

Mindfulness for Innovation: Future Scenarios and High Reliability Organizing Preparing for the Unforeseeable

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Abstract: This work synthesizes two approaches to strategic learning in the face of uncertainty: Future Research (FR) as a set of methodologies to imagine and elaborate on future developments within companies and their environment, and High Reliability Organizing (HRO) as an approach to cultivate collective mindfulness and to prevent unwanted critical events. While both address different primary objectives (future development versus accident prevention) they share essential principles such as reckoning with complexity and unpredictability, skepticism against established expectations as well as rational decision taking, deviances as a resource for learning, facing the impermanence of organizations. Both approaches suggest a set of interventions to better de-couple past expectations from future projections. While HRO is mainly applied for safety and quality challenges in order to maintain reliability rather than for future developments, future research is still a separated domain of innovation and strategy units that needs to be better integrated into daily practices. We discuss cases from the telecommunication, internet business and high hazard businesses. A synthesis of both approaches in terms of basic concepts, methodologies and organizational execution enables a sustainable corporate development. As examples we discuss advanced communication measures, weak signal radar sessions, future staff rides and scenario site visits. The major challenge for both approaches remains their practical utilization for corporate development. Conclusions reflect upon shared guidelines for activating interventions and implications for organizational execution as well as the role of management and leadership. We point out challenges for further research and potentials for the management of reliability, resilience and innovation.

Keywords: Strategy, Organizational Learning, High Reliability Organizing, Scenario Planning, Futures Research, Innovation Management

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1 Introduction

Google is the name of the maybe greatest corporate success story of the new century. Critics remark that Google is still dealing with and structuring information, while competitors like Facebook moved on to even more powerful and sustainable customer relationships by structuring and exploiting social relationships. Still, already Facebook may suffer from a kind of tunnel view by strictly following Mark Zuckerbergs vision of a society in which "you have one identity" (Kirkpatrick 2010) only. Its social graph is being challenged by an even more valuable interest graph representing personal preferences and real life interactions. While new competitors arise exploiting new potentials for innovation windows of opportunity close for once dominant market players.

BP used to be a role model for innovative oil extraction and a shooting star at the stock markets. But due to the oil spill at Deepwater Horizon in 2010 BP holds one of the highest records in loss of reputation and credibility, still digesting massive financial downturn. Its financial performance is perilously hurt by compensation costs for 11 people who died, reparations of up to 4300 US Dollar for each of the 4 million barrels of oil that poured into the sea, unpredictable claims of the destroyed fishing businesses and an incalculable loss of reputation.

Google, its competitors and BP: At the first glance these companies struggle with different challenges concerned with innovation and maintenance. While Google missed early chances to seize opportunities and to re-invent its business model, BP failed to create necessary reliability for its high-risk business. (How) Could Google have perceived and responded earlier to the opportunities and threats that were evolving with the raise of social networks like Facebook? (How) Could BP have made sense of early signals to prevent the catastrophe before it was able to materialize?

2 Sensemaking challenges

Observation, interpretation and decision capabilities are becoming crucial for organizations in fast paced and risk-prone contexts. Organizations need to develop a repertoire to better detect surprising (negative or positive) deviances and make sense of these variations: How can new threats evolving be avoided at an early stage? How may new opportunities be identified and seized? According to Teece (2009) sensing (i.e. to perceive

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new business opportunities and emerging threats in a still latent mode) and seizing (i.e. being able to take intelligent decisions in the face of complexity) and reconfiguring are essential corporate capabilities to compete in innovation driven markets. Still, lessons learned from organizations operating in high-risk environments like nuclear power plants or wildland firefighting show comparable practices of collective mindfulness at work. They avoid crisis and catastrophes and ensure reliability in complex, trying conditions (Weick and Sutcliffe, 2003).

Sensemaking capabilities are built into organizational processes, structures and every day practices on the one hand, and they have to be trained as individual skills on the other. They provide answers to methodological questions such as: Which filters do we need to observe our operations and environments? How do we interpret the data collectively? And in addition: How flexible are we towards our established ways of sensemaking?

If it is left to evolutionary drift sensemaking can tend to collective patterns of oversimplifying reality construction. Especially in complex situations with a high degree of uncertainty various studies observe a tendency to reduce equivocality by collective bias patterns in order to keep up the illusion of control: People and teams hesitate to challenge assumptions as well as once-made “rational” decisions. They rely on expectations created in the past and seek for confirmation, labeling new situations as known or an easy piece of cake in order to raise certainty (Oswald and Grosjean, 2004). They normalize deviances in order to stick to plans (Vaughan, 1996) and they avoid and sanction doubt and contradiction by group think (Janis, 1982). Tunnel views, the hesitation to speak up as well as a favor for command and order behavior reduce the volume of data to be considered in stress situations (Dörner, 1987). Complex decisions tasks are simplified by excessive optimism (Audretsch, 1995). Looking at Google and BP we may illustrate some of these patterns.

”I screwed up”. In 2011, former Google CEO Eric Schmidt acknowledged that Google didn't take Facebook seriously enough (Fried, 2011). At least for Schmidt himself Google's own network Google+ came in 2011 too late. Four years before when the social networking site had around 20 million active users Google did not recognize Facebook's people-centric approach as a serious alternative to Google's' algorithm based search machine. At this stage 20 million seemed ridiculous compared to Google's user community – a comparably weak signal. Still, already at this time a valuable exercise for Google would have to scan for exponential growth in

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user numbers as an early warning system to become aware of the evolving threat. The threatening insight could have been used to inform alternative future scenarios.

Neither innovations nor catastrophes do happen all of a sudden. Catastrophes unfold in an evolutionary way by a number of small variations building on each other (Luhmann, 1987). Each of these signals is weak and it is up to people to utilize these insights and make sense how they could interrelate with each other. Severe accidents and catastrophes can be avoided if latent failures such as small leaks, unknown smells but also positive surprises are discovered, interpreted and addressed or eliminated before they sum up and an unwanted event takes place (Reason, 1980).

A similar figure of thought applies for innovation: To foster innovation, many organizations started installing practices to encourage and detect surprising deviances like failures, new ideas and spontaneous changes. With its famous 20 percent rule of discretionary time for employees Google for example successfully raised the variation of new business ideas and models. And in fact: In 2002 a young Google employee used his discretionary time and started a social networking service called Orkut.com. But Google did not seize the opportunity and misinterpreted early signals: Following the founders' vision "Let's get these systems to prove themselves" (Levy 2011, 372) management refrained from investing sufficient resources into the incubation of the project. Orkut failed not only in spite of its instantly high usage statistics, but because of overuse. Only in the particularities of the Brazilian ecosystem (e.g. with lower response rates and user expectations) the site remained popular until today.

We may only speculate why Google neglected this and other early chances to move on from information to social relations. Our thesis is that here as always shared concepts and assumptions constitute collective reality, and people tend to work on the challenges they have solutions and instruments for (as in the tale of the man looking for his lost key under the lantern where there is light). Google believed in the engineering driven algorithmic approach that powered its success. "The basic premise of social networking – that a personal recommendation from a friend was more valuable than all of human wisdom, as represented by Google Search – was viewed with horror at Google" (Levy 2011, 374).

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Patterns to blend out misfits can also be observed at BP. There was a strong collective belief that the blowout preventor system (BOP) was failsafe – despite contradicting information. The BOP prevents oil from pouring into the sea in case of emergency and its failure was critical in the unfolding catastrophe at Deepwater Horizon in April 2010. In June 2009 already, management was warned by BP engineers about possible damages of the BOP under high pressure. In addition the manufacturer of the BOP described more than 250 exceptional circumstances that could cause malfunctioning at the BOP. Financial reasons (given the costs of 500.000 Dollar for system maintenance in deep water) and a willingness to take risks as part of BP's corporate identity (“doing the tough stuff that others cannot or choose not to do”), Tony Hayward in a speech in April 2008 in front of BP top managers) may have helped BP believing in a failsafe system despite contradicting views and warnings – with the known dramatic and costly consequences. Collective patterns like the illusion of invulnerability encouraging risk taking, the normalization of early warnings, excluding and labeling alerters as disturbing are typical symptoms for group think, a dynamic nurtured by stress, complex and contradicting tasks as well as uncertainty (Janis 1982). Expectation based behavior between BP and regulators fostered the risk: Control institutions constantly lowered their safety restrictions for BP's oil drilling projects in the Mexican Gulf and they were willing to allow risky exceptions. In fact, neither BP nor regulators had experienced severe accidents in this area yet. Nothing ever happened, and soon the participating parties felt comfortable to stretch the limits.

Such tendencies preclude people from evaluating weak signals and hinder organizations getting a profound view on relevant changes in their business ecosystem as well as taking adequate decisions. How can organizations work against dangerous collective tendencies and which approaches and methods are useful to consciously driven innovation and mature sensemaking capabilities? High Reliability Organizing and Future Research are concerned with these questions and they deliver solutions to build different patterns of sensemaking that counteract the natural tendencies of organizational drift. While futures research aims to empower and prepare individuals and organizations to desirable or possible developments, HRO focuses on increasing organizational reliability. In the following we describe how both approaches counteract simplifying tendencies and biases.

3 High Reliability Organizing and Future Research to develop mindfulness

This confrontation of futures studies with the paradigm of high reliability organizing was born out of a discussion between a future researcher and an expert for reliability. Comparing the efforts fostering organizational innovation and reliability we discovered many overlaps like a social constructivist respectively systemic approach, skepticism towards rational models of organizing, appreciation of uncertainty, as well as the need to sensitise for surprises in order to learn. Both future research methods and the principles of HRO challenge biases like the tendency of expectation based assumptions by reframing and by de-coupling of past, present and future. Both approaches encourage unlearning established routines and a variety in observation, and thinking in alternatives.

Some biases preserve an illusion of control in situations that are out of control. As a well-established informal pattern to absorb uncertainty nobody ever decided for officially they are not easy to change. In a way, irrational biases protect a rationalistic mindset of organizing. The stronger the formal believe in the rational model with its premises of predictability, right decisions and optimal solutions, the stronger becomes the need for informal workarounds to preserve the idea of rationality and control. With High Reliability Organizing and Futures Research we discuss two approaches to counteract this vicious cycle.

Driven by the intuition that each line of research and consulting work would offer valuable extensions we first had to define the level of comparison. How could we ensure not to compare apples with oranges, or paradigms with toolsets? Should we consider futures studies or scenario analysis as the overarching strategic approach and HRO as a potential specification focused on internal operations in safety critical firms? Or is HRO the new paradigm of organizing and scenario management a set of tools to be used within? Finally, for the context of this paper, we decided to focus on scenario management methods as a well-established strategic approach in the corporate world (dismissing methods like futures workshops or Delphi-analysis) on behalf of futures studies. Scenarios extend and enrich sensitivity to operations as an organizing principle of the HRO paradigm.

3.1 Sensemaking by altering the relations of time

Sensemaking resembles the activity of constant map-making depending on perspectives, motives as well as opinions about what can be left out (Weick, 2001). There is neither one best map nor something like a pre-existing map to be discovered. Instead, an infinite number of maps can be created to represent the terrain. Resulting questions are: How do organizations construct their maps? And what representations are useful for which task and situation? When and how to change existing representations, when to create new maps?

Over time each organization creates its specific way of sensemaking. By taking decisions, which are themselves based on previous decisions, organizations develop their unique way to recognize, to select and to interpret things going on in its environments (Luhmann, 2000). These selection structures determine the way they construct their own reality and shape expectations and expectations of expectations.

Organizations have to focus attention and therefore they create their own blind spots. Every affirmation of options excludes other options: opportunities cost effort. Uncertainty persists but it is absorbed unless decisions are questioned. Decisions always create risks on the other side of the coin: Had it been better to decide differently? Therefore in fast-paced times, organizations need routines to oppose once-made decisions. They need to be ready to say “no” to themselves, to their past decisions, their expectations and their description of their identity. By altering perspectives and allowing new observations organizations concern themselves with their own, inevitable blind spots preparing the grounds for organizational learning.

Our construction of our present reality depends on our construction of our present past and our present future to come. A greater awareness about the construction circular relations of present future and present past and its impact on our perception of the actual present is essential for sensemaking. The way present past, present future and present are related enables and influences the possibilities we see in the here and now (Luhmann, 2000): Which options do we see now that we realized or missed in the past? Which options may we realize or miss in the future? Altering the interrelation of present past and present future can broaden attention in the here and now. For example, a strong focus on the present past (“the algorithm based search machine is the most successful model”)

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influences the opportunities we see in the present future (“social search mechanisms will never make it”). This again creates the context in which weak signals are evaluated in the present (“20 million users is ridiculous”). To foster capabilities to make sense of the present, organizations raise their awareness in these processes of social construction and they have to find ways to de-couple past and future more consciously.

Many biases and especially expectation-based behavior are based on the rather unreflected assumption that there is a continuous timeflow suggesting that the future is more or less determined by the past – i.e. present trends could be used to approximate future developments. Modern Futures Research and also HRO developed a repertoire of practices and tools to construct and deconstruct past and future in the present. In the next paragraphs we will show how both approaches facilitate coupling and de-coupling of past expectations and future projections to enhance mindfulness.

3.2 High Reliability Organizing: Reflect on the past to better anticipate the future

Weick & Sutcliffe (2001 and 2003) examined organizations operating in a high-hazard environment and looked at the way devastating catastrophes materialized. They describe a set of “mindful practices” which help organizations to perform more reliable by better sensemaking. Mindful practices account for impressive reliability performances related to production, safety or other critical outputs. These records are sometimes surprising given the considerable risks and challenges these organizations face. Although practices may look very differently from organization to organization, most features are built around five hallmarks: a sensitivity to operations in the here and now; a preoccupation with failure and even small deviations; a reluctance to simplify interpretations; a deference to expertise to migrate decision taking and a commitment to resilience. Whereas the first three principles are concerned with sensing and sensemaking abilities of things evolving, the latter foster resilience capabilities in case of “fire”. High Reliability Organizing introduces a new mindset of managing and organizing: How to create daily routines and practices to raise collective attentiveness and responsiveness:

- Sensitivity to operations: Practices that shift the attention to the ambiguous and complex world of the here and now, to the concrete actions to be able to detect discriminatory details and make sense of them. This principle is based on the fact that collective perception of

the present is distracted by future plans that were made in the past. This is why practices around this principle foster the observation of the here and now, try to get a broad picture of the present in order to construct a rich picture of the present future. This way of open planning needs practices that counter the common and certainty creating reluctance to give up past future plans, i.e. evaluation criteria of incentive systems have to be aligned.

Every observation counts in order to get a better picture. Therefore, many practices dedicated to this hallmark counteract communication blockades created by hierarchical structure, attitudes as well as mutual expectations of leaders and employees. Gaps between abstract strategic management and “dirty” operations, a lack of communication channels between levels and disciplines, a reluctance to question opinions of leaders as well as pressure to justify ones decisions – all this avoids reading the signs and the revision of plans. This explains the emphasis placed on short, quick feedback between managers and employees. Very often managers can be found physically near production sites to gain from the deviating observations of employees (not by controlling their way of operating). Observations in the here and now are interpreted by using multiple framing options: In which context does this data make sense? What could this be an early sign for? Cockpit teams for instance 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.

- Preoccupation with failure: Mistakes and also smaller deviances are not hastily viewed as an unwanted disturbance caused by human error but are welcomed as a valuable source of information about the system. A greater attention of what is going on raises the number of deviances and failures people are seeing. This principle suggest creating practices constantly seeking and evaluating deviances, surprises, near misses or failures to learn about the status quo of the system and its in-built sensemaking capabilities: How could the problem evolve, what latent incidents were missed to make sense of and which interaction patterns supported us not sensing it earlier? What do small deviations “teach” about the system? How could they – in coactions with other incidents – harm the reliability of the system? On aircraft carriers for example, 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? With staff rides failures or near-misses are simulated going to the locations where the event took place asking people about their observations, assumptions and communication behavior: What did you observe? How did you interpret this signal and why? How did you communicate it further? Or, if not: Why didn't you do it?

- Resistance to simplify: Seeking to complicate the picture to interpret what has been observed, e.g. by introducing doubt and contradiction or by creating equivocality by leveraging multiple perspectives. 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. Still these practices are very much focused to interpret events to ensure reliability. For a more innovation driven approach a more active reframing of past, present and future enriches existing practices.
- Deference to expertise: Flexible decision taking structures to being able to shift decisions to the location or person with the greatest expertise. No-one can predict when and where something unexpected will happen. Management does not always have the best overview when sudden disruptive events occur to make intelligent decisions. 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. 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.

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- Commitment to resilience: Because unexpected events cannot be anticipated organizations invest in general problem solving capabilities being able to make sense and improvise on the spot. Intensive training and simulations keep staff alert to various sorts of threatening scenarios as well as to the fact that the future can be different as expected.

Capabilities to act resiliently are tested regularly: Are we able to find ways of dealing with an unexpected catastrophe? Redundancies are included into work processes to avoid dangerous chain reactions caused by strict coupling. 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.

High Reliability Organizing goes beyond creating reliability by control mechanisms, checklists and procedures in order to assure stability. In contrary – as uncertainty is considered as the only certainty, preparedness for change is taken as the prerequisite for reliable performance. It is considered as extremely risky to rely on a continuous flow of past, present and future. Therefore, and next to controlling and meticulously monitoring all predictable disturbances that can be expected, mindful practices are countering the tendency to rely on expectations of the future that are built on the past.

In HRO a dominant lever to overcome the assumption of a continuous time flow is to counter communication blockades due to hierarchical structures and interaction patterns. Hierarchical structures focus attention on the perspective of managers, direct communication flows and foster hesitation to speak up as well as the tendency to justify once made decisions, plans and strategic directions.

Whether many of the suggested HRO practices and tools address the hierarchical issue needed the de-coupling of time is not yet addressed explicitly as a tool or practice. Observations of the present are dependent of the time context they are put in. Reframing of the present by altering future and past projections has to be considered as a basic prerequisite profound sensemaking. Future studies deliver an interesting set of methods

consciously reframing the present by altering future and past. Thereby they enrich anticipation principles of HRO.

3.3 Futures Research and scenario management

Futures studies address possible, probable, and preferable futures and support individuals and organizations in trying to create a better world. Futures research as scientific study of possible, desirable and likely future developments assumes that different, but not arbitrary or countless futures are possible and viable. Its interdisciplinary and multidisciplinary research approach matches potential futures that also develop across disciplines. As the Greek politician Pericles mentioned in the 4th century B.C. the task is not to predict the future, but to be well prepared for it. Accordingly scenario planning emphasizes decision-making utility as main outcome of inquiry over the production of testable knowledge (Walton 2008). Within the broad field of futures studies scenario analysis and management represent privileged methodology (Ramirez, Selsky, & van der Heijden 2010). They also play a pivotal role in organizational practice.

Scenarios enable us to anticipate and structure discussion about the shape of things to come. Since the Royal Shell Dutch Group conducted the first systematic scenario studies in the 1970s based on the work of Kahn & Wiener (1967) numerous scenario-processes have been conducted and several scenarios have been published. While the Shell approach gained impetus with the Oil Shock in 1973, dynamic developments in the IT and telecommunications industries and its environments promoted scenarios as a valuable approach to address and prepare for upcoming uncertainties.

By modeling scenarios researchers and consultants point out alternative and logical consistent development possibilities in the face of abounding uncertainties. As well-informed projections of uncertainty factors into a dated future they form an internally consistent image that can be plausibly derived from the present state of affairs. Often they are presented as stories around constructed plots. Different scenario approaches are discussed in Mietzner & Reger 2005, and Steinmüller 1997.

Working with scenarios and thinking in alternative futures prepares and informs decisions how to strengthen desirable developments. Unlike traditional forecasting and even recent Delphi Studies scenarios do not intend to predict the future. Instead they fuel strategic conversation (Van der Heijden 2005) and challenge conventional assumptions. They prevent

from linear extrapolation, and foster thinking in alternatives. According to Peter Schwartz, one of the founders of the approach, scenarios are vehicles helping people to learn. Other than simulations they identify patterns and clusters among possible futures and include subjective interpretations (Schoemaker 1995, 27). Scenario planning then aims at changing mindsets about external factors antecedent to the formulation of specific strategies. “A constant stream of rich, diverse and thought provoking information” (Schwartz 1991) is needed to foster organizational learning. Principles and best practices of scenario planning have been described (van der Merwe 2008). While numerous methodologies to develop and model scenarios exist, at least two major weaknesses persist: their utilization for daily practices (as we learned from observation in various scenario projects e.g. in Breuer et al. 2011), and their scientific elaboration and evaluation (Schoemaker 1993). The one essential question in our view: How can they become more influential in daily practices?

Introducing scenario management into corporations consultants often needs to proceed from prognostic to exploratory and normative scenarios, having to repeat “ontogenetically” the “phylogenic” history of futures research as it moved from attempts to predict the future with advanced trend extrapolation to the notion of (social systems with inherent uncertainties resulting in) multiple, alternative futures, and to scenarios as means of learning on individual and organizational levels. Assuming that trend extrapolation may yield probabilities for future developments some managers initially expect to receive one reliable vision of the future as the result of inquiry. The first lesson to be learned is the persistence of uncertainty: Not lack of brilliance but epistemological limits render such expectations of holistic prognostics unrealistic. Instead of the single true vision only alternative scenarios combining expectable trends (like demographic changes) with fundamental uncertainties (e.g. scientific breakthroughs) may be delivered. () Even these alternative scenarios may hardly be associated with probabilities, but rather unfold the range of uncertainty with the dimensions considered most relevant today. An exploratory approach trying to identify influencing factors, key uncertainties and future possibilities is described e.g. in Fink, Schalke & Siebe 2000 or Fink & Siebe 2006. While traditionally exploratory scenarios focus on external developments a combination with organizational requirements named “Future Scorecard” was also proposed (Fink, Marr, Siebe & Kuhle 2005). It combines the external, market-based, and the internal, resource-based view of organizations to create a strategic early warning system.

Once the idea of multiple futures is accepted the difference between exploratory and normative scenarios (Kosow & Gaßner 2008) describing preferable futures and their interference need to be understood. Since “explorations” of future uncertainties and consistent scenarios heavily depend on present projections and constructions of meaning the own position and desire within these complex developments is put into question. The further into the future scenarios range, the easier it becomes to concentrate on desirable futures as limits of feasibility dissolve – and the need for normative (components within) scenarios becomes evident. A preferred vision of the future allows backcasting to derive necessary measures to be taken today and alternative implementation strategies. A normative vision enables strategists to reconsider and focus sensing and seizing helpful developments and to direct in depth exploration of critical topics. Blind spots and search fields for innovation may be identified; strengths and weakness of the present organization may be analyzed in the context of each scenario.

On a second, process-oriented level, the journey of scenarios within organizations starts with the notion of scenarios as alternative representations to the notion of organizational learning taking place through their development. Even more than providing distinct future alternatives to prepare for they provide tools for learning today and for practicing future-open thinking. Once scenarios are understood as learning experiences few organizations move on from a single exercise to a continuous challenge think with, reevaluate and reconfigure scenarios to an organization wide endeavor that is not limited to top management strategists.

3.4 From similarities and differences towards new synergies

Companies trying to avoid risks and trying to identify and exploit opportunities for innovation and new business share several challenges. Both deal with uncertainty and irregularities within their operations, either understood as a threat of failure and disaster, and / or as a chance for innovation.

Fink at al. (2005) view scenario management as a combination of systems thinking, strategic thinking, and future-open thinking. While system thinking primarily refers to dealing with complexity, it is compatible with system theoretical approaches that have been utilized in HRO (Gebauer

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2009). Strategic thinking utilizes future potentials for corporate success as a basis for visionary strategies. Future open thinking accepts uncertainty in the business ecosystem and exploration of alternative possible developments.

One approach supporting HRO as well as scenario management consists in reframing: Cirka and Corrigan (2003) for example argue that managers have to overcome the very common probabilistic view and rather develop a possibilistic view. They have to learn that the future is not determined by the past but loose-coupled. After the terrorist attacks on the World Trade Center in 1993 by a bomb in the garage well established probabilistic thinking led to more security in the basements to avoid a similar threat. But nobody tried to think further and was able to anticipate the possibility of a plane attack or something similar. Cirka and Corrigan propose reframing as a method to overcome probabilistic views. Mitroff and Murat (2003, 2011) suggest using scenarios as well as role-plays to imagine yet unthinkable events.

Going even further into the requirements of successful innovation within a business ecosystem new management approaches are proposed, i.e. the idea of dynamic capabilities (Teece 2009), chronically unfrozen, fluid structures (Eisenhardt & Martin 2000) or innovation routines (Zollo & Winter 2002). The evaluation of successful management innovations (Hamel & Bren, 2009) and other studies about how to shape learning capabilities of the organization (e.g. Wimmer 2004, Gebauer 2007) suggest approached balancing needs for stabilization and renewal. According to Baecker (2007) innovative enterprises have to managed and organized from a social science rather than from a business administration point of view and therewith refers to the practices of High Reliability Organizing.

4 HRO and scenario management: synergies, limitations, and interventions

The following table provides an overview of some similarities and differences between HRO and scenario management and lists the concepts that may be transferred from one to the other.

Similarities	Appreciation and cultivation of persisting uncertainty	
	Adaptability and organizational learning as a prerequisite	
	Importance to sense and make sense of surprising events	
	Awareness of challenging biases (expectations, illusion of control)	
	Promoting broad sensing for weak signals & harvesting collective intelligence	
	Reframing, decontextualizing and de-coupling of past, present, future	
	HRO	Scenario Management
Differences in focus	Maintenance – Adapt and improve to keep existing performance	Renewal – Adapt and improve performance and competitiveness
	Present past focus – Practices raising attention to past critical incidents to improve present patterns	Present future focus – Anticipation of alternative complex future developments.
	Internal capabilities	Environmental developments
	Design of daily practices to develop sensing and seizing abilities	Strategic management tools to develop sensing and seizing abilities
	Reliable operations and operational risk	Innovation, strategic opportunities and business related risks.
	Abilities for mindfulness as sensing and interpretation skills.	Tools to create relevance criteria for sensing and interpretation activities
	HRO as a task for operative managers and maintenance experts	Scenario management as a task for top management and innovation experts
Synthesis	Use scenarios and deviances as trigger for innovation (5.1)	Events, practices and structures to create mindfulness for innovation (5.2)
	Complementary capabilities synthesize operational reliability with proactive innovation development; integrate functional expert groups, strategic management and operating staff cultivating operational reliability and mindfulness for innovation (5.3)	

Table 1: Similarities, differences and synthesis of both approaches

5 Lessons learned from one another

Combining aspects of HRO and scenario management basic concepts and methodologies of both approaches can be extended, guidelines for organizational practices and structures can be derived. In terms of new intervention methods we address advanced communication measures, weak signal radar sessions, future staff rides and scenario site visits. The following interventions are derived from our confrontation of HRO and scenario management practices:

- **Deviances as trigger for innovation:** Inquiry on positive and negative deviance from expectation strengthens mindfulness for innovation and inspires change (5.1).
- **Events, practices and structures to establish mindfulness for innovation:** Innovation theater adapts the situated learning approach of incident analysis through staff rides for the exploration of future scenarios with a broader audience across hierarchical levels. New collective practices and structures combine both approaches to foster innovation (5.2).
- **Strengthening complementary practices** cultivating operational reliability and excellence in innovation within one move may lead to a new sensitivity to innovation (5.3).

The major question in this context is how and where to institutionalize integrated methods and interventions within the organization: Who has to drive the initiative, who else has to be involved and what are conditions to institutionalize methods into daily practices?

5.1 Working with Future Scenarios & Deviances as Trigger for Innovation

How can methodological wisdom of future research be build into daily collective practices within the organization? High Reliability Organizing may profit from the potential of future scenarios to consciously alter the present future to facilitate the sensitivity to operations.

While sensitivity to operations implies a present future orientation as discussed scenario management has developed a dedicated and profound methodology to actually model and utilize alternative future scenarios for enhancing operations and preparing organizations for contingent future developments. Scenarios serve as alternative maps of the future in order to get a better understanding of the present: they broaden the variety of things to see and the ability of making sense about the present state in

order to prevent unwanted events to evolve. In routine management meetings for example, diagnosed surprises, failures, deviances and other perceptions like “gut feelings” can be discussed in the context of different future scenarios. Another example is the use of future scenarios in regular controlling meetings to get a broader range of interpretations: What could be relevant in the light of this scenario? What could the data possibly be a latent signal for?

As explained before, High Reliability Organizing counteracts biases like the tendency to rely on past expectations or the normalization to deviance in order to reduce complexity and uncertainty. By integrating future scenarios into daily practices people are constantly forced to think in alternative futures raising the awareness that the future is contingent. Therefore it is recommended to work with various future scenarios, to alter the scenarios from time to time and to reflect on the process of using scenarios.

By exploiting methodologies of future research for mindful organizing the greater sensitivity to deviances might be used for both: to avoid unwanted threats and as well as for innovation.

Both HRO and scenario management share a basic sensitivity to deviances. This basic sensitivity should be cultivated even further through advanced means of observation and interpretation since deviances from the expected developments may indicate windows of opportunity for innovation or early birds of future breakdown. HRO has a tendency to focus on deviances as a trace for negative breakdowns of systems. Practices and methods can raise attention on positive and negative deviances strengthen mindfulness for innovation as well as for reliability and inspire change. Especially organizations in risk-prone and highly dynamic business ecosystems profit from an extension and integration of HRO practices with scenario management. Even though large companies do have experiences with both approaches they are usually dealt with in different units, missing out synergies and sustainable change in corporate culture.

Weak signals radar sessions review microtrends regarding customers (Penn 2007), technology, or the business ecosystem and may apply a grounded innovation approach to aggregate and interpret findings (Breuer & Steinhoff 2010). Weak signals radar and deviance interpretation sessions (e.g. following Pascale, Sternin & Sternin 2010) may be established as new activities enhancing reliability and innovativeness.

These sessions should be in-built into daily practices, e.g. in team meetings, shift changes etc. As HRO proposes asking for surprises and deviant observation in team meetings as a sign for unforeseen negative future events a weak signals radar encourage people to bring in their perceptions and ideas and their possible impact on new developments.

5.2 Events, practices and structures to establish mindfulness for innovation

Different quantitative and qualitative approaches how to generate scenarios are rather well described. Less obvious are proven approaches how to communicate and disseminate scenarios within the organization. Within previous work we started to discuss tradeoffs between different visual and narrative formats (Breuer, Grabowski & Arnold 2011). Still, the real challenge remains to establish work with scenarios as a valuable practice within innovation development departments and the whole organization. The operationalization of insights and the introduction of new practices within organizations are complex tasks. Methods include advanced communication measures and events to trigger learning on behalf of individuals and collaborating units. Trying to drive insights from scenario analysis into an organization and focusing on potentials for innovation scenario management may adapt approaches from HRO.

Advanced communication measures apply a variety of media in order to represent and convey insights from research on risks, failures and potential future scenarios (Breuer, Grabowski & Arnold 2011). This multimodal processing of insights intends to foster empathy. Within a scenario management process for a large telecommunication provider we explored suitable media for communication and further refinement of research results. Detailing a realistic narrative for instance usually directs attention to aspects that would have else wise been overlooked. Strengths and weaknesses of several communication formats such as a newspaper with animated images, illustrated deep dives into topics, and an animation movie have been discussed (Breuer, Grabowski & Arnold 2011). Still, in most cases results of scenario analysis have been utilized and advanced in a representational rather than operational manner.

Even more engaging than prefabricated media communicating insights are activating events and interventions aiming to increase collective observation and sensemaking. Here, scenario management may adopt HRO formats like the staff rides and gun drills.

In staff rides a single specific past event serves in an exemplary way to learn something about the complex functioning of the system.

Representative teams across hierarchical levels examine interaction patterns that allow latent deviances to develop, build on each other and result in a larger, unwanted event or accident. Whereas staff rides make sense of past events, gun drills simulate a possible future event: How could we have seen the event coming earlier? What could have been early signs, and who had been able to observe what? Would he or she have been able to make sense of it? What communication measures were available...?

Experiences in different industries like manufacturing or process industries show that staff rides and gun drills sensitize operative teams, staff function and management for the systems complexity, potential early warning signals and how unexpected things evolve step by step. People become aware of interaction patterns based on biases, assumption and expectation based behavior, collective beliefs, communication blockades as well as gaps between the “talk” of plans and the daily “walk” of muddling through (Gebauer, 2010).

Whereas in HRO staff rides are mainly used in a more defensive mode to learn about reliability capabilities, past and future event analysis can be also used to investigate and promote capabilities for future innovation by asking: How do we make sense of deviances to be used for innovations? In HRO a concrete past event or anticipated future event localized in the organization serves as original reference – which is one crucial difference to future scenarios missing such real world reference. Accordingly the original site of the event (including its spatial setup, available tools and channels of communication) and the authentic experiences and potential abilities of participants contribute first hand insight to the collective reconstruction or construction of the event. Confronting the different perspectives and interpretations not only weak links and breakdowns of interaction but the whole structure and dynamic of the exemplary event may be worked out and redesigned in order to increase reliability. Even though future scenarios miss such authentic reference their differentiation and implementation may profit from such situated learning activities (Lave & Wenger 1991). Performing future scenarios spatial, object-related and social relations and dynamics may be communicated and explored in depth. Instead of past critical incidents potential future scenario, dynamic constellations of business (models) and new distributions of power set the stage. Personas and role-playing techniques

may be applied in order to act out key uncertainties populated by the different stakeholder roles involved and their potentially divergent perspectives. The scenarios set the stage, the script interprets the consequences of decisions regarding the key uncertainties and the play explores the interaction between stakeholders and key factors joining into a hypothetical event of a future world.

An example: With a scenario project on convergent IP service in the year 2020 customer expectations of ownership versus usage was identified as a key uncertainty: Would people increasingly rely on the ability to use functionalities and access content when they need to – as they already do in car sharing and cloud services. Or would they prefer to own what they appreciate keeping it under their sole control? While narrative approaches have been established to communicate, deepen and evaluate the alternative stories (Kosow & Gaßner 2008), we experimented with a theatrical performance to work explore the consequences of either attitude in relation to other key factors. Participants staged stand-up performances in ideation sessions, where participants convey innovative product or service ideas or aspects of future scenarios through little *sketches* or television spots.

Again like in HRO, critical incident even though hypothetical ones or even wildcards may be used to challenge the robustness of the assumption (wildcards represent disruptive events with low probability but high impact). If for instance we assume that a majority of customers moves from ownership to a usage models, how would a persona including that trait react if criminal kidnap his or her childhood pictures? Or how would another persona sticking to the ownership model cope with new image data formats rendering his pictures inaccessible? Once the stage is set and populated with personas and interactions new needs, fears and hopes emerge and prepare the ground to identify missing information and products indicating potentials for innovation. Such an **innovation theater** as a live learning environment is inspired by works on informances as information-oriented performances to communicate and explore design ideas and concepts (Burns et al. 1995, Laurel 2003) and staff rides and gun drills in HRO. Situated action and live experiences across hierarchical levels are mobilized to engage and anchor insights and delimit search fields for innovation.

Scenario site visits go even further utilizing built scenario spaces, preferably in the real, alternatively in virtual worlds. Fictional sites may be staged in several media and manners. Systemic consulting has transferred work with family constellations (Hellinger 2002) to cooperative

constellations within teams and companies. Alternative approaches include role playing exercises or virtual online worlds. One example for such a real living and working environment was “Palomar5”, an environment to develop future forms of work with digital natives. Staff rides, gun drills, innovation theater and scenario site visits can serve as a starting point for organizational development activities to increase collective mindfulness and they can be institutionalized as a routine practice constantly reviewing and questioning bias provoking patterns.

Single exercises do not suffice to break and establish new patterns, but **new practices** need to be introduced on a daily basis and backed up by suitable structures. Despite of difficulties to change deeply rooted mindsets HRO theory is grounded in tight closing of ranks with everyday practices of operations. Driven by sometimes-disastrous experiences there was always a fundamental need to reflect upon, to challenge, and to improve seemingly natural casual practices. Trained skepticism against formal checklists and formalized processes goes hand in hand with an appreciation of bottom-up escalation and situated experiences. Extracting checklists from best practises and similar expert driven solutions regularly fail in situations requiring behavioural change embedded in a complex social system, sometimes the search and discovery of solutions need to owner by a community of participants to succeed.

HRO has a track record in convincing top management of the necessity to empower operational workforce, cultivate local attentiveness and utilize local knowledge to prevent and reacted threatening events. Scenario management is traditionally associated to strategy, and most scenarios have been generated together with top management to be used by top management. Basic insights and proven techniques from HRO and other management intervention techniques may enrich the management of scenarios and attempts to establish new practices within organizations.

Finally, structural borders prevent organizations to fully unfold mindfulness for innovation: Work packages are thrown across the organizational fences between functions and departments, Chinese whispers, not-invented here and declining commitment contribute to the degeneration of once powerful ideas.

5.3 Complementary capabilities: From HRO to Scenario Management and back

Principles of HRO have been so far introduced mainly to operation-near practices such as safety, risk or quality management, fewer for strategic management issues or corporate development. HRO principles start to replace control-oriented approaches in expert groups concerned with reliability issues. Future scenarios in contrary have been mainly used for strategic foresight, i.e. by expert groups such as innovation management or strategy development. So far, reliability and innovation challenges have been dealt with in different departments. Decoupling is one way coping with co-existing and conflicting demands of exploitation and exploration of routines (March, 1991). The research on HRO brings to light that in risk-prone, fast paced times stability is not reached by control of the existing but can only be achieved by adaptability. Reliability and innovativeness both profit from a greater collective mindfulness and therefore both efforts should be better integrated or at least orchestrated in the organization.

The example of German energy provider ENBW illustrates how strict decoupling of reliability and innovation tasks can create liabilities. The company ensured so far safe operations of its four atomic plants that contributed more than half of the earnings. Two of them had to stop operations after the atom moratorium of the German government, and EnBW's earnings broke down resulting in a loss of 590 million Euros in the first half of 2011 after early warnings have been ignored (Movegreen.com, 2011).

Integrating innovation and reliability challenges implies a new managerial mindset and division of tasks and responsibility. Managers have to gain insights into the importance to empower and create settings for people to collectively accomplish more sophisticated forms of sensemaking. Innovation is not anymore a one-time, expert driven event detached from operations. It becomes a process build into daily practices and routines using the broad range of the perception abilities of all employees, cultivated by mindful practices. Therefore managers need to consciously create conditions for mindfulness depicted by HRO.

Innovation and reliability experts have to collaborate more closely and gain from each other's perspectives: How to make use of the deviances we observe throughout the organization? An organization-wide center of

excellence or a company-wide network for mindfulness could serve as a starting point to integrate knowledge and approaches. To prepare for the future organizations do not need a distinctive safety, quality or innovation culture but a culture for mindfulness as a basic condition to cope with risk-prone, fast-paced times. Integrating the separate functions a new capability emerges: mindfulness for reliability and innovation.

6 Conclusions

Companies trying to avoid risks and trying to identify and exploit opportunities for innovation and new business share several challenges. Both deal with uncertainty and irregularities within their operations, either understood as a threat of failure and disaster, and / or as a chance for innovation. Responding to these challenges this paper discussed similarities and differences between scenario management and HROs sensitivity to operations. High Reliability Organizations may profit from deep dives into futures scenarios and positive deviances from expected developments in order to exploit potentials for process innovation. Scenario management on the other hand may introduce HRO practices in order to implement scenarios and attentiveness in daily operations. A synthesis of both approaches provides a powerful basis to design activating interventions. Future experience has to prove that the theoretically derived approaches not only increase future reliability of corporations but also support the development of sustainable new worlds through mindfulness for reliability and innovation.

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