want to keep crises from escalating build systems that reward people for chasing down and curing potential problems before they become crises.

Even then, experts make mistakes. In events of moderate complexity, experts misdiagnose situations about 20 percent of the time. Inexperienced managers fail to connect the dots about 80 percent of the time. In complex crises, though, even experienced experts misdiagnose about 80 percent of the time.

This underscores the importance of teams of experienced people with diverse backgrounds who know how to collaborate and also challenge one another as they seek the right answers.

best practices

In the best crisis management teams we studied, practice

made perfect. This started with communication. Strong crisis managers learned to explain—clearly—not just their goals, but also the reasons behind them so that the rest of the team could work independently and creatively, and still move in the right direction.

The best teams promoted mature teamwork, leadership, management, and followership. Members learned to subordinate their personal prominence to achieve a winning team. They also learned to work within a fluid organization where leadership developed and migrated so that the team could do things otherwise beyond its reach.

Trust was critical, and it came only with lots of practice. There is an endless list of potential crises for which organizations can prepare. Certainly, it is important to achieve proficiency in handling the most likely disaster scenarios. Yet it is equally important to see a diverse range of less likely threats, too. This helps teams develop a broader repertoire of strategies and methods. These diverse approaches are like money in the bank, a resource that companies can draw on when they confront a completely unexpected challenge.

The trail of work that began with the Seattle Symphony has led to interactive crisis management systems used in a variety of engineered systems, most of which face daily crises that could prove fatal. The focus on interaction has proven an essential link with proactive and reactive approaches to assure life-cycle quality and reliability in engineered systems.

The interactive approach focuses on supporting both people and systems. People support is focused on selecting, training, organizing, leading, and managing the right stuff. It makes sure the right stuff is applied in the right amounts and ways at the right times and places.

System support is focused on providing serviceable, safe, compatible, and durable assemblies of hardware, and organizational systems that are robust and resilient. Strategies that reduce the likelihoods of malfunctions, increase their detection and remediation, and reduce the effects of malfunctions are employed in a continuous process to improve quality and reliability.

To make it work, though, takes the five C's:

- **Commitment** to achieve quality and reliability from the top down and bottom up.

- **Capability** created to apply the right stuff in the right

places at the right times.

• **Cognizance**, a constant awareness of hazards and risks.

Culture focused on achieving superior life-cycle quality and reliability.

Counting, the use of accounting and incentives to recognize early warnings and successful interventions.

When it is combined with proper team preparation, the interactive approach can help crisis teams overcome unexpected challenges with the same fluidity shown by the musicians who stepped out of the Seattle Symphony Orchestra to play jazz.

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