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Managing the Unexpected

What Business Can Learn from High Reliability Organizations

One of the greatest challenges any business organization faces is dealing with the unexpected. For example, a leading manufacturer of integrated circuits expects to boost competitiveness by dramatically improving quality and doubling capacity, but it unexpectedly finds its share price falling as customers switch to the new products being offered by its competitors. A premier forest products firm continues production during a normal trough in the business cycle, only to be surprised by a deeper and more long-lasting trough than they ever expected. The responsible manager of the largest corporate division of a consumer products firm suddenly realizes that his market has been conquered by a certain competitor—a development that his

subordinates suspected had been building steadily for several years. As these examples show, the unexpected doesn't take the form of a major crisis. Instead, it is triggered by a deceptively simple sequence in organizational life: A person or unit has an intention, takes action, misunderstands the world; actual events fail to coincide with the intended sequence; and there is an unexpected outcome.[1] People dislike unexpected outcomes and surprises. Because of that, they sometimes make situations worse. That's the tragedy that motivates this book.

We suspect that the inability to manage the unexpected lies behind a number of the pressing problems that executives face. Problems, after all, occur either when something that we expected to happen fails to happen or something that we did not expect to happen does happen. For example, consider the chief concerns of today's business professionals reported in the first annual (2000) University of Michigan Business School Pressing Problems survey. The second most frequent problem executives reported was "thinking and planning strategically"; the third most pressing problem was "maintaining a high-performance climate." From our perspective, both these problems are variants of one that is the focus of this book, *dealing with unexpected events*. Whether the issue is strategy or performance, problems become more pressing when expected strategy and performance outcomes fail to materialize or when unexpected impediments to strategy and performance materialize. Either scenario is a brush with the unexpected. And in either case people often take too long to recognize that their expectations are being violated and that a problem is growing more severe. Moreover, once they belatedly recognize that the unexpected is unfolding, their efforts at containment are misplaced.

In general, people can manage unexpected events poorly, in which case the events spiral, get worse, and disrupt ongoing activity; or they can manage them well, in which case the events

shrink and ongoing activity continues. How you can improve your organization's management of the unexpected is the subject of this book.

What does it mean to manage an unexpected event well? Good management of the unexpected is *mindful* management of the unexpected. That answer comes from careful study of organizations that operate under very trying conditions all the time and yet manage to have fewer than their fair share of accidents. These organizations, which are referred to collectively as *high reliability organizations* (HROs), include power grid dispatching centers, air traffic control systems, nuclear aircraft carriers, nuclear power generating plants, hospital emergency departments, and hostage negotiation teams. The better of these organizations rarely fail even though they encounter numerous unexpected events. They face an "excess" of unexpected events because their technologies are complex and their constituencies are varied in their demands—and because the people who run these systems, like all of us, have an incomplete understanding of their own systems and what they face.

We attribute the success of HROs in managing the unexpected to their determined efforts to act *mindfully*. By this we mean that they organize themselves in such a way that they are better able to notice the unexpected in the making and halt its development. If they have difficulty halting the development of the unexpected, they focus on containing it. And if some of the unexpected breaks through the containment, they focus on resilience and swift restoration of system functioning.

When we call this approach *mindful*, we mean that HROs strive to maintain an underlying style of mental functioning that is distinguished by continuous updating and deepening of increasingly plausible interpretations of what the context is, what problems define it, and what remedies it contains. The key difference between HROs and other organizations in managing the

unexpected often occurs in the earliest stages, when the unexpected may give off only weak signals of trouble. The overwhelming tendency is to respond to weak signals with a weak response. Mindfulness preserves the capability to see the significant meaning of weak signals and to give strong responses to weak signals. This counterintuitive act holds the key to managing the unexpected.

This book is grounded in the assumption that high reliability organizations enact on a larger scale what all of us try to do well on a much smaller one. We can all get better at managing the unexpected if we pay more attention to those who have no choice but to do it well. In this first chapter we will illustrate this argument by taking a close look at how the Union Pacific Railroad mismanaged the unexpected during its merger with the Southern Pacific Railroad and ended up gridlocking significant portions of its transportation system. We argue that Union Pacific got into trouble because it failed to use any of the five processes that enable HROs to manage the unexpected mindfully. The five processes are previewed briefly in this chapter; linked with expectations, blind spots, and mindfulness in Chapter Two; described in fuller detail in Chapter Three; formatted as an organizational audit for use by executives and managers in Chapter Four; interpreted as the infrastructure of a safety culture in Chapter Five; and translated into a set of practical guidelines for action in Chapter Six.

Union Pacific Mismanages the Unexpected

"An old brakeman faces his ultimate test." This breathless headline in the October 6, 1997, issue of *Business Week*[2] signaled the failure of Union Pacific CEO Richard Davidson to manage the unexpected when Union Pacific (UP) merged with Southern Pacific (SP). The Surface Transportation Board had unanimously

approved the merger in August 1996 because it promised to bring the vaunted expertise of UP to bear on the badly deteriorating SP. Not long after the formal acquisition on September 11, 1996, the vaunted "expertise" of the UP began to unravel. Unexpected events came in waves. And the responses only made things worse.

Mismanaging the People

The expectation that safe operation would continue on the merged system proved to be unfounded. In the first eight months of 1997, four employees were killed in railyard accidents. Between June 22 and September 11, 1997, the railroad experienced six major collisions that killed another five employees and two trespassers.[3] Sixty federal regulators started riding the trains and watching dispatchers as a result of these accidents.[4] Among other findings, they found that crews were on duty longer than allowed by law, equipment had not been maintained, and dispatchers were unfamiliar with regions to which they had been assigned. These conditions were due in large part to swift cuts in personnel shortly after the merger. As a result of these cuts, fatigue, poor maintenance, and slow dispatching had become issues because management underestimated the number of people needed to run the merged railroad. For example, on October 29, in Navasota, Texas, a southbound freight from North Platte, Nebraska, moving at twenty-five miles per hour, smashed into the rear of a stopped unit rock train. There were no serious injuries, but evidence suggested that the engineer and conductor on the North Platte train had gone on duty after only eight hours of rest and had fallen asleep.[5]

Equally surprising was the dramatic shift of sentiment on the part of shippers, particularly in the Gulf Coast area. Those who had endorsed the merger now found themselves confronted by delays that got worse and worse, shipments that were

lost altogether and couldn't be traced, and expensive truck transportation as their only remaining option. Shippers were badly hurt when the average speed of trains dropped from nineteen to twelve miles per hour. This is a severe drop because it equates to a loss of 1800 locomotives, or about one-fourth of the UP fleet.[6] The dramatic loss of speed was often a moot point since growing numbers of trains didn't move at all. They were stuck in sidings without locomotives, which had been removed to solve power shortages elsewhere.[7] For example, at one point the Bailey Yard in North Platte, Nebraska, found itself 161 locomotives short of the number needed to power the trains that were expected to leave that yard in just the next twenty-four hours. Trains that did have locomotives still couldn't move because they were manned by crews whose duty time had expired while they waited for clearance to move the train. "On the morning of October 8, systemwide, 550 freights stood still for lack of engines or crews."[8] Since all the sidings were full with backed up trains, movement on the single track mainline was possible in only one direction. There was no place where a train going in one direction could pull over into a siding and allow a train moving in the opposite direction to pass. Since most of the trains on the mainline were pointed toward Houston, they could not move aside to allow movements in the opposite direction away from Houston. The system was gridlocked as far away as Chicago.

Mismanaging the Operations

Much of this meltdown could be traced to one spot, the Englewood classification yard in Houston.[9] When SP ran this facility, they kept it moving at its capacity of 3,500 cars by workarounds that involved moving some of the classification to satellite yards at Strang and Beaumont, and by sorting some cars down line, away from yards, by a technique called block-swapping. This tactic involved sending trains with cars for mixed destinations "in the same direction in close order. Down the line they swapped blocks of cars to form solid trains for three destinations—for East St. Louis, Memphis, and Pine Bluff."[10] When UP took over the operation of Englewood, they moved all this satellite classification back to the Englewood yard, where it could be centralized and "done in the right way."[11] Trains began backing up the very next day. On October 27, Englewood locked up with 6,179 cars in the yard.[12] UP sent more managers and more engines to break the logjam, but all this did was plug up the system even more.

What makes all this so puzzling is that it occurred on the watch of a self-proclaimed "operations guy." Davidson had been a railroader all his life. He had been vice president of operations for Union Pacific in 1982 when the UP merged with the Missouri Pacific Railroad. Davidson had been courted by the Burlington Northern in 1994 to straighten out its operations problems. And yet here is Davidson, finally the top person at the railroad, and he can't get the trains to run on time. Why not?

You begin to get a clue if you examine the list of reasons given by top management to explain why service had become so rotten. The postmerger problems were variously attributed to blizzards in the Midwest, customs backups at the Mexican border, unexpected track work, flash floods, derailments, a surge in plastics traffic, Hurricane Danny, poorly maintained SP equipment, and inherited labor agreements. In the eyes of top management, UP and its system were the victims, not the culprits. Not a good sign.

But not a rare sign either.[13] Executives often manage the unexpected by blaming it on someone, usually on someone else. This happens with sufficient frequency that it qualifies as a pressing problem in its own right. But there are other issues in managing the unexpected that are visible in the Union Pacific example.

Mismanaging the Strategy

The Union Pacific clearly had a growth strategy in place. Just two years before formalizing the SP merger, it had acquired the five thousand mile–long Chicago and North Western Railroad (CNW). Even though that earlier consolidation had big problems, top management ignored the early warning signs that the strategy was flawed, and used that same strategy to fold in the SP operations. The fact of poor implementation was not that hard to see. A veteran railroad observer, quoted in the *Wall Street Journal* just nine months before the SP merger, described the UP-CNW merger this way: "It has been about the ugliest operational situation I have seen since I have been around railroads."[14] In a pattern that would be repeated with the SP merger, UP did not listen to the locals when those people described what had worked for them.[15] For example, the Midwestern location of CNW meant that a sizeable portion of their business was grain shipments. To keep operations moving during harvest, CNW moved large quantities of grain to Gulf ports by barge. When UP took over the CNW, management abandoned this practice, used rail to move the grain to the Gulf, and promptly congested the rail lines. Shipments throughout the system were delayed and complaints soared. Ironically, in support of their application to acquire SP, UP executives argued that they had "learned a lot about how to do it right the next time" from their experience with CNW.[16] In an even stranger twist of logic, they also argued that their problems with CNW would be solved if they were allowed to merge with SP. This reasoning fairly reeks of potential for trouble to escalate.[17] Hence, there were early and ample signs that the UP did not understand either itself or its environment. And with less understanding, there should be more surprises and less adequate coping with any of them.

The more general point—and one that is crucial to those seeking effective ways of managing the unexpected—is that

strategic goals contain a subtle trap. The trap is this. Strategic goals explicitly describe how the organization wants to position itself. But they do not describe the important mistakes people should guard against in pursuit of these goals.[18] It is the failure both to *articulate* important mistakes that must not occur and to *organize* in order to detect them that allows unexpected events to spin out of control. If an organization has an inflated view of its capability, there is little incentive to think about important mistakes simply because people assume there won't be any. A less charitable way to state this point is to say that arrogance and hubris breed vulnerability. UP, by many accounts, was the poster child of arrogance. This was true both internally, where its culture was described as militaristic and intimidating,[19] and externally, where shippers were given take-it-or-leave-it deals and where acquired railroads were viewed as inept.

What, then, would a less arrogant style of management look like? How do people act when they are mindful that important mistakes can scuttle the most luminous strategy? Those questions are the focus of this book. We draw our answers to those questions from a neglected body of work, namely, studies of organizations that operate under trying conditions yet have less than their fair share of accidents. Even though high reliability organizations such as aircraft carriers and nuclear power plants may seem unique, that impression is misleading. These organizations provide important lessons about managing the unexpected because of what they do on the input side, not because of what they generate on the output side. That people can be killed on an aircraft carrier but not at Silicon Graphics matters less than that people in both organizations make an effort on the input side to complicate rather than simplify their processes of attention. People who maintain complex sets of expectations (that is, have complicated mental models of how events unfold)[20] experience fewer unexpected events. And when unexpected events do occur, complex models enable people to

"read" those anomalies earlier in their development and to resolve them with smaller interventions. Those are the kinds of similarities we are after.

Hallmarks of High Reliability

In this book we focus on five hallmarks of organizations that persistently have less than their fair share of accidents. Together, these characteristics of HROs make up what we have termed *mindfulness*. They are

- Preoccupation with failure
- Reluctance to simplify interpretations
- Sensitivity to operations
- Commitment to resilience
- Deference to expertise

Here we briefly describe these key characteristics of high reliability organizations and how failures in these areas caused problems for Union Pacific.

Preoccupation with Failure

Even though high reliability organizations are noteworthy because they avoid disasters, they do not gloat over this fact. Just the opposite. They are *preoccupied with their failures*, large and mostly small. They treat any lapse as a symptom that something is wrong with the system, something that could have severe consequences if separate small errors happen to coincide at one awful moment (for example, the disastrous release of poisonous chemicals from the Union Carbide plant in Bhopal, India, in 1984). HROs encourage reporting of errors, they elaborate experiences of a near miss for what can be learned, and they are

wary of the potential liabilities of success, including complacency, the temptation to reduce margins of safety, and the drift into automatic processing.

Against this background what stands out about the Union Pacific is its preoccupation with success and its denial of failures. It is the classic case of top management being buffered from bad news, a pattern that was repeated at all levels of the hierarchy. For example, in November 1995, during the horrendous shipping delays of the CNW merger, then CEO and president Ron Burns wrote a letter of apology to shippers. Burns, a nonrailroader (he came to UP from Enron in August 1995), was praised by the shippers for this act, but he was also severely criticized internally for his admission that UP had failed.[21] He lost his job ten months after the letter was sent.[22] Persuaded by their own rhetoric of competence that they had used in Washington to influence regulators, UP executives neither looked for failures nor believed that they would find many if they did. This message was not lost on those at the operating level. As a result, slowdowns were underreported and allowed to incubate until they were undeniable and close to irreversible.

Reluctance to Simplify

Another way HROs manage for the unexpected is by being *reluctant to accept simplifications*. Success in any coordinated activity requires that people simplify in order to stay focused on a handful of key issues and key indicators. HROs take deliberate steps to create more complete and nuanced pictures. They simplify less and see more. Knowing that the world they face is complex, unstable, unknowable, and unpredictable, they position themselves to see as much as possible. They encourage boundary spanners who have diverse experience, skepticism toward received wisdom, and negotiating tactics that reconcile

differences of opinion without destroying the nuances that diverse people detect.

Union Pacific presents a somewhat different picture. UP has a dominant logic that simplifies how railroads work. Trains are made up in central locations called classification yards, not in dispersed locations called shipper yards, satellite yards, or mainline tracks. Freight shipped by railroaders is moved by rail, not barge. The problems caused by these simplifications are overlooked until the central location or excessive grain shipments become a bottleneck. Simplification, in the case of UP, is encouraged by the preference for staffing top management positions with railroad people. Some of the more innovative moves at UP were made by outsider Michael Walsh, who was chairman and CEO of the railroad in the late 1980s. In fact, Walsh's innovations were featured in a Tom Peters documentary about how the tradition-bound railroad industry finally found its way into the twentieth century. Walsh's era was not a popular period for veteran railroaders. And when Walsh moved on to Tenneco, Davidson assumed the CEO portion of Walsh's job, while Drew Lewis assumed the chairman's duties.[23] Both these moves ensured that UP was once more back in the hands of insiders. The subsequent short interval during which outsider Ron Burns attempted to run a more customer-focused railroad only served to confirm the belief that the Union Pacific was in the best hands if those hands belonged to veteran railroaders. That belief is understandable. It makes for a cohesive top management team. But that team is of one mind simply because the minds that compose it are redundant. Everyone sees the same warning signals and is blind to the same unexpected warnings. That kind of homogeneity can encourage people, under the guise of consensus, to misread local innovations and workarounds as signs of inefficiency rather than as adaptations that make the difference between profit and loss.

Sensitivity to Operations

An additional characteristic of HROs, *sensitivity to operations*, points to their ongoing concern with the unexpected. Unexpected events usually originate in what psychologist James Reason calls "latent failures." Latent failures are "loopholes in the system's defenses, barriers and safeguards whose potential existed for some time prior to the onset of the accident sequence, though usually without any obvious bad effect."[24] These loopholes consist of imperfections in features such as supervision, reporting of defects, engineered safety procedures, safety training, briefings, certification, and hazard identification. Many of these latent failures are discovered only after the fact of an accident. But that need not be the case. Normal operations may reveal deficiencies that are "free lessons" that signal the development of unexpected events. But these lessons are visible only if there is frequent assessment of the overall safety health of the organization.

This is an area where HROs distinguish themselves. They are attentive to the front line, where the real work gets done. The "big picture" in HROs is less strategic and more situational than is true of most other organizations. When people have well-developed situational awareness, they can make the continuous adjustments that prevent errors from accumulating and enlarging. Anomalies are noticed while they are still tractable and can still be isolated. All this is made possible because HROs are aware of the close tie between sensitivity to operations and sensitivity to relationships. People who refuse to speak up out of fear enact a system that knows less than it needs to know to remain effective. People in HROs know that you can't develop a big picture of operations if the symptoms of those operations are withheld. It makes no difference whether they are withheld out of fear, ignorance, or indifference. All those reasons for

withholding are relational. If managers refuse to examine what happens between heads, they'll be eternally puzzled by what appears to happen inside individual heads.

In contrast, there is general agreement that relationships at the UP were tense. People keep mentioning intimidation, a militaristic culture, hollow promises to customers, abandonment of workarounds, production pressure on train crews, and the same old resources thrown at problems (for example, send more engines to an already immobilized rail yard). What is striking is the disconnect between operations as viewed at the top and operations as implemented on the front line. Theoretically, the language of operations should have been a common language at UP that everyone from top to bottom could understand and use to resolve merger-related problems. Practically, that didn't happen. At the top, "sensitivity to operations" meant improving the balance sheet and sensitivity to escalating costs (for example, overtime). At the bottom, "sensitivity to operations" meant sensitivity to the fact that trains were backing up outside the Englewood yard and that the entire UP system was grinding to a halt. Hence, there were at least two "big pictures" of operations at UP, not one.

Commitment to Resilience

No system is perfect. HROs know this as well as anyone. This is why they complement their anticipatory activities of learning from failures, complicating their perceptions, and remaining sensitive to operations with a *commitment to resilience.* HROs develop capabilities to detect, contain, and bounce back from those inevitable errors that are part of an indeterminate world.[25] The signature of an HRO is not that it is error-free, but that errors don't disable it.

Resilience is a combination of keeping errors small and of improvising workarounds that keep the system functioning.

Both these avenues of resilience demand deep knowledge of the technology, the system, one's coworkers, one's self, and the raw materials. HROs put a premium on experts; personnel with deep experience, skills of recombination, and training. They mentally simulate worst case conditions and practice their own equivalent of fire drills. Psychologist Gary Klein, an expert in high-stakes decision making, suggests that the most effective fire commanders have rich fantasy lives and mentally simulate potential lines of attack.

The meltdown of operations at UP by definition shows an inability to bounce back. When some trains began to back up, even more trains began to back up. The problem got worse, not better. There is little evidence of learning, either from the CNW merger or from the massive backups that had occurred years before in the Conrail consolidation. There is little evidence of resilient improvisation to deal with the unexpected. The UP remained essentially a by-the-books operator that favored centralization and formalization and treated improvisation as insubordination.[26] People who bypassed the hierarchical decision structure and enacted unique solutions not prescribed in existing procedures were accused of being insubordinate. In addition, there is little evidence that slack resources were reallocated, a common way to create resilience. The UP trimmed crews, locomotives, and supervisors shortly before the Englewood disaster and removed whatever slack they had. A more subtle loss of resilience occurred when UP argued that the merger had merit because the SP was in terrible shape and only the UP could save it. That reasoning is dangerous because, once the merger was approved, UP had to run twice as much railroad with basically the same resources as before. Management couldn't very well merge the companies and then delegate key operations to people they had just labeled inept. In short, most of the moves made by the UP removed rather than added resilience.

Deference to Expertise

The final distinctive feature of HROs is their *deference to expertise.* HROs cultivate diversity, not just because it helps them notice more in complex environments, but also because it helps them do more with the complexities they spot. Rigid hierarchies have their own special vulnerability to error. Errors at higher levels tend to pick up and combine with errors at lower levels, thereby making the resulting problem bigger, harder to comprehend, and more prone to escalation. To prevent this deadly scenario, HROs push decision making down—and around. Decisions are made on the front line, and authority migrates to the people with the most expertise, regardless of their rank. This is not simply a case of people deferring to the person with the "most experience." Experience by itself is no guarantee of expertise, since all too often people have the same experience over and over and do little to elaborate those repetitions. The pattern of decisions "migrating" to expertise is found in flight operations on aircraft carriers, where "uniqueness coupled with the need for accurate decisions leads to decisions that 'search' for the expert and migrate around the organization. The decisions migrate around these organizations in search of a person who has specific knowledge of the event. This person may be someone who has a longer tenure on the carrier or in the specific job."[27]

At the UP, however, decisions were made at the top and continued to be made this way regardless of whether they were made during times of crisis or times of calm. This meant that decisions about the Englewood yard were being made by an overloaded team of people who were not current in their operational skills and who were being fed information they wanted to hear. Davidson kept saying publicly that the worst was over when, in fact, the worst was yet to come. He kept sending UP people to see what was up rather than going himself to observe this first-hand or listening to Southern Pacific experts who had run the

yards successfully. This is the classic command-and-control bureaucracy that is adequate for a stable world but too inflexible in times of change.

HROs differentiate between normal times, high-tempo times, and emergencies and clearly signal which mode they are operating in. Decisions come from the top when it is normal, they migrate during high-tempo operations, and a predefined emergency structure kicks in when there is danger the ship could be lost. These clear signals tell everyone when migration is crucial and when it is not. No such signals were available at the UP. There was no agreed-upon way to signal, systemwide, either that this was a unique period with unusual pressure and problems or that "we are in big trouble." Crisis times were treated just like normal times. As a result, people did what they always did, only they did more of it. So when the system approached gridlock, more people and more equipment were thrown at the problem. What top people did not do was consult different resources, listen, pull cars out of the system, bypass the system, rebuild a system elsewhere, or own up to the growing calamity. Stonewalling does not manage the unexpected. HROs have learned this lesson the hard way.

What Can We Learn from Those Who Face Catastrophes?

Part of the novelty of the argument presented in this book is that we have taken a persistent pressing problem—*How can we manage the unexpected?*—and suggested a new answer: *By acting more like a high reliability organization.* These high reliability organizations maintain reliable performance despite constant exposure to the unexpected, in part by developing and maintaining their capability for mindfulness. A well-developed capability for mindfulness catches the unexpected earlier, when it is smaller, comprehends its potential importance despite the small size of

the disruption, and removes, contains, or rebounds from the effects of the unexpected. By managing the unexpected mindfully, HROs continue to deliver reliably the performance they were chartered to deliver.

Issues of Harm

HROs have a big incentive to contain the unexpected because when they fail to do so, the results can be catastrophic. Lives can be lost, but so can assets, careers, reputations, legitimacy, credibility, support, trust, and goodwill. All organizations know firsthand the potential for the latter losses. It is the very fact of these high stakes in HROs that makes them unusually good models of how to handle the unexpected. Yet in the eyes of many observers, these high stakes may make HROs seem irrelevant. Without giving the matter much thought, some people tend to dismiss the relevance of HROs to their own activities with the pat remark, "We don't kill people. What can we learn from those who live in chronic fear that they might?"

If you think about it, that reaction doesn't make much sense. If people are serious about becoming a "learning organization," they should not impose strict definitions in advance about where the learning will come from. The whole point of a learning organization is that it needs to get a better handle on the fact that it doesn't know what it doesn't know.

It is commonplace among people in business to claim that "it's a jungle out there," meaning that the world is filled with physical, financial, and psychological casualties. True, most of us don't see ourselves as working in places that kill people. Neither do most people who work in HROs. There were no fatalities at the Three Mile Island nuclear power accident, even though much hand wringing implies there were. In fact, the consequences of a lack of mindfulness in business can be no less deadly than in HROs. Deck operations on carriers kill fewer people in a year

than died at the Union Pacific the year it tried to absorb Southern Pacific. To the currently controversial question of how many people die each year from medical errors, the answers range as high as the equivalent of two fully loaded 747s crashing with no survivors, each day of the year. Hospitals aren't even considered high reliability organizations. The existence of any pattern in these statistics is not obvious. And that's the point. The ability of HROs to teach us about mindfulness does not lie in their outcomes, or in the noncomparability of their outcomes with yours. It lies instead on the input side: what they pay attention to, how they process it, and how they struggle to maintain continuing alertness.

HROs, in fact, are organizations like any other. All organizations, HROs and businesses alike, develop culturally accepted beliefs about the world and its hazards. All organizations develop precautionary norms that are set out in regulations, procedures, rules, guidelines, job descriptions, and training materials, as well as informally on the grapevine. And all organizations accumulate unnoticed events that are at odds with accepted beliefs about hazards and norms for avoiding these hazards.[28] It is these very similarities that encourage transfer of the lessons of HROs to other organizations. For example, HROs develop beliefs about the world and its hazards with fewer simplifications, less finality, and with more revision than we see in most organizations. The definition of what is hazardous is continually refreshed. Likewise, HROs develop precautionary norms just like everyone else. But unlike everyone else, they use both the small failures and liabilities of success as sources for these precautions. And like all organizations, HROs accumulate unnoticed events that are at odds with what they expected, but they tend to notice these accumulated events sooner, when they are smaller in size. They also concentrate more fully on the discrepancy, its meaning, and its most decisive resolution. Each of these elaborations of the basics by HROs suggests directions in which other

organizations can make their own elaborations in the interest of heightened mindfulness.

Issues of Scale

Another source of misunderstanding about the relevance of HROs to non-HROs involves a misunderstanding of issues of scale. If the activity being observed is an assembly line, for example, an unexpected shutdown is not a severe crisis (there was no fatality). But it is a crisis relative to what the supervisor expected would not fail and a crisis relative to precautions taken so that it wouldn't fail. A visit from Mike Wallace to a CEO's office does not produce fatalities, but it can affect markets, share price, and liability. In each case the meaning of the unexpected is contextual. Once we understand the context, the precautions, the assumptions, the focus of attention, and what was ignored, it becomes clear that many organizations are just as exposed to threats as are HROs, and just as much in need of mindfulness. In all organizations people do things that they expect to continue doing reliably and for which unexpected interruptions can eventually turn disastrous if they manage the unexpected poorly. This possibility is more at the center of attention for HROs than for most other organizations. But it is a possibility that haunts all organizations.

As noted earlier, how well or poorly people manage the unexpected is a foundational issue that underlies the handling of any pressing business problem. Hence, the difference between an HRO and a non-HRO is not as large as it might appear. In both settings, trouble starts small and is signaled by weak symptoms that are easy to miss, especially when expectations are strong and mindfulness is weak. These small discrepancies can cumulate, enlarge, and have disproportionately large consequences. This path of development also is similar across organizations. What differ across organizations are variables such as

how much value people place on catching such developments earlier rather than later, how much knowledge people have of the system and its capacity to detect and remedy early indications of trouble, and how much support there is from top management to allocate resources to early detection and management of the unexpected, error-acknowledging communication, and commitment to mindfulness at all levels.

Issues of the Setting

The environment of HROs is one in which there are high-risk technologies. These technologies must be mastered by means other than trial-and-error learning, since in many cases the first error will also be the last trial. HRO environments unfold rapidly and errors propagate quickly. Understanding is never perfect, and people are under pressure to make wise choices with insufficient information. But whose environment isn't like this? Stanford business professor Kathleen Eisenhardt, for example, describes the environments of the microcomputer industry as "high velocity environments." "High velocity environments are characterized by rapid and discontinuous change in demand, competitors, technology, and/or regulation such that information is often inaccurate, unavailable, or obsolete."[29] The ways people deal with a high-velocity environment resemble the mindful activities of people in HROs. For example, she finds that her fast decision makers pay close attention to "real-time information, that is, information about current operations or the current environment which is reported with little or no time lag."[30] The parallel to our third process of mindfulness, *sensitivity to operations*, is clear. Eisenhardt also finds simultaneous centralization-decentralization, which we describe in Chapter Five under How Culture Controls, to be a signature of HROs. She finds it in the form of a pattern she calls "consensus with qualification," which refers to a two-step decision process. The

first step is decentralized because everyone who will be affected by the decision tries to reach a consensus on what it should be. But if they can't reach it, the decision is made in a centralized fashion by the leader.

In summary, HROs worry about the unexpected, mindfulness, and reliability, but so do an increasing number of organizations. The UP is not alone in its troubles with the unexpected. E-commerce, new economic rules, offshore manufacturing, constantly changing parent companies, and jolts of downsizing put every organization in the same position as the UP. Everyone has their own Englewood yard, patched together with baling wire and duct tape, which is just itching to spring the unexpected. For people who hate surprises, a stream of unexpected events can be a pressing problem. It is a problem whose resolution lies partly in the lessons learned by those who live with a steady diet of the unexpected.

CHAPTER SUMMARY

In this chapter we have introduced the topic of *managing the unexpected* by looking at the efforts of the Union Pacific Railroad to absorb both the Chicago and North Western Railroad and the Southern Pacific Railroad in the short span of two years. Both mergers generated escalating events that paralyzed the UP system. These difficulties can be viewed as problems in managing the unexpected. The UP was not prepared for the unexpected. Its management team dealt with it poorly as it unfolded. And when they tried to bounce back from the unexpected, they often made things worse.

A benchmark for best practices in managing the unexpected is a set of organizations, called high reliability organizations, that reliably forestall catastrophic outcomes through mindful attention to ongoing operations. People in these organizations hate the unexpected just as much as everyone else. But it doesn't surprise them or disable them. And their coping actions seldom make the situation worse.

We have summarized five ways in which HROs operate that make them more aware of their own capabilities, what they face, and what it might mean: preoccupation with failure, reluctance to simplify interpretations, sensitivity to operations, commitment to resilience, and deference to expertise. These guidelines apply upward to divisions and organizations as well as downward to teams, crews, and team leaders. Although HROs seem unlike any other organization, that appearance is deceptive. They resemble other organizations in their input processes, their adoption of precautionary beliefs, and their susceptibility to surprises. Where they differ is in their commitment to mindfulness as a means to manage inputs, precautions, and surprises. Even though HROs may be unique in their pursuit of mindfulness, there is nothing unique about how they pursue it. Processes by which HROs pursue mindfulness are processes that can be adopted by anyone. The purpose of this book is to make those processes more visible, accessible, and available.