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High Reliability Organizing

Managing the Unexpected by Building up Organizational Capabilities

High Reliability Organizations are able to perform reliably even in risky, dynamic or crisis-prone environments. Whether aircraft carriers, nuclear power plants or chemical companies, what these HROs have in common is a set of unique organizational capabilities. HROs can teach managers in more traditional organizations a great deal about preparing themselves – and their companies – for extreme situations.

In this article, the authors show how the organizational principles guiding High Reliability Organizations (HROs) can successfully be used for organizational and management development. Using ThyssenKrupp as an example, they show how different organizational practices can improve reliable performance. HRO principles provide managers with a prism through which to view their own business practices from a new perspective. From this starting point companies can begin to experiment with different ways of organizing that are more suited to ensuring resilient performance in unexpected and extreme situations that we cannot imagine. A strategic learning infrastructure provides the framework to develop different individual styles of managing and management practices. Studying HROs also provides managers with the opportunity to reflect their understanding of organizations and management based on system-theory thinking in practice.

Creating a mindful infrastructure

Companies today are confronted unremittingly with disruptive events that no-one expected and hardly could have been anticipated. When thinking about unexpected events we tend to turn our thoughts to terrorist attacks, environmental catastrophes or the economic crises brought about by financial system collapse. But in addition to these sorts of extreme incidents, organizations in general must prepare themselves like never before for unpredictable situations that we can barely imagine. Being able to recognize

early warning signals and responding to sudden changes in a flexible manner is a matter of survival, especially for companies operating in a dynamic market environment. Although companies might face changing customer requirements, fluctuating demand, difficult-to-predict volatility in financial flows or supply chain breakdowns, they must be able to maintain functioning and have to operate reliably. At the same time, they have to remain innovative. In dynamic environments, the willingness to find new solutions, to change and give up old ways of acting and thinking is a prerequisite for reliable performance.

Traditionally organized companies are often their own worst enemy. They focus too much on their expectations, plans and past successes. This preoccupation impedes their ability to question their once-made expectations in order to gain a refreshed view of the current situation and properly respond to it. In hindsight, the way businesses responded to the financial and economic crisis shows an all-too-common pattern: Lots of signals indicating the impending crisis were ignored – often against better knowledge. As a collective whole, we concentrated on what we expected to see happening, instead of paying attention to the many small and sometimes counterintuitive surprising observations that would have allowed different conclusions and decisions to arise. These could have prevented the crisis or at least limited its destruction. Grit your teeth and get on with it was the motto in many places as the financial markets tumbled. That is why critical discrepant information like initial warnings from financial experts, changes in liquidity, and unexpected sales declines in certain market areas or changed customer behavior did not manage to reach the relevant decision makers. Employees and managers alike failed to communicate surprising information and anomalies to their superiors – or, worse, they even sugarcoated the information – out of fear that they would be sanctioned or punished in some other way. The involved parties concentrated on once-made plans and ignored the concrete shifts in the here and now. Individuals collectively validated expectations made in the past and extrapolated them into the future. Companies lack principles which force them to gather and appraise conflicting information and to revise laid-out plans and decisions.

Organizations need adaptive forms to handle new and changing situations if they are to survive in unpredictable and dynamic market environments. They need to develop behaviors and attitudes and confront the reality that they might sometimes be disappointed. They must enhance their ability to interact variably with clients, suppliers, competitors and even employees. All this confronts management with demanding tasks of self-organizing. Management must ask itself: What ways of organizing ensure that dissent can be collectively voiced toward our own decisions and expectations?

Learning from HROs

Managers who are interested in better understanding their own organization and management style can gain a great deal by studying the organizational principles and practices of HROs. HROs have always had to deal with potentially high-risk situations. They are extreme examples of anticipatory mindful engagement with the unexpected. These organizations operate in a high-risk environment. The smallest of anomalies in the environment, technical system or in human performance can quickly lead to a massive catastrophic event, along the lines of a nuclear reactor meltdown or fatal explosion. That is why HROs must be alert and prepared for something surprising to happen, even in quiet periods. They must be acutely attentive to any changes in their environment and they have to prepare themselves for a worst-case scenario.

Weick und Sutcliffe (2001 and 2003) examined HROs and looked at the way devastating catastrophes materialized. They describe an ideal set of “mindful practices” which aid successful HROs to better manage the unexpected and which enable them to prevent potentially destructive happenings turning into full-blown catastrophes. These mindful practices help successful HROs find the right balance to the organizational dilemma that arises from the dual needs of a company to be open to change yet remain stable. They know that controlling and meticulously monitoring all predictable disturbances and problems is not enough. In addition, they work on countering their own tendency to rely on expectations of the future that are built on the past.

High reliability organizing highlights ways to expand the learning and innovating potential of an organization: Successful HROs create routines to change their established routines (cf. Baecker 2003). As paradoxical as it sounds, this preparedness for change is the prerequisite for reliable performance. This marks a good starting point for managers to critically reflect upon the established ways of organizing and to assess and foster the current organizational capabilities to better manage the unexpected.

High reliability organizing offers valuable impulses for many important management issues. Three examples:

1. How to organize for strategic renewal

   “How do we stay alert to unexpected information relevant to strategy and what processes do we need to quickly respond to changes?”

2. How to organize for product-related innovation

   “What are ways to follow - externally and internally - new trends and how can we use them for product-related decisions?”

3. How to organize for quality and workplace safety

   “How do we guarantee reliable quality and workplace safety in innovation-driven environments with fast changing manufacturing practices, short product lifetime cycles, etc.?

HROs: Organizing Contradiction

Successful HROs, when viewed from an organizational-theoretical vantage point, can also be considered pioneers of a new managerial mindset. In contrast to the traditional management model, HROs do not think organizations are perfectly functioning machines. Managers in the traditional model are expected to make the right decisions and find the optimal solution, both of which is expected to be “right” or “wrong” independent of the highly dynamic and uncertain context. Managers in HROs place their trust in only one truth: It is extremely risky to rely on laid-out plans and past decisions. No matter how ingenious a system might be, something unanticipated can always occur. For this reason, HROs do two things:

- They gain intimate knowledge of all incidents that could possibly be expected to become relevant in order to contain them and limit their impact before they become critical.
- At the same time HROs intentionally establish interaction patterns to nurture the collective consciousness that something unanticipated can always occur – despite all existing control mechanisms.

In the following section, we explain how studying HROs can be beneficial for developing management and organizations. To accomplish this, we first outline the principles that many HROs follow to expand their organizational reliability and resilience. We also highlight the features distinguishing HROs from more traditional models of organizing. Using the ThyssenKrupp Impact Workout "Building an HRO" as a case study, we are able to demonstrate how a strategic learning infrastructure can be designed that draws on HRO principles to explore current practices and to look for ways to enhance mindfulness.

Mindful Practices

Given the nature of their operations, HROs cannot afford to believe they have things under control. They never consider themselves to be safe. They establish practices that ensure that they never forget their own fallibility. They organize their processes in such a way that they systematically question their own decisions and experience-based perceptions. In addition to questioning their own built-in expectations, they also make sure that they can actually manage completely unexpected or unlikely situations.

HROs reach this state of mindfulness, this questioning of assumptions and expectations through specific organizational practices that are relevant to their particular business environments and that they have developed over time. Weick and Sutcliffe outline five principles that, in an ideal way, characterize how HROs organize themselves. These principles distinguish HROs from more traditional forms of organizing. HROs develop a stable repertoire of mindful practices that help them to expect anomalies and react flexibly to them. Alertness towards the unexpected is the only constant. HROs develop

stable mindful practices in order to recognize the things they never would have expected. This in turn enables them to change their routines and respond rapidly in a variable manner. Traditional organizations take the opposite route: Their perception is shaped by fixed routines and expectations. When confronted with conflicting perceptions, they are more likely to change their mindful practices than question their routines and expectations (cf. Weick und Sutcliffe 2003). For example, they prefer to modify assessment criteria or ignore first signals to prove their expectations and routines.

HRO Principle 1: Preoccupation with Failure and Surprises

Successful HROs attentively pursue anomalies and the smallest of surprises and evaluate these with inquisitiveness. Mistakes are not hastily viewed as an unwanted disturbance caused by human error, but are welcomed as a valuable source of information about the system. Mistakes reveal a great deal about how the entire system is functioning. How the problem evolved is of greater interest than who could be blamed. Small surprises and close calls, like tiny objects lying around where they should not be, and dimension variation are made into topics. HROs devote time and energy to identifying all possible consequences of these close calls: What do these small deviations “teach” us about the system? How could they – in coaction with other incidents – harm the reliability of the system?

To be attentive to failure, HROs do not only rely on employees’ or manager’s individual behavior and capacity to act as a role model. Instead, they institutionalize certain practices, observation criteria, etc. to foster a blame-free culture and to encourage mindful behavior. Analyzing mistakes becomes part of the daily routine.

This sort of mandatory failure analysis is exemplified in the systematic analysis of an engagement that occurs in staff rides. These are compulsory in the military and fire department following failed missions. During a one-day process, external observers along with all involved parties reconstruct in minute detail how the failed mission developed step by step. They examine how certain interaction and communication patterns helped compound the evolving incident. The broad variety of perspectives,

conflicting opinions and ambiguous observations are taken into consideration in order to learn as much as possible about the functioning of a complex and unpredictable system. On aircraft carriers, recruits complete so-called walk downs several times a day, walking the full length of the deck in search for anything out of the ordinary, for anything that might suggest something is amiss. This activity improves their ability to notice early warning signs such as tiny pieces of debris or dripping liquids. Frequent routine briefings encourage managers and employees to candidly discuss surprising observations and discrepancies. They ask: What surprised you in your last shift, about the functioning of the technical system, working with your gear, talking with clients, dealing with suppliers and service providers, about the technical or controlling data? How can these deviations be explained? How could they impact our business, or our ability to perform?

HRO Principle 2: Reluctance to Simplify

People and organizations tend to simplify things. Especially new unsettling situations seduce us into prematurely categorizing surprising observations along the motto “That really isn’t new, we’ve experienced that before.” Complex events, however, usually cannot be reasoned away by old, simple explanations. HROs deliberately attempt to complicate the picture. HRO practices counteract the unavoidable tendency to label new situations as known and to bury new questions with old suggestions. Team members must work with multiple perspectives, consider for-and-against arguments, and deal with doubts and contradictions. When manufacturing the 737, Boeing set up practices that enable every mechanic facing a problem or disturbance to quickly put together a team of people with different expertise to find an effective solution to the problem. Different perspectives and experiences are considered during the search for a solution. Everyone is aware that bringing together multiple perspectives raises the complexity of the situation. It takes more time to find a sustainable solution considering all the relevant opinions. Mindful practices contradict efficiency targets that have to be met. Therefore, HROs have to find a good way to balance short-term effectiveness with long-term reliability demands.

HRO Principle 3: Sensitivity to Operations

A hierarchical mindset, which focuses attention from bottom to top, combined with an obsession with plans and abstract numbers makes us blind to what is happening in the here and now. Actual observations in the "now" stand little chance against hoped-for situations. This is why HROs establish practices that encourage employees to improve their situational awareness. In many traditionally organized companies, managers focus primarily on the clear-cut world of ideas and "talk" (cf. Brunnson 1993). HROs in contrast shift their attention to the ambiguous and complex world of operations, to the concrete actions. At the same time HROs do not take their eyes off their long-term strategic goals. They are balancing contradicting needs: They are obsessed with details without giving up orientation. Long-term plans are not written in stone so that unexpected delays and changes can be reacted to with flexibility.

HRO managers know that they are dependent on their employees' observations for this flexible planning, which explains the emphasis placed on short, quick feedback between managers and employees. Very often managers can be found physically near production sites, tending not to spend much time away from operational processes. They want to be where the action is, not hidden away at headquarters. Being sensitive to operations should not be confused with micro-managing. Managers gain from the deviating observations of employees when communication is constant, not by controlling their way of operating. Cockpit teams are trained to keep in constant contact with others in precarious situations. They gain a good overview of the critical situation because they draw on the observations and perceptions of all involved parties. Based on this, they can carefully decide how to proceed.

The three principles we described so far mainly focus on the anticipation of unexpected events in order to prevent their emergence. Yet forward-looking anticipation does not cancel out the possibility of something unexpected happening. HROs prepare themselves for maintaining performance even in states of emergencies or during grave disturbances that cannot be anticipated. Therefore, the following two principles focus on

containment: How do we find adequate solutions for unexpected problems that we did not know would exist today?

HRO Principle 4: Commitment to Resilience

HROs must keep functioning during expected and unexpected extreme situations like catastrophes and accidents. In theory, states of emergencies arising from a plane crash, an explosion at a nuclear power plant, or from a military operation occurring during a time of peace can be expected. But because these emergencies happen so infrequently – or have never occurred – established routines and standard knowledge for dealing with such events rarely exists. Moreover, the singularity in the way in which catastrophes develop means routines are difficult to establish. Indeed, rigidly adhering to a certain manner of responding could be fatal, as envisioned crises seldom resemble the catastrophe that actually unfolds. People collectively have to be able to respond quickly and flexibly to completely unexpected situations. Employees at HROs are not drilled with a set solution for a specific situation. Instead, HROs invest in developing individual and organizational capabilities, fostering flexible problem-solving abilities. Intensive training and simulations keep staff alert to various sorts of threatening scenarios. The capabilities to act resiliently are tested regularly: Are we able to find ways of dealing with the worst case?

HROs deliberately introduce a certain redundancy into their work processes. They do this to avoid dangerous chain reactions caused by strict coupling of one action causing the other. In addition, they ensure that there are several ways to catch problems before they become too large. They do not rely on formalized communication channels for information to flow. Through alternative communication channels – think here of informal networks, knowledge banks and interest groups – they create conditions that make it easier for managers and employees to use the entire knowledge of the system and to be able to improvise in worst case scenarios. While this surplus of information and solutions might appear to create confusion and be more distracting than helpful in normal situations, it is critical for rapidly finding alternative solutions and to push on with these in unexpected extreme situations.

HRO Principle 5: Deference to Expertise

Decisions should be made on the front line, meaning with the person who has the best knowledge or expertise of the particular situation. A hallmark of high reliability organizing is flexible decision making. The decision making processes at HROs contrast sharply with those hierarchical forms favored at more traditionally organized organizations. HROs pay deference to the fact that management does not always have the best overview when sudden disruptive events occur to make the most intelligent decisions. No-one can predict when and where something unexpected will happen. Far too often someone lacking special rank or status will realize something disruptive is taking place within the organization, but does not dare to take action because he does not have the hierarchical authority to do so. That is the reason why many HROs refuse to rely on hierarchical decision making processes, even if these work well in normal day-to-day operations. In extreme situations, HROs migrate decision making competency downwards. Decisions should be made on the front line where the best knowledge of the situation exists. A good example of this mechanism is the “andon cord” principle followed at Toyota’s production plants. When a problem on any vehicle is spotted, any employee – as the expert of the situation – is authorized to pull a rope strung along the assembly line to halt production. Only when the problem is resolved, the line is restarted.

HROs do not reject hierarchical patterns of authority wholesale. They rather adapt decision making modes to fit the individual circumstance. In normal situations, HROs benefit from the advantages of hierarchical decision making processes. In these moments, top-down decisions are made efficiently without dissent. Yet in unknown, uncertain situations, their decision making processes change. When military operations suddenly become precarious, soldiers on the ground who have the best knowledge of the situation make the decisions. This would be unheard of during normal circumstances when they strictly follow command orders.

Being flexible towards one's own mode of decision taking is a demanding task for an organization. Different and contradicting ways of organizing have to co-exist. It requires from employees great situational awareness and the ability to trust and judge own perceptions. From an organizational perspective, a sophisticated interplay of established management practices, containing incentive systems and evaluation criteria, the development of consistent values as well as constant efforts in training, etc., encourages employees to trust their five senses and to speak up if needed.

During times of emotional stress, teams tend by-and-large to relapse back to well-established hierarchical routines that minimize uncertainty instead of relying on alternative, less-comforting forms of responding. This can be seen in the response of companies to the financial and economic crisis. Companies immediately relied on conventional patterns, like centralizing decision making, reducing costs, and introducing shortened work hours, instead of using the creative power of the entire organization to think about alternative market strategies or innovative product portfolios. HROs are aware of this tendency to relapse and try to stop it in its tracks. This is especially important in organizations with strict chains of command. Pilots, for instance, are trained to contradict their captains in extremely stressful situations when their opinions about a situation differ. Pilots learn both to recognize precarious situations and to deal with the personal emotional stress arising from responding to a superior in a counter-intuitive manner.

Looking at organizations and management in a different way

As simple and evident as these principles may seem on first appearance, they force management to fundamentally rethink gained wisdom about organizations. Examining the HRO model allows managers to explore and critically reflect on their own organizational beliefs and practices. Largely out of necessity, HROs developed a view on organizations that contrasts starkly with classical management and organizational theories. This fits to a view on organizations based on system-theoretical thinking. Newer sociological system-theory recommends treating organizations like social

systems (cf. Luhmann 2000). This brings to light other management practices that help organizations perform reliably in volatile conditions.

HROs do not consider themselves to be predictable machines whose performance is jeopardized by human error. They are more likely to describe themselves as being non-trivial, unpredictable systems in which something unexpected can happen at every moment. The HRO model takes into account that organizations are not *complicated* but *complex* systems. Whereas complicated systems are difficult but in principle possible to be controlled, complex systems are unpredictable. Even detailed knowledge about every single component and their interrelations does not enable a manager to predict the behavior of the whole system. This is to say, complex systems cannot be controlled by management, only managed. Whereas traditional organizational models optimistically believe that reliability can be secured through a sophisticated system and by control mechanisms, HROs take a more pessimistic stance. They believe that there is no point in getting a holistic overview. Unpredictability, uncertainty and opaqueness is the normal status quo, not the exception. HROs know: As the unexpected cannot be controlled, it has to be managed.

HROs are aware that they always create blind spots. In order to focus their attention on their tasks they have to decide on a specific way. They say yes to certain options and thereby always have to exclude others. This is how organizations are “self-organizing”: By taking decisions, which are themselves based on previous decisions, organizations develop their unique way of organizing. They develop their strategic direction and their specific approaches to fulfill their goals. They develop communication patterns that determine how different elements, like departments, functions and teams, collaborate. This gradual self-organizing through decisions influences and shapes expectations and the picture the organization develops of itself and its relevant environments, such as customers, suppliers, and competitors. And it is precisely this unavoidable, structurally determined perception that HROs try to oppose. By altering perspectives and by allowing new observations to be made, they concern themselves with their own, inevitable blind spots and use this information for their organizational development.

HROs illustrate how an organization can say “no” to itself, to its own decisions, to its expectations and its way of describing itself.

Seen in this context, people in the organization are not a disturbing factor but an important resource for perceiving what is actually happening within the system. At the same time, everyone is aware that it is impossible to get a complete overview about what is going on. Through the ability to perceive and feel, reflect, describe, and learn, as well as by their capacity to say “no”, people – the “computer human being” (cf. Baecker, 2003) – are an organization’s best resource for finding ways to deal with unexpected situations. To act mindfully, organizations especially depend on the ability of humans to be alert and perceive deviations. They have to look for ways for utilizing this valuable human potential as much as possible. Managers have to institutionalize settings in which people are encouraged to share their observations, opinions and gut feelings even if they contradict the common rule.

From a system-theoretical point of view, every decision is based on uncertainty.
HROs show how this assumption can be made visible using concrete practices. Dealing in a high-risk environment HROs learn to reject the comforting premise of rational decision making. Instead, they rather consider the “paradox of decision making” (cf. Luhmann 1993). According to this view, it is not possible to make correct decisions. Every decision is based on the paradox that it cannot be decided. Strictly speaking, if there were optimal, rational decisions, nothing would have to be decided upon. Whatever needed to be done would have been self-evident without making any decision (cf. von Foerster 1985). HROs view their decisions as temporary solutions that are dependent on the specific context. Mindful practices ensure that context changes are recognized at an early stage and that decisions are questioned if needed. In addition, HROs understand that they cannot make any one person responsible for the fallibility of decisions. Since the sustainability of decisions is a more general issue, HROs search for ways to deal with it at the systems level.

Putting Theory into Practice

ThyssenKrupp Impact Workout "Building an HRO"

The learning architecture that we will describe in the following illustrates how to start reflecting upon one's own management practices from a systemic management and organizational perspective. The learning infrastructure described here was developed and implemented in collaboration with Prof. Kathleen Sutcliffe from the University of Michigan as well as with Dr. Bert Slagmolen from the company "Apollo 13". During the learning journey, managers critically examined their own organizational and management practices through the prism of HRO principles. As part of this learning process spanning several months, they also experimented with alternative organizational forms.

Basic Concept of the Format "ThyssenKrupp Impact Workout": Studying New Management and Organizational Ideas

The mission of the format "ThyssenKrupp Impact Workout" is to work through real problems by asking questions from new management and organizational perspectives. Senior management works on finding new ways to address an existing business problem that needs to be solved. Yet instead of relying on the conventional management and organizational logic that would normally guide their thinking they look at the problem from a completely new angle. The learning infrastructure, in contrast to normal project work, provides managers with a theory-based academic framework that makes a difference to the established logic of organizing and points out alternative ways to design communication and decision making processes.

Critically reflecting upon their own practices enables managers to see alternatives to their current organizational habits. In a second step, they can start experimenting with changing their practices. They can evaluate how useful these practices are and they may want to think about how they can be extended and used throughout the entire organization. While this sort of reflection desired during this exercise clearly takes more time and energy than is usually required in results-driven projects, results are still expected. Introducing in one's own area of responsibility management practices that have been successfully experimented with in a pilot project, could be one expected

result of an Impact Workout. Also, first signs that a manager is changing his or her management style is a good outcome from a learning perspective.

The learning infrastructure provides managers with a safe environment to test out organizational alternatives. Steps are taken by the facilitators to make sure that results and experiences in this “parallel world” are relevant to the organization as a whole. The learning infrastructure takes into account established decision making processes. Feedback loops ensure the feasibility of new approaches. Topics are approved by the management board, a patron overseeing the project, and by numerous relevant persons involved in the process. Participants present and discuss their initial results and experiences with the program sponsors and important decision-makers in their area of responsibility. They ponder: What have we experienced that could be useful for our business? How can we institutionalize these practices in our day-to-day business?

Ensuring Quality and Workplace Safety - Critical Concerns

The ThyssenKrupp Impact Workout “Building an HRO” was developed following the observation that the expert-based approach to reliability and quality challenges had reached its limit. Although numerous quality processes and safety instruments like Six Sigma, EFQM, Kaizen, and TQM had been implemented, certain areas continued to suffer from quality and safety problems. These were now to be addressed in a systematic fashion. To increase the reliability of the performance processes in a high-risk and innovation-driven environment, managers were asked to examine structural alternatives to the work processes currently in place. In this context, the HRO model provided a useful academic framework. Reliability would be examined as an organizational issue. At the same time, HRO principles and practices provided an alternative management logic that diverges from the group’s classical hierarchical form of organizing. The learning process had less to do with finding the right instruments – experts had already tried to answer that question. The goal was rather to examine mindful management and organizational practices. Managers had the opportunity of seeing how mindful organizing could help bring out the potential of existing instruments.

Using HRO Principles as an Analytical Framework

The field work carried out in five groups of five-to-seven people formed the core of the learning infrastructure. Top management worked in mixed teams on a challenge that was pressing to at least one of the team members, one such challenge being, for example, to improve workplace safety in a plant with a high accident rate. Another example was to ensure the quality of processes in an IT project, which was critical for high service quality right at the time of implementation. Three over-arching learning modules flank the fieldwork. During the fieldwork intervals, the fieldwork teams also receive coaching. In the learning modules and the team coaching sessions, participants learn about HRO principles and they reflect on what they can learn from this new perspective concerning their own organization and management practices. During the learning sessions and the coaching support, participants were continuously reminded to stick to the new perspective when reflecting upon their own practices.

The learning process started with a kick-off meeting in which the participants learned about HRO practices. During this meeting, teams clearly defined the parameters of the problem they wanted to address and they determined how they planned to proceed. The first fieldwork phase that followed allowed participants to examine their own practices. This examination purposely slowed down the normal problem-solving process. Instead of prematurely discussing possible solutions derived from conventional wisdom, the teams were encouraged to examine their own practices by analyzing concrete exemplary incidences using HRO criteria. How did the problems we want to solve actually develop, step by step? Who perceived what? And how and which observations were actually communicated? Who took what action? Who did not and why? What were the alternatives? What are the underlying expectations and collective convictions that guided the way of perceiving, interacting and communicating with each other? This detailed examination of sample incidences quickly led to more general insights about interaction patterns and attitudes in the respective area. The teams got a better picture of their organizational capabilities: Where do we have pockets of HRO practices in place and how could they be extended? What practices could help us to raise our organization’s collective mindfulness?

All the observations collected by the teams during the fieldwork were written down in a second over-arching learning module and reflected upon (Result Report 1). The teams thus benefitted from critical feedback by their peers. Building on these reports, they planned sensible measures and interventions that were piloted in the second fieldwork phase. Some teams introduced processes that would improve communication when work teams change shifts. Employees finishing their shift would be asked about any surprising events or problems before handing over to the next shift. No individual would be blamed for disturbing the workflow. Instead, they would be considered the person with the most expertise of the situation, and together observations surrounding the error would be evaluated. Other teams put different reporting procedures to the test. Abstract accident statistics were replaced with reports containing qualitative mistake analyses. In addition, they created processes to ensure this content-rich information would reach management. Managers started to visit factory sites and locations more frequently, speaking directly with employees and explicitly asking about divergences from the plan in order to gain a more nuanced picture of the situation. This information was evaluated together with employees. Other teams again created multi-functional teams to find sustainable solutions to problems.

The different experiences were evaluated by the teams in a third learning module (Result Report 2) and critically reflected upon. This highlighted the importance of improving communication as an important condition for mindfulness. Better communication would be necessary for the new practices to gain traction in the long term. Some of the desired practices include developing a more modest and respectful management style, creating a work atmosphere free of stigma and blame, and accepting (unavoidably annoying) doubts. The critical reflection on the practices also made clear the difficulties and challenges involved. Whereas traditional models of organizing depend on simple interpretations of situations that lead to well-defined solutions, a comforting and seemingly efficient approach, high reliability organizing raises the awareness of uncertainty and complexity. HROs allow contradictions, accept multi-faceted observations and interpretations, and put into question past decisions and

indeed the entire decision making structure. But this is part of the learning experience. Managers are confronted with basic management contradictions for which they have to find solutions. They have the chance to discuss how to organize work so that a good balance can be found between the organizational needs for renewal and stability, between centralization and de-centralization, and between efficiency and reliability.

Instructive Contradictions – HRO Practices Shape Design

HRO principles not only form the content of the learning program, they also shape its process design. During the learning process, managers experience personally what it means to apply these organizational principles and can reflect upon these experiences that are very often accompanied with uncertainty and opposition. While most organizations quickly embrace the idea of high reliability organizing in theory, it gets more difficult when it comes to application. Differences to the traditional model of organizing are becoming more obvious. Managers tend to turn back to their old way of thinking. The fieldwork phase combined with the task given to managers to examine actual practices raises top managers' sensitivity to operations. They experience first-hand the benefits looking more closely at the "here and now" has on better understanding the functioning of the system as well as the emergence of problems. This will allow them to design better solutions like business processes, etc. Managers discuss, for example, how concrete problems like safety or quality issues in the system take shape and develop at the operative level. Additionally, they consider which management structures and management behavior would encourage mindfulness during unexpected events.

Defensive reactions are pre-programmed and they are actually desired: According to established traditional logic, this elaborated way of dealing with a problem is considered as a waste of time. Why should managers bog themselves down with annoying operative details? Why can't a subordinate do the analysis? Teams are confronted with their assumptions about hierarchical structures: Can we candidly discuss mistakes with our employees? How do we create an atmosphere free of anxiety and fear when we jointly discuss incidences, lack of quality, manufacturing disruptions or accidents?

Working in multi-disciplinary, division-spanning teams allows additional alternative work experiences, which can be reflected upon during the process. A multiplicity of view points, explanations and solutions is guaranteed thanks to the selected mix of operative managers and quality and safety experts in the teams. This illustrates functional thinking alternatives. Each team has a member who is not knowledgeable about the business area. This team member is a valuable resource, broadening the discussion through his observations and questions posed from an external perspective. Foreseeable resistance here again was instructional and was part of the process reflection: Can we afford to talk openly with external participants about internal weakness, without losing face? How do we manage the complexity created in the team work because of the different perspectives and opinions?

Summary

Encouraging self-observation processes is a central lever for developing management and organization. The HRO practices described here provide a prism through which to view your own practices in another light and to find new ways to describe actions. HROs show how organizations can design their own survival framework, one that enables them to operate reliably in dynamic contexts. The learning infrastructure helps managers to take responsibility for expanding their own organizational capacities instead of blindly drifting this way and that.

HROs show how an abstract system-theoretical management philosophy can be put into practice. They can assist managers to fundamentally question their own mind-sets (how they think about the organization and their role as a manager) while working on existing managerial challenges. After all, it is only by working on real problems that managers experience how demanding the application of this new model of thinking is. High reliability organizing differentiates itself from other organizing by its conviction that reliability does not occur through controlling stable conditions. Resilient performance results from making routines more flexible and, at the same time, from developing and

abiding by mindful principles and practices that gradually influence company culture and management styles.

Establishing a strategic leaning infrastructure, like that illustrated in an exemplary fashion by the ThyssenKrupp Impact Workout, is a time-consuming process. The self referentiality of social systems must be taken into account. This is true for the planning and linking of the learning infrastructure just as it is for implementing the learning processes. All new impulses, approaches and ideas are going to be looked at and interpreted using the conventional logic. It takes a great deal of patience, tact and perseverance to persuade decision-makers to accept new approaches and the learning architecture's process design. Those responsible for teaching must realize that changes to the organization's planning and implementation processes, especially those that increase complexity and uncertainty, will be attacked time and again, because the planned interventions do not conform to the established management logic. A design has to be found that is compatible with the existing management logic.

It is precisely here that the careful study of HROs is advantageous, as it caters to the penchant of many managers to compare themselves with successful companies. Studying HROs can be sold as a "benchmarking" exercise. Managers can use this opportunity to observe themselves and their organization through a different and inspiring management and organizational perspective. External partners such as consultants or learning partners can contribute a great deal in this context. Outsiders are important because they can pinpoint the organization's self referential logic and counteract the unavoidable tendency towards normalization. By understanding the attraction of the organization's established logic, third parties can counteract in conjunction with internal instructors the unavoidable tendency toward normalization.