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Safety Management

Jean-Christophe Le Coze · Benoît Journé *Editors*

Compliance and Initiative in the Production of Safety

A Systems Perspective on Managing Tensions and Building Complementarity

FONCSI
Foundation for an Industrial Safety Culture

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Safety Management

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Series Editor's Foreword

This collective volume is the fruit of a "strategic analysis", a research methodology developed by FonCSI that brings together academics and practitioners for inquiry, debate, and anticipation. A strategic analysis starts with a challenge, a conceptual or practical knot identified by FonCSI's partners from industry and the regulatory world. The question is debated with representatives from our partners, alongside a small group of safety experts, who explore work from various scientific disciplines that can contribute to untwining the knot. This book results from this exploratory process; it presents the contributions of international experts who were invited to explain and confront their viewpoints during a two-day residential seminar organized by FonCSI in 2022 on "the articulation between compliance and initiative in safety management". This latter phrase was FonCSI's effort to translate into English a conceptual puzzle that is well known in the French-speaking safety community, as the tension between «sécurité réglée» (literally "rule-based safety", or the avoidance of accidents through careful system design and compliance with safe work procedures) on the one hand, and «sécurité gérée» (literally "managed safety", the presence of frontline expertise which can competently handle unexpected situations). While well known by both the academic and practitioner community in France, this terminology is less familiar elsewhere, though the distinction between "work-as-imagined" and "work-as-done" is increasingly recognized outside the resilience engineering community where it first emerged.

Our framing of this topic aims to include in its scope the related trade-offs between anticipation and resilience (following the pioneering work of Aaron Wildavsky, who highlighted the difference in mindset between these two strategies for coping with possible hazards); between centralization and decentralization of decision-making related to safety management; and between the emphasis placed on situated frontline expertise and that on the standardization of safety management activities. It aims to encompass concepts developed by a range of scientific disciplines, from the pioneering work of French-speaking ergonomists such as Jean-Marie Faverge and Jacques Leplat from the 1950s concerning the active role that sharp-end workers play in compensating for imperfections in equipment, procedures, and other aspects of system design; to the cognitive engineering work developed in particular around

Jens Rasmussen from the 1970s, emphasizing the ability of experienced operators to avoid accidents by understanding and compensating for system deficiencies; to the work of the "high-reliability organizations" scholars in the 1980s who recognized the importance of maintaining systems' adaptive capacity by maintaining a degree of "organizational slack", even at the expense of everyday efficiency; the influential work of James Reason aiming to understand human error mechanisms; and more recently the well-connected and articulate "resilience engineering" community.

This volume brings together these strands of research on organizational design, professional autonomy, organizational rule violations, resilience, and adaptation, in order to improve our understanding of the articulation between compliance and "intelligent application" of rules and procedures. While most work on this topic has concerned the compliance and adaptive behaviors of frontline workers, the contributions in this volume adopt a systems perspective and a meso- and macro viewpoint on this question, in particular examining the work of managers and including interorganizational issues in the scope. The introductory chapter, written by Jean-Christophe Le Coze, a member of the strategic analysis group, describes the importance of the historical and organizational context to the tension between rules and autonomy in safety. We hope the ideas presented help think about how to build safety capacity and face the challenges of a rapidly changing world.

June 2023

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Chapter 1
Contextualizing (Safety) Rules

Jean-Christophe Le Coze

Abstract This introductory chapter combines several dimensions which are meant to help frame a complex topic representing a very rich diversity of situations across industries, countries, and epochs. The idea is to sensitize readers to several aspects associated with the topic of rules and autonomy in the domain of safety, and of this book. Its aim is to emphasize the importance of contexts when it comes to (safety) rules. Contexts refer to organizations, to industries, to risks, to histories, to practices, to situations, and to countries. Three sections develop the importance of context: (1) *The advent of safety rules as an established narrative*, (2) *There is more than rules in safety*, and (3) *Historical trends … a bureaucratization of safety?* The last section presents the chapters of this book, grouped in three categories, (1) *Finding or losing the balance*; (2) *The role, position, and influence of middle-managers and top management*, finally; (3) *When autonomy, initiative, and resilience take the lead*.

Keywords Rules · Autonomy · Safety · System · Work · Organization · Regulation · Context

1.1 Introduction

This chapter suggests several dimensions which are meant to help frame a complex topic representing a very rich diversity of situations across industries, countries, and epochs. The idea is to sensitize readers to several aspects associated with the topic of rules and autonomy in the domain of safety, and of this book. It implies several simplifications. Such choices strongly limit nuances, but the aim is to emphasize the importance of contexts when it comes to (safety) rules. Contexts refer to organizations, to industries, to risks, to histories, to practices, to situations, and to countries. Nuances would require far more space but would also divert from the general idea of

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this text which is to provide elements of analysis and perspective to situate several issues associated with the topic of this book.

The result is a relatively short but dense text which relies on a mix of conceptual and empirical research in a diversity of traditions in the field of safety and beyond. In this introductory chapter, three sections develop the importance of context: the advent of safety rules as an established narrative (1), there is more than rules in safety (2), and historical trends … a bureaucratization of safety (3). The last section presents the chapters of this book, in three categories, finding or losing the balance; the role, position, and influence of middle-managers and top management, finally; when autonomy, initiative, and resilience take the lead.

1.2 Rules in Context (1): The Advent of (Safety) Rules as an Established Narrative

The principle that rules exist to protect workers from unsafe conditions in a capitalist era has a long history. The horrific working conditions depicted in the industrial revolution of the nineteenth century remind us of how much progress has been made over the past two centuries in many countries (starting with child labor). The notion of safety rules is thus embedded in the idea, and a long history, of making sure to protect workers from harms and hazards, limiting the risks, for instance, of falls, anoxia, electric shocks or crushed limbs when respectively working from height, in confined space, close to live electric cables or close to moving mechanical parts. Ideally, system design should prevent people from exposure to hazards, yet rules understood as practices (not "behaviors") are also necessary to make sure that workers limit their exposition to hazards when safer designs are not possible.

The law has progressively evolved to make sure that such rules are in place and enforced to prevent harming workers. The idea that the expectations should be set by states is also particularly ingrained in the struggle to improve workers' safety (the same applies to product safety, road safety, or fire safety). So, the idea that the absence of safety rules or the absence of their implementation (when existing) is a problem because it exposes workers to hazards, is a strong legacy of the past, and of its successes. History shows us that countries which tighten, through laws and state enforcement of rules their expectations in terms of safety, obtain results (a broad comparison between countries across the world makes it clear).

One reason is that the forces of capitalism are not compatible with safety if not counteracted by strong requirements imposed, from within or from outside, to organizations of all sorts. These requirements are translated in rules. To work safely, hazards need to be identified (which is itself a rule), then safety rules designed to prevent and to mitigate these hazards, then complied with in practice. This is potentially constraining for businesses because such rules can slow down work, can make products or services more expensive. Rules in terms of design can cost extra money. Therefore, and seen from this perspective, an accident in the workplace is

very often associated with the lack of sufficient attention granted by employers to the safety of their employees, and the design, implementation, and enforcement of adequate rules. It is a discourse which makes sense considering many industries and countries' experiences in history.

In other domains than workers' safety, with the advent of new modes of transportation during the industrial revolution for instance, starting with trains and steamships, safety has also been linked to the importance of rules. The first severe train crash in France in Meudon in 1842, caused a fire which killed fifty-five passengers. The doors were locked by the controller after departure, and many could not escape their carriages, increasing the death toll. The rule was then changed. The doors were no longer locked after this event. The Titanic sank in 1912 and didn't have sufficient lifeboats to evacuate its passengers. It had 20 lifeboats, half of what was needed to save everybody on board. The design rule changed afterward to make sure enough lifeboats were available for all passengers of steamships.

Because of the safety risks to workers and passengers, rules became central to the achievement of safe operations in such transport systems, not to mention design improvements much later in road safety, from safety belts to airbags and other features implemented in cars' designs to secure driving, including of course design of infrastructures (roads, tunnels, bridges) and rules to regulate traffic and drivers' practices. There would be a list of many other cases in which rules (of design or of practices) evolved to improve the safety of systems as they matured (mining, explosives' production, or transport of hazardous material for instance). But the advent of more complex and larger technical systems in the second half of the twentieth century is another good example to show the importance of rules (of design and of practice) to reach high levels of safety.

Nuclear power plants, ballistic missiles, space exploration, nuclear weapons or submarines, civil aviation, chemical plants, pipelines, and refineries are many other examples in which safety had to be translated in rules (of design, of practices) to maintain operations and activities under control. It is difficult to imagine obtaining such levels of reliability and safety without the existence of rules, standards, procedures and of compliance with them. And regulatory systems also played a strong role in many of these cases. For some of these systems, they are protected from the forces of markets and capitalism (mostly in the military domains), but many are not. This view of industries in general (e.g., construction, factories, warehouses) and safety-critical systems (e.g., nuclear, oil and gas, aviation, chemical, railways) therefore constitutes a well-established discourse. From this macro perspective of the history of safety, rules matter.

It is a narrative which makes a lot of sense considering what we know and what to recommend for improvements. However, this discourse also needs a certain degree of refinement. First, there is always room for improvement. For instance, in France, a country in which safety in the workplace has been incorporated in the law for decades, two people died at work every week in 2021 (more than 700 deaths) in industries and services (this figure excludes workers killed when traveling to work or employees committing suicides). This situation is obviously unsatisfactory and reflects profound issues. And, in highly regulated safety-critical systems, accidents

and disasters still occur from time to time, also indicating the limits of safety. In France, if one considers as an indication the number of casualties, the last major event in the chemical industry was in 2001, in Toulouse; the last major aircraft crash happened in 2009 between Rio and Paris, and the last major derailments were in 2013 in Brétigny and 2015 in Eckwersheim.

Second, a point to be developed next, rules need to be strongly contextualized to understand how safety is really produced, and this tends to bring another discourse to the one sketched above, not replacing it, but refining it. Safety can only be achieved through workers' expertise for instance, but also when the proper working conditions are created for rules to be implemented, which is, in both cases, an organizational outcome. Rules also need to be further contextualized from a historical point of view, to incorporate trends in work, labor relations, organizations, businesses, markets, and states over several decades. To contextualize rules, the contribution of many different disciplines or research traditions is needed. Law, sociology, psychology, social psychology, cognitive engineering and ergonomics, political science, and management have much to bring to such contextualizing. Indeed, our understanding of rules in safety has been tremendously improved over the past decades thanks to these traditions, and this book is an addition to this.

1.3 Rules in Context (2): There Is More Than Rules in Safety

The key problem with rules is simply that work, organizations, and regulations are far more complex than what rules can actually reveal about daily activities. There is more to work, organizations, and regulations than rules in general. This is the result of decades of research. Studying work shows how workers must adapt to circumstances in ways that requires their expertise and judgment. Realities of work often create imperfections not accounted for, including imperfection of rules themselves. Dilemmas and surprises also challenge the application of (safety) rules. A certain degree of autonomy is therefore expected. French ergonomists have long and ethnographically described the difference between what is defined as "prescribed work" and "real work", translated in English with the notions of "work as done" and "work as imagined".

Studying organizations shows that bureaucracies, epitomizing the ideal of the legal-rational principles of conduct through formal structures (e.g., standardization, division of work, lines of authority), also reveal informal realities beyond rules. The perfect, clockwork, ideal of organizations based on rules must be complemented by what psychologists and sociologists have shown for decades to be a far more complex mix of cognitive, informal, relational, social, and political dimensions beyond the structure of formal organizations. In this respect, safety risks are not given but collectively constructed instead. Rules (of design, of practices) are constructed. And

regulation, one important role of the state consisting in producing laws and their enforcement through administrative bodies (e.g., inspectorate), is no different.

These two paragraphs shortly frame broadly some of the key analytical elements of several decades of findings in different research traditions in the field of safety, such as cognitive system engineering and high-reliability organizing for instance. The outcomes of many empirical studies in these traditions show the importance of understanding safety beyond a simplistic approach to rules. Ethnographic studies of cognition and organizations in safety-critical contexts show the ability to cope with complexity (i.e., imperfections of work and organizations, unexpected events), and therefore the combination of rules and of a certain degree of autonomy.

These different research traditions, beyond their intellectual background and the way they frame it, using different vocabularies, address the ability to find ways to combine anticipation and resilience, centralization and decentralization, compliance and initiative, or standards and expertise. The choice of vocabulary can convey differences in conceptualization, but the problem is shared by researchers in safety irrespectively of their disciplinary backgrounds (e.g., sociology, psychology, ergonomics, management, political science). However, as already discussed in the introduction when contrasting highly regulated organizations (e.g., aviation, nuclear) with other industries (e.g., factories, warehouses), but also countries, there are many differences in the level of resources and strategies of companies, industries, and states involved in managing this combination.

Centralizing in certain safety-critical systems (e.g., aircraft, nuclear submarines, space exploration, nuclear power plants) implies great expenses in training, engineering, and design to make sure that rules and standards are created with adequate support for them to be properly implemented, and to be relevant to the level of risks of different tasks and activities. Decentralizing means that a certain degree of autonomy is made possible thanks to the adequate level of expertise of the workforce (including management) obtained through training, socializing, and professionalization.

In other words, the quality of the balance between rules and autonomy or centralization and decentralization to manage safety risks is thoroughly an organizational, or system one. One cannot understand what happens locally in daily frontline practices, in terms of rules and autonomy, independently of the organizational contexts and resources involved. Thus, the ability to reflect and to find solutions to problematic situations met in the field in terms of the balance between rules and autonomy is an organizational matter, not a frontline one. Safety-critical systems must manage this daily.

To do so can imply the involvement (preferably before a major event) of an awful lot of roles and functions depending on the extent of the problem, from workers, supervisors, middle-managers, engineers, and perhaps sometimes also, top managers and regulators. What happens at the front line, in the field, depends indeed on a wide range of vertical and horizontal coordination, cooperation, negotiation, and communication in all kinds of situations in terms of resources, delay, and objectives. The ability to calibrate organizations to meet their safety expectations translated in rules is a challenge which varies greatly according to domains.

For instance, organizations outside of the category of safety-critical systems, with different levels of resources, expectations, and requirements, do not have the same options. This, of course, does not imply that major events in safety-critical systems do not happen. It does not also imply that improvements are not possible in these highly regulated, reliable, and safe systems, and that they do not face complex problems daily, and risks of degradation in their accomplishments (many cases illustrate this, the Boeing 737 Max comes to mind). It does not imply either that other industries cannot be successful in safety, and many are. However, the point made is that the construction industry, for instance, because of its very distinct (business) model is very different from aviation in terms of the combination of rules and autonomy, or centralization and decentralization.

It is therefore important for the topic of rules and autonomy in safety to be strongly contextualized when discussed. This issue cannot be approached in the same way in the construction industry or in the aviation industry. Different systems, different approaches. So, this contextualization of (safety) rules matters, but that is not all. Another type of contextualization is needed. It refers to the historical trends in work, labor relations, organizations, businesses, markets, and states over the past decades which have been now widely commented in the field of safety across research traditions, industries, and countries.

1.4 Rules in Context (3): Historical Trends … a Bureaucratization of Safety?

While the importance of rules (of design, of practices) in safety are variously established across domains, requirements and expectations are not fixed and have also considerably evolved over time too. Three important sources of evolution can be identified and briefly discussed. One is the increase of standards. As the economy evolved toward extended global markets in the 1980s and 1990s, management standards to ensure quality of services and products across contracting companies, certified through audits by external parties, proliferated. It created new demands on organizations to show to auditors how compliant they were with management standards, requiring an important level of paperwork (or increasingly digitalized version). Safety followed that trend, to also become a domain framed by management standards, certified by auditors, expecting traceability for auditing then certifying, or not, companies.

This transformation implied the recruitment and training of people dedicated to such activities of certification inside companies, including safety professionals. It also created a new business for certification and consulting companies. This increase in standardization was concomitant with evolutions in states' strategies in terms of regulatory approach. A move from the prescriptive, command-and-control philosophy was replaced by tools with various degrees of self-regulation. The genesis of these changes in regulatory regimes led to an increased reliance on the production of

internal rules, adapted to their safety risks, to be inspected by authorities. The change of regulatory philosophy was not at all the end of rules, but a new way of prescribing rules internally for companies, and the need to show how such rules were in place for inspectorate to check on them externally.

Another source of important changes connected to the production of rules in safety in the past decades is the outsourcing of many activities in companies which implies the production of contracts, and a codified, legal mode of interacting between organizations, including the topic of safety. For multinationals operating across the world, these evolutions (management systems, certification, and audits; self-regulation, internal standards, and inspections; externalization and contractual relationships) have meant an important investment in the production of safety management systems and of a range of categories of rules. This was coined, when it first appeared, the development of an audit society, then of a bureaucratization of safety.

While multinationals are indeed concerned across domains, other organizations, smaller ones working as subcontractors for these bigger ones for instance, must cope with this increase too. This description is not to say that we discover the issue of red tape (the excessive, slow bureaucratic process of submitting decisions to multiple authorizations and formalities) but that the bureaucratization of safety addresses the problem of a potentially overly bloated, disproportionate level of requirements in relation to the safety risks involved. Another dimension of this expansion of rules is the lack of consideration, in the context of inflated bureaucratic processes, of the complexity that it entails for workers and managers. Moreover, it has become subsequently easier (although of course far from new), after an event, to find a rule which has been breached. Workers' autonomy, expertise, and professionalism are employed to find ways to cope with a plethora of rules that have become a risk for them to manage.

1.5 A Complex Empirical Question, a Sensitive One

Diversity and variation in epochs, countries, industries, organizations, practice, situations, and systems…the aim of this very sketchy picture, intently so, is to signify the need for a very careful, nuanced, and empirical approach to the question of rules and autonomy in safety and the importance of contexts. Dedicated studies on safety and rules over the years show how researchers have considered contexts and this idea, for instance, that there is more to rules, from cognition to organization [3, 5–9] but then paying more attention to historical contexts in terms of bureaucratic and regulatory trends of the late twentieth and early twenty-first centuries [1, 2, 4, 10, 11].

In this respect, the perspectives offered in this book by multiple traditions (sociology, psychology, management, criminology, cognitive engineering) are a blessing. Bringing multiple angles, methods, concepts, and vocabularies, these chapters avoid the excessive restrictions of a single view and contribute to sensitizing to contexts. Associated with the picture introduced in this chapter, they reveal the importance of thinking rules and autonomy, centralization and decentralization, or anticipation

and resilience from an organizational or system angle. They can be categorized into three types of contributions.

Finding or losing the balance
Uncertainty Regulation in High-Risk Organizations: Harnessing the Benefits of Flexible Rules by Gudela Grote
Producing Compliance: The Work of Interpreting, Adapting, and Narrating by Ruthanne Huising
*Untangling Safety Management: From Reasonable Regulation to Bullshit Tasks b*y Kristine Størkensen
The situations, roles, and influence of middle-managers and top management
Ambiguity, Uncoupling, and Autonomy: The Criminology of Organizational Middle-Management by Paul Almond
The Effect of Top Managers' Organizational Reliability Orientation by Rangaraj Ramanujam
When autonomy, initiative, and resilience take the lead
Interlocking Surprises: Their Nature, Implications, and Potential Responses by Moshe Farjoun
Resolving the Command—Adapt Paradox: Guided Adaptability to Cope with Complexity by David D. Woods.

1.6 Finding or Losing the Balance

The issue of "finding or losing the balance regarding safety rules" is addressed in three of the chapters of this book. Gudela Grote advocates, from a psychological angle, in *Uncertainty Regulation in High-Risk Organizations: Harnessing the Benefits of Flexible Rules*, a practical way of finding a balance. It consists in articulating in a coherent manner dimensions such as uncertainty, autonomy, flexibility, and (safety) rules to the diversity of situations met in work contexts. Rules can be of different types, action rules (describing precisely what to do), process rules (providing guidance about what to do), and goal rules (helping set priorities about what to do), and these types should be adapted to the level of uncertainty of situations. An attention to the right level of expertise is therefore needed when flexibility is expected.

In *Producing Compliance: The Work of Interpreting, Adapting, and Narrating*, Ruthanne Huising follows a descriptive, ethnographic perspective, showing how compliance with the law and standards by producing and following rules is concretely made possible daily in practice, in organizations. It requires the work of dedicated people, compliance officers (technicians, officers, and managers) involved, pragmatically, in what is defined as an *accountability infrastructures* made of offices, technico-legal experts, programs, operating procedures, technologies, and tools. This pragmatic translation, to find a balanced strategy between (safety) rules and work, follows a pattern of interpretation, adaptation, and narration involving an array of actors, and their relationships, which produce contexts' relevant outcomes.

When such a balance is lost, Kristine Størkensen in *Untangling Safety Management: From Reasonable Regulation to Bullshit Tasks* argues that the expression of bullshit jobs becomes a good characterization of what an excess of rules entails for many people affected by this excess. When workers, managers, or engineers start doubting about the relevance of their activities and the value of what their paperwork generates, it is a likely indication that rules might have become a hindrance without much purpose rather than a support to daily operations. Specifying the different levels of sociotechnical systems which contribute to a widespread case of bureaucratization across domains, Størkensen offers possibilities of improvement through strategies of relabeling, moving, and ultimately, removing such unwanted and problematic tasks.

1.7 The Situations, Roles, and Influence of Middle-Managers and Top Management

The topic of "situations, roles, and influence of middle-managers and top management" is covered by two chapters. In *Ambiguity, Uncoupling, and Autonomy: The Criminology of Organizational Middle-Management*, Paul Almond develops the insights from criminology on the topic of this book. Describing the role of middle-managers in their active contribution regarding compliance with rules, he situates them at the heart of complex organizations, in their difficult roles halfway between top management and frontline realities. Their responsibility and autonomy in this respect take place in the midst of potential ambiguities of meaning (regarding the extent of complying—or not—with rules in tough business contexts), structural uncoupling (existing differentiated units within organizations with a certain degree of freedom, identities, and cultures), and autonomy deficits (managing difficult situations—getting the job done—on behalf of organizations without their support in case of compliance breach, retrospectively).

In *The Effect of Top Managers' Organizational Reliability Orientation*, Rangaraj Ramanujam proposes a management analysis, based on high-reliability research, contrasting what he describes as a modular orientation and a systemic orientation. A modular orientation represents a view of work and organizations as stable, unambiguous, formal, and proactively managed, while a systemic one represents an understanding made of instability, ambiguity, informal reality, and improvisation. With this conceptualization, he addresses the likely role and influence of top management team on practices in organizations when it comes to rules, reliability, safety, and events. Because top management teams affect organizational design, performance measurements, incentives, and accident investigations, such orientations, capturing two opposite mindsets, might indeed play a role in how they shape practices. Ramanujam argues that the need for a systemic orientation is ripe, considering multiple contemporary trends (including a post-Covid world) exposed in his chapter.

1.8 When Autonomy, Initiative, and Resilience Take the Lead

The idea that such current trends should be included in a discussion about (safety) rules prompts some researchers to emphasize the importance of resilience over anticipation. This situation "when autonomy, initiative, and resilience take the lead" is explored in two chapters. With *Interlocking Surprises: Their Nature, Implications, and Potential Responses*, Moshe Farjoun develops an argument about the likelihood of events which seriously defy our past habits of coping with the unexpected and require new practices of resilience. The reason for this evolving situation is the possibilities of interlocking surprises across space, time, and scale which, in his own words, are "*evolving, recursive, multiplex, cumulative, and nested*". An increase of interconnectedness is certainly one source of such novelties, and the COVID-19 has played role in increasing this awareness. Farjoun advises organizations to follow diverse strategies when the time comes, from requisite variety to breaking affinities, through robust response.

To Dave Woods, the relation between anticipation—resilience is a paradox. The paradox is that there is a definite need for plans to specify action but people must adapt such plans at the sharp end because of the uncertainties, constraints, complexities of real-life situations. So here is the paradox of safety management. In *Resolving the Command–Adapt Paradox: Guided Adaptability to Cope with Complexity,* Woods argues that the two work together through the principle of guided adaptability. In this chapter, he relies on several decades of studies to delineate a theoretical yet practical answer to this paradox. Situating his reflection in complexity science, at the interfaces of natural, artificial, cognitive, and social sciences, the notions of brittleness, collapse, boundaries, and envelopes frame this issue as an adaptive one for which the principle of "*plan and revise*" constitutes the engine.

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Chapter 2
Uncertainty Regulation in High-Risk Organizations: Harnessing the Benefits of Flexible Rules

Gudela Grote

Abstract There is increasing awareness that uncertainty cannot be "managed away" to ensure safety. However, how uncertainties can be handled more effectively is still a debated question. In this chapter, I offer a new approach to uncertainty regulation in organizations, which includes opening and closing behaviors aimed at reducing and increasing uncertainty respectively in an attempt to align stability and flexibility requirements for effective and safe performance. I then apply this approach to decisions on rules and operating standards as one of the most fundamental tasks of risk and safety management. By proposing the use of flexible rules and participatory processes for writing, implementing, and monitoring rules, I aim to answer two fundamental questions that have plagued effective rule management: How can rules successfully guide behavior even if substantial amounts of uncertainty about the right course of action in any given situation remain? How can rules instigate autonomous motivation for rule compliance? I close by suggesting steps that organizations can take to explore and implement the proposed new approach to uncertainty.

Keywords Uncertainty regulation · Opening behaviors · Closing behaviors · Flexible rules · Safety · Autonomy

2.1 Introduction

Organizations that have to responsibly handle high operational risks have long aimed to do so by quantitatively estimating both the risks they are faced with and the effects of measures to mitigate these risks. While this remains the dominant approach in risk and safety management, there is growing concern that there are a number of challenges that cannot be adequately met by this approach [2]. Uncertainties need to be acknowledged that by their very nature cannot be quantified and a mere focus on

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reducing risks and uncertainties in risk mitigation neglects the necessity to improvise, learn, and innovate in view of these uncertainties.

In this chapter, I address these challenges by proposing a new approach to uncertainty regulation in organizations. I then apply this approach to decisions on rules and operating standards as one of the most fundamental tasks of risk and safety management. Lastly, I discuss possible steps toward adopting this new approach to uncertainty.

2.2 Definitions of Uncertainty

Uncertainty is ubiquitous. Accordingly, debates on how to define and manage uncertainty abound. For the purpose of this chapter and the proposed new approach to uncertainty, I refer to two distinctions to position uncertainty:

- Aleatory uncertainty is related to the randomness of events and cannot be directly influenced, but captured in probabilities at best. Epistemic uncertainty refers to lack of knowledge and can be influenced by seeking knowledge in a given situation or entering new situations with new unknowns. Uncertainty regulation only includes epistemic uncertainty, that is in the most basic terms uncertainty stemming from "not knowing for sure" [9, 17].
- Exogenous uncertainty is the uncertainty present in an actor's environment. Endogenous uncertainty is uncertainty as perceived by the actor, which is affected by exogenous uncertainty, but also by the actor's capabilities, attitudes, and motives related to recognizing and appraising uncertainty. Actors can only influence endogenous uncertainty, which may indirectly impact exogenous uncertainty [7].

2.3 Uncertainty Regulation in Organizations

The proposed approach builds on uncertainty regulation theory as suggested by Griffin and Grote [7]. Regulation in this theory refers to processes internal to an actor, which help the actor to manage internal and external demands during goal striving. The theory was developed from the perspective of individuals who accomplish tasks in a work setting. It posits that work performance relies on two intertwined self-regulatory processes: (1) Endogenous uncertainty related to the task to be performed is addressed by behaviors that enable different amounts of flexibility in response to that uncertainty, called opening and closing behaviors, opening behaviors such as suggesting changes to existing procedures or raising concerns about a current course of action momentarily even increase uncertainty, whereas closing behaviors such as seeking confirmatory feedback or following a routine process reduce uncertainty. (2) Independent of what the specific task requirements are, endogenous uncertainty is increased or decreased in line with an individual's uncertainty preferences, e.g.,

a curious person may use many opening behaviors that increase uncertainty, such as trying out new tasks or changing jobs. If individual uncertainty preferences and the uncertainty to be handled in a task align, then the two processes interact in an effective way leading to successful performance. However, the interaction between the two processes can also entail that an individual who is averse to uncertainty, responds with routine behavior to a task that would require innovation, leading to suboptimal performance. The reverse is also conceivable: an individual who loves to learn and innovate tries out new behaviors in a task that would require sticking to existing rules and routines, again resulting in suboptimal performance.

This theory can be transferred to the functioning of organizations in two ways. First, one may assume that the same kinds of individual processes apply to key decision-makers in organizations, such as members of the top management team, which brings the suggested processes to the organizational level because these individuals' behavior impacts the whole organization. For instance, a new CEO may even have been hired because of their known willingness to increase uncertainty for themselves and the organization, leading to many opening behaviors that—depending on what the actual organizational challenges are—may affect organizational performance positively or negatively. Second, one can turn to processes of organizational governance and seek to identify preferences for opening and closing behavior at the institutional level and their effects on organizational performance. A young company may mostly rely on opening behaviors, such as trying out new products and markets in search for the best opportunities to grow, whereas more established firms often have built a stock of organizational routines for core processes and mostly rely on those. The effects on performance again depend on the particular circumstances, where possibly young organizations embrace uncertainty to a point where they cannot handle the ensuing operational risks anymore, or established organizations realize too late that their routines do not match emerging environmental changes. Lastly, one has to consider that individual and institutional processes depend on each other. It is through the action of key decision-makers that new institutional processes are introduced and old ones abandoned.

2.4 Flexible Rules

2.4.1 Basic Problems with Rules: Uncertainty and Autonomy

Rules, defined as any prescriptions that guide behavior and coordination among actors in a social system, are a cornerstone of risk and safety management [13]. Rules are to reduce variation in behavior and with that ensure the correct—that is also, safe—way of acting in any given situation. Rules thus are considered the silver bullet for ensuring safety by many. However, anyone involved in writing and implementing rules has a different story to tell. It is impossible to come up with rules that control all conceivable behavior in all conceivable situations, not to speak of the

non-conceivable behaviors and situations [5]. Even if rules can capture the necessary behavior, rule compliance is notoriously difficult to monitor and enforce.

Two issues lie at the heart of these difficulties: uncertainty and autonomy. Rules are derived from knowledge about the correct course of action in a given situation. They therefore require that uncertainty about what the correct course of action is has been sufficiently reduced to be confident in the chosen action being the right one. Obviously, this cannot always be achieved, and the resulting rules may lead actors to do the wrong thing, unless they decide to violate the rule as they realize that it does not fit the circumstances they find themselves in. Many accidents have been caused because people followed the prescribed, but inadequate course of action, just as other accidents resulted from people not following rules, potentially with all good intentions because they felt that the prescribed behaviors did not match the situational demands. The opposite is obviously also true: People follow rules in useful ways and also sometimes deviate from rules in useful ways. However, because recovery from difficult situations is usually not systematically tracked, organizations often lack knowledge on successful rule violations. Therefore, there is generally too little awareness of the uncertainty actors are faced with when trying to follow rules [18].

The second issue, autonomy, has two important facets. One facet is directly linked to the previous discussion about uncertainty. To successfully face uncertainty, actors need to have freedom of action, i.e., autonomy, to adapt their behavior as new knowledge emerges and to proactively choose new courses of action to explore and improvise in the face of highly unexpected circumstances. If actors violate rules because the rules turn out to not be helpful, they exercise this autonomy. The second facet of autonomy is the expression of agency through autonomous action which is a major motivating force for human behavior. Individuals are motivated to engage in activities of their own accord (= autonomous or intrinsic motivation) when these activities are inherently interesting and/or meaningful [6]. People in general resent attempts to curtail their autonomy and are found to be less motivated and satisfied at work or in other settings when they feel externally controlled. Rules are a very direct form of external control, therefore, it is hard to create autonomous motivation for rule compliance. Punishment for non-compliance has been found to be an insufficient or even counterproductive driver of behavior, frequently leading people—and even whole organizations—to cover up inadequate behavior. Rewards for compliance may work better, but in this case the motivation for the correct behavior nevertheless stems from external factors rather than from an internal desire.

Following from these considerations, there are two questions to be answered: How can rules successfully guide behavior even if substantial amounts of uncertainty about the right course of action in any given situation remain? How can rules instigate autonomous motivation for rule compliance?

2.4.2 Rules as Part of Uncertainty Regulation

With respect to the first question, understanding how rules operate through the lens of uncertainty regulation helps to redefine and broaden the function of rules in guiding behavior even in situations with substantial uncertainty. For this to happen, organizations should adopt a process for systematically managing the introduction and adaptation of rules along the following five steps [12]:

i. Any situation for which a rule is to be devised should be analyzed in terms of the uncertainty the situation entails.
ii. Depending on the amount of uncertainty, different rule types should be employed that include different degrees of flexibility in line with the uncertainty that needs to be handled by the actors [14]. Such "flexible rules" may also momentarily increase uncertainty, for instance when they require the actor to consider more choices for possible behaviors in a given situation.

    - If there is little or no uncertainty as to what the correct course of action in a situation is, then *action rules* should be used, that is rules that specify in much detail what that correct course of action is.
    - If the uncertainty is fairly limited, then the right choice are action rules with *systematic inclusion of degrees of freedoms* to allow for adaptations in behavior in view of that uncertainty, by using terms such as "if needed", "in light of specific conditions", or "depending on the availability of further information".
    - If there is uncertainty about which of a number of possible behaviors is the correct one in a given situation, and that decision has to be made by the actor based on emerging information in the situation, *process rules* should be used, that is rules that guide the actor in collecting information, coordinating with others, etc. in the process of deciding on the right course of action.
    - If there is much uncertainty and there are no means to reduce that uncertainty for the actor beforehand, the only way to guide action is to provide *goal rules*, that is rules that help to set priorities and keep the overall direction of action within certain bounds.

iii. The use of different rule types should also be considered in light of the assumed uncertainty preferences of the actors for whom the rule is devised. Obviously, differences between single individuals cannot be accounted for when rules are written, but differences between professional groups, hierarchical levels, or other broader categories should be examined. For instance, differences in knowledge, ability, and prior experience as well as in professional codes of conduct or cultural norms are likely to shape the willingness to cope with existing uncertainty and the desire to further reduce uncertainty or on the contrary increase uncertainty as a means for learning and competence development.
iv. The experience with existing rules needs to be monitored, and feedback by all actors encouraged as part of a continuous learning process for which knowledge of "successful" rule violations is particularly important. In this process, it is

also important to consider whether there are outdated rules, which need to be abolished, and whether all actors are always fully up to date on the currently valid rules.

v. The processes involved in rule making should be embedded in an overarching concept of how an organization approaches uncertainty. Following the Griffin and Grote [7] theory and earlier work by Grote [10], organizations should consider costs and benefits of reducing and increasing uncertainty in light of performance requirements in different situations. We return to this point in the final section when we discuss which steps organizations might take to adopt a new approach to uncertainty.

2.4.3 Rules as Constraints and Enablers for Behavior

To answer the second question of how autonomy can be preserved when for safety reasons there must be strict bounds on permissible behavior, a closer look at who decides on rules is helpful. Mostly, rules are made for others as a means of controlling their behavior, which then creates the motivational problems already discussed. If, however, people make rules for themselves, they are given a different kind of autonomy, that is the autonomy to make decisions on restricting one's own autonomy. Such "higher-order autonomy" [8] can keep autonomous motivation alive as restrictions of one's freedom to act are taken voluntarily and with full understanding for why they are necessary. Participation in rule making, assessment of existing rules, and continuous feedback on and adaptation of rules thus is key to promoting autonomous motivation for rule compliance [3, 16].

Moreover, if the restrictions are chosen in line with the uncertainty considerations discussed in the previous section, then it becomes clear that rules do not only constrain but may also enable behavior [1]. When actors have to handle difficult situations with high amounts of uncertainty, goal and process rules provide some guidance, but also leave sufficient flexibility to adapt behaviors as needed. Thus, actors receive help in managing the uncertainty, but are also empowered to make their own decisions. This autonomy needs to be coupled with adequate education and training to ensure that actors have the required knowledge and skills to make adequate use of the offered degrees of freedom. Additionally, actors' uncertainty preferences have to be taken into account. Flexible rules demand a willingness by actors to accept or even increase uncertainty, which can be fostered by competence building and by creating a culture in the organization that encourages empowerment and learning [12].

2.5 Steps Toward Adopting a New Approach to Uncertainty

For organizations to adopt flexible rules as a way to more effectively regulate uncertainty, predominant perspectives on risk and safety management need to be reflected upon. At their core, these perspectives concern deep-rooted assumptions about the relationship between safety and autonomy [11] and the necessity to create stability by reducing uncertainty [10]. Despite the increasing emphasis on organizational resilience as the answer to managing the unexpected [15, 21], many organizations still aim to minimize uncertainty in the hope to maintain stability and control as prerequisites for safety. Autonomy that would allow flexible action and resilient adaptations to external changes is considered unnecessary or even dangerous as it threatens routine operations. Accordingly, a *first step* is for organizations to reevaluate the balance between stability and flexibility that is required for different operations. Flexibility demands mostly stem from having to cope with uncertainty, while stability demands result from internal and external requirements for predictability and control. These demands may vary between different parts of the organization and also between different points in time and have to be monitored and reassessed frequently [4].

Once it is clear that uncertainty regulation is about more than just trying to minimize uncertainty, the relationship between safety and autonomy needs to be scrutinized as a *second step*. If safety requires the full range of opening and closing behaviors because situations frequently change and behavioral routines have to be complemented by learning and exploration, actors have to be empowered to autonomously choose the right behaviors. The different kinds of flexible rules discussed earlier can help them to make good choices.

As a *third step*, organizations should reflect on basic assumptions and values shared by their members which promote or hamper a fuller understanding of this new approach to uncertainty regulation [19, 20]. Thereby, organizational culture is highlighted as a driving force behind organizations' practices in risk and safety management. Only if there is a shared commitment to broadening the perspective on uncertainty and empowering actors to respond to and possibly even increase uncertainty, can measures such as flexible rules be successfully implemented.

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Chapter 3
Producing Compliance: The Work of Interpreting, Adapting, and Narrating

Ruthanne Huising

Abstract Organizations, to comply with regulations and growing prosocial demands, develop robust *accountability infrastructures*: offices, techno-legal experts, programs, operating procedures, technologies, and tools dedicated to keeping the organization's operations in line with regulations and external standards. Although an organization has a single, unified accountability infrastructure—one program, one set of policies and procedures, and so on for environmental management, or health and safety, or risk management—this infrastructure must produce compliance across a dynamic, complex organization. This happens when and because compliance managers and officers make a single, unified accountability infrastructure multiple and diverse in its day-to-day implementation. This approach to compliance work is pragmatic in the sense that rules and requirements are altered based on a deep understanding of regulatory expectations, local operations, and local work cultures. It depends on the skilled interpretation and adaptation of regulation and narration of compliance.

Keywords Compliance · Pragmatism · Expertise · Work · Regulation

3.1 Introduction

Traditional regulatory approaches tend to produce one-size-fits-all regulatory frameworks that gloss over important differences among organizations and rely on command-and-control style enforcement. Contemporary regulatory approaches—performance-based regulation, responsive regulation, risk-based regulation, light-touch regulation, and so on—rely on regulated organizations to design and manage homegrown systems. Beyond achieving compliance with regulatory expectations,

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organizations must provide an account of how they organize to produce compliance. Regulated parties are encouraged to tailor their compliance programs, continuously observing, aligning, and improving compliance efforts rather than adhering to off-the-shelf prescriptions. Such contemporary approaches require that organizations internalize the regulatory work of setting standards and guidelines, developing policies and procedures, auditing, and correcting.

This shift in regulatory approach, combined with the growth of prosocial demands on organizations, requires that organizations develop robust *accountability infrastructures*: offices, techno-legal experts, programs, operating procedures, technologies, and tools dedicated to keeping the organization's operations in line with regulations and external standards [1]. This includes systems for managing health and safety, environmental sustainability, enterprise risk, diversity and inclusion, quality, GDPR, corporate social responsibility, and so on. As the complexity and sophistication of accountability infrastructures grow—aided by consulting firms, professional and industrial associations, and information technologies—organizations should not lose sight of the fact that training programs, manuals, inspection checklists, standard operating procedures, and databases do not by themselves create compliance. Accountability infrastructures rely on human expertise and discretion to understand local conditions and constraints across the organization, and to situate and adapt instructions to suit these conditions in ways that preserve compliance goals.

The central issue then is that although an organization has a single, unified accountability infrastructure—one program, one set of policies and procedures, and so on for environmental management, or health and safety, or risk management—this infrastructure must produce compliance across a dynamic, complex organization. This happens when and because compliance managers and officers make a single, unified accountability infrastructure multiple and diverse in its day-to-day implementation. This approach to compliance work is pragmatic in the sense that rules and requirements are altered to be useful in relation to the context in which they are applied. Pragmatic compliance depends on staff recognizing the need for local adaptation of rules and appropriately varying rules based on a deep understanding of regulatory expectations, local operations, and local work cultures. Together this techno-legal expertise depends on skills in interpreting, adapting, and narrating compliance.

3.2 Studying the Work of Compliance Officers

The daily, face-to-face work of ensuring that organizational operations align with regulatory demands and other prosocial concerns is the responsibility of compliance officers. Over the past 20 years, I have observed technicians, officers, and managers responsible for compliance—health and safety, radiological safety, and biological safety—as they work [2–6]. Following them on inspections, attending their trainings, and watching them solve problems, write procedures, and manage tight budgets, I have seen them in action in their organizations. I have also trailed them

at national conferences, regulatory training sessions, professional association meetings, and showdowns with regulators. Through extensive longitudinal and comparative observation, interviews, and archival work, I have observed different approaches to compliance work.

Compliance officers who work pragmatically understand their work as managing the gap between the compliance expectations and the daily enactment of these expectations [6]. Their work is to narrow this gap as much as possible by understanding how the daily performance of compliance expectations may be experienced as difficult or incompatible with operational goals and procedures. From this perspective, producing compliance requires understanding the social, political, and operational barriers to following rules and procedures rather than psychological ones. To take such an approach requires that compliance staff develop an extensive and deep understanding of the operations and work of the organization. Further, it requires that they develop an appreciation for the variation of conditions that exist across the organizations including differences in organizational subcultures, management styles, budgetary pressures, turnover rates, forms of expertise, etc. To acquire this appreciation, compliance staff must spend a considerable amount of time in and around the organization and outside of their offices, away from their desks, developing local knowledge and relationships. Not all compliance offices take a pragmatic approach to compliance. Those who lead and direct the compliance staff display different approaches to conceptualizing or defining compliance and managing it [2, 3].

3.3 Producing Compliance Pragmatically

Compliance is produced pragmatically when compliance staff understand, appreciate, and attend to variation in the organization. This knowledge is used to interpret and adapt regulation, and narrate compliance. The claim is that when local context is taken into account in developing and enforcing compliance efforts, compliance is more likely to be consistently observed. By articulating and fitting regulation in relation to the situation in which it must be enacted, regulation will be better customized and focused to that situation. This approach should not be understood as a cover for incoherence or a slide into permissiveness. Instead, attention to the local and the particular allows organizations to meet the universal ends that regulation seeks. Rules that recognize and reflect the diversity of situations make the enactment of regulation versatile and multiple in a way that is not only compatible with but in service of its universal goals. A pragmatic approach weaves regulation in a sensible, responsible way through the human foibles, cycles of work, constraints on change, limited money, and deadlines that make up organizational life.

3.3.1 Interpreting Regulation

Moving across multiple regulators and sets of regulations, compliance officers must "work out" which regulations are in play for particular activities in their organizations, what those regulations "say", and how to manifest them appropriately across the organization. The need for interpretation stems from the multiple, misaligned, complex, general and incomplete quality of regulations. Regulations, because they must cover a wide range of contexts and situations, are often general and incomplete relative to a particular context. Compliance officers must fill in such voids. Regulations may also be, at first glance, appear infeasible relative to the scale or breadth of an activity within an organization. Compliance officers seek clarification from regulators about these requirements and how they can be made feasible within the context. Regulations are also often silent, unable to anticipate every situation and emerging situations. In this case, compliance officers must work with regulators to understand how to appropriately hand such situations.

The need for interpretation also stems from the particularities of the organization's activities and how they are staffed, mechanized, and organized. Equipment and architecture may deviate from ideal. Combinations of hazards may not be directly or easily addressed in regulations. Compliance officers try to understand what regulators expect from the organization but also how the organization can be made—through local fixes and workarounds—compliant. This "working out" is done with the possibility that the interpretations produced may or may not be shared by regulators or be acceptable or affordable from a managerial perspective. The interpretative work of compliance officers ultimately defines compliance within and across the organization, producing local prescriptions that are externally and internally legitimate.

3.3.2 Adapting Regulation

Adapting compliance practices across the organization depends on recognizing variation across operating situations and contexts. This variation may stem from physical, technological, or cultural differences in the organization. Units or divisions may emerge from different histories, be built on different professional cultures, or have significantly different status and resources in the organization. Compliance practices, if they are to be useful, need to be adapted in accordance with these varying contexts. Compliance oversight including inspection, training, and informal dialogue should also vary across contexts. Some pockets of the organization require more frequent inspection, not because of the inherent risk of activities, but because of the local culture, turnover, novelty of the operations, and so on. Adaption should also consider the temporal rhythms of different operational aspects, assessing and assisting compliance efforts according to the operational life cycle.

Variation within organizations is at times understood as deviance from and failure to conform with centralized standards and norms. Such an understanding ignores the real differences in constraints and resources across local units within an organization and may prompt efforts to punish and homogenize locally productive variation. Pragmatic compliance requires that compliance officers have detailed knowledge of the landscape of the organization, understanding variation in conditions and resources so they can calibrate their interactions and tactics to particular situations. Accommodating variation may involve giving different units or groups some freedom to develop their own responses and practices in response to regulations. It may also involve experimentation—iteration and learning—with different approaches to compliance across the organization.

3.3.3 Narrating Regulation

Compliance staff working to bring accountability infrastructures alive across the organization must go beyond measuring compliance to providing accounts of how they organize to produce compliance. They do this through talk, text, numbers, and figures. They are required to narrate compliance processes to several audiences, and these narratives perform different functions. External parties, including regulators require that compliance offices, periodically and formally account for how they more or less align organization operations with regulatory expectations and how they achieve this. These are well-known moments of narration. As are narrative accounts, again often formal, that are sent up the hierarchy to inform senior management and the board of compliance activities. These formal moments of narration are crucial for securing approvals, resources, and legitimacy.

Narration of compliance and non-compliance also occurs on an ongoing basis, through less formal means, among compliance officers, managers, and employees. These accounts provide a means of through compliance staff teach, learn, and legitimate the human judgment and professional discretion needed to implement accountability infrastructures. They are also a crucial means of developing interpretations and adaptations of regulations. For example, in one organization, concerns about drain disposal of materials across over 500 laboratories and in accordance with myriad regulations emerged and were addressed through months of inquiry accompanied by ongoing narration. Histories of the buildings' infrastructures that had been built and renovated over many decades were required [6]. These inquiries revealed that multiple narratives circulated for the same building, leading to misunderstandings about compliant practices.

Articulating variation in compliance practices and their effects verbally or textually provide a circulating means for compliance officers and managers to understand how interpretation and adaptation work to create compliant operations. Narrating compliance practices also facilitates learning and further adaptation by sharing near misses, incidents, accidents, and failed attempts to vary the regulation.

3.4 The Challenges of and to Pragmatic Compliance

The work of pragmatic compliance depends on several conditions. First, it depends on hiring compliance workers who understand their work through a holistic and pragmatic lens or training them to understand this. Rather than understanding their work to be strictly delimited to creating and managing accountability infrastructures, they must recognize that their work is to bring these infrastructures alive in different ways across the organization [7]. Second, it requires more than techno-legal expertise. It requires an interest in and knowledge of the operations and cultures that make up the organization. Compliance staff, to appropriately adapt regulations to be functional and meaningful across the organization require significant knowledge of the organization's operations and its variation. To generate and cultivate such knowledge compliance staff need to spend significant time interacting with and learning from the managers and workers whose actions and routines they are trying to shape. In addition to knowledge, they are developing relationships and channels of communication that keep their knowledge base current. Third pragmatic compliance depends on empowering compliance staff with time and authority to interpret, adapt, and narrate. Importantly, these workers require the authority to adapt rules and to narrate these alternatives.

Beyond the work of compliance staff, pragmatic compliance depends on organizations and regulators accepting multiple narratives of the methods and means of producing compliance. Rather than requiring a single, unified account of compliance, multiple and varying accounts must be accepted and understood as a signal of learning and adaptation rather than deviance. This may be the most significant challenge for pragmatic compliance. Regulators often expect and organizations design singular systems that provide a strong, unified narrative of compliance. These systems are supported by data collection, inspection, and reporting systems that are standardized and thus singular. How to make the expectations and supporting systems "pragmatic friendly" is an open question. Again, it seems to rely on the fundamental observation that human interpretation, adaptation, and creativity are necessary to bring legal and technical systems alive.

3.5 Conclusion

Ultimately managing the gap between the compliance expectations and the daily enactment of these expectations depends on changing and sustaining change in the daily routines of the organization. Creating and sustaining organizational change is a significant challenge. Thus, beyond operating pragmatically, compliance staff must consider how a reinforcing system of bureaucratic, cultural, and behavioral support can produce compliance [8]. Again, rather than a singular approach to compliance, multiplicity is required to generate change. This need for multiplicity along with appreciation of variation—healthy and necessary variation—in organizations

emphasizes the need for compliance staff who are enabled and able to exercise discretion—interpretation, adaption, and narration—to bring regulation alive in the organization.

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Chapter 4
Untangling Safety Management: From Reasonable Regulation to Bullshit Tasks

Kristine Vedal Størkersen and Håkon Fyhn

Abstract In this chapter, we argue that the management of values like safety and quality often leads to the creation of unnecessary tasks that interfere with the actual work being done. These tasks, referred to as "bullshit tasks", are experienced as meaningless and time-consuming. We draw on two decades of empirical research in safety management and work practices in various industries and organizations. We highlight examples where regulations and management systems result in paperwork overload and hinder the efficiency of workers. We discuss how the sociotechnical system, including government regulations, management practices, and worker perspectives, contributes to the proliferation of bullshit tasks. We emphasize the need for a fundamental change in how regulations are made, enforced, and audited to address this issue, and suggest that organizations and managers can take steps to reduce bullshit tasks and improve the overall efficiency of work processes.

Keywords Safety management · Organization · Sociotechnical system · Bullshit tasks · Automation

Safety. Quality. Transparency. Accountability. Nice words, great values. However, the management of these values is not always well-received by workers, as *safety* and *quality* do not have the same connotations as *safety management* and *quality management*. Our research from several projects shows that addressing such values tends to generate requirements that interfere with the core work, or "real work", as it is often called. In other words, safety management interferes with safe work. It is not surprising that such values are difficult to manage, but it is surprising that

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we have failed for so long and continue to use the same methods. In this chapter, we start untangling the messy state of safety management by exploring how safety management is influenced by the surrounding sociotechnical system. We describe how the organizational and technological systems encourage a tendency to move safety management away from the sphere of human experience—the sphere in which "real work" is performed and understood—toward more non-sense or bullshit tasks. At the end of this chapter, some actions to mitigate bullshit are suggested.

4.1 Background and Examples

The empirical approach of this chapter is not based on a straightforward research design, but rather the authors' various empirical experiences. For two decades, we have studied safety management, organizations, and work. We have conducted interviews, surveys, and fieldwork in different public and regulatory entities, as well as industries and private companies within construction, aquaculture, fisheries, and education. Over the years, we have interviewed more than one hundred people in different positions in a range of organizations. While the specific topics of the interviews have differed, a clear majority of the interviewees have been frustrated about extensive management systems, bureaucratized computer systems, or reporting procedures eating away at the time that should have been spent on their "real job" [11, 13, 36, 38]. They described their tasks in an opposite hierarchy as illustrated in Fig. 4.1, where their primary work was hampered by other tasks. Personnel at all levels had tasks they could not see the purpose of doing, with output seemingly disappearing into a "black hole". Such tasks were typically extensive documentation of simple routine chores, reporting in systems they never saw anyone use, following procedures that gave little sense, or ordering things through computer programs that took more time than going to the physical store. While we also identified many positive outcomes of safety and quality management, and situations where the systems worked according to its intentions, the many negative implications were irrefutable. Operational personnel, managers, and regulators all talked about "all this bullshit or non-sense that we don't know how to get rid of".

For example, in a study of energy consultants, the introduction of new digital documentation procedures intended to ensure the compliance of regulations and standards, resulted instead in the consultants having to spend their limited consultation time filling in the digital forms. Due to the time-consuming new procedures, they ended up not having sufficient time with the customers, resulting in unsatisfactory solutions. In some cases, the consultant ended up bypassing the whole system, making an informal deal with the customer [13, 14]. Another example from the construction industry was the introduction of "paper-free building sites", where builders were supposed to build directly from the digital models, rather than printing out paper drawings. The goal was to avoid expensive errors occurring when builders used different versions of the plans, printed at different points in time. However, at all the "paper-free" building sites we visited, builders used paper drawings, either

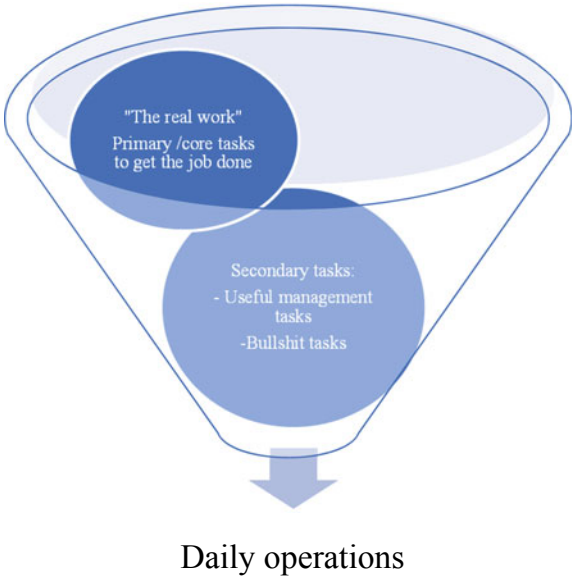

Fig. 4.1 Empirical descriptions of different types of work tasks

openly or in hiding. The most prominent reason expressed by the builders was that as the model was never perfect, they had to make changes while building. Furthermore, as the digital interface was not designed to incorporate builders' feedback, using pencil on paper allowed them to talk back to the drawing without interrupting their workflow [11].

When Graeber [15] introduced the term "bullshit job", meaning a job not even the person holding it sees the value in, this resonated with the frustration our informants had expressed. However, our studies did not show any *jobs* that were useless. But almost everyone had certain *tasks* in their jobs they experienced as useless. Tasks they wondered if anyone could benefit from, including their employers who were demanding they do said tasks. Thus, we became interested in non-sense or *bullshit tasks*. We explored such tasks and their safety relevance in several Norwegian opinion pieces and oral presentations (e.g., Størkersen and Fyhn [37]). To our surprise, these pieces were republished in tens after tens of branch-journals for various professions, ranging from nursing to diary workers, indicating a widespread frustration with bullshit tasks. Now the time has come to analyze this phenomenon more systematically based on the levels of the sociotechnical system.

4.2 The Sociotechnical System Entangling Safety Management

To realize how safety management failed, or is linked to bullshit, one must understand the broad range of expectations, regulations, and actors the organizations try to handle simultaneously [35, 38]. These are a part of the sociotechnical system involved in risk management described by Rasmussen [32], emphasizing the connection between the societal levels from government to work, and the influence from environmental stressors such as the public, market, and technological change. In this chapter, we thus build on Rasmussen's framework to shed light on the road from reasonable regulation to bullshit tasks. This is illustrated in Fig. 4.2 and was also visible in the example from the energy consultants and the construction sites above: Regulations make companies implement measures that may give unintended, troublesome, and even meaningless tasks to the personnel [11, 13, 14].

4.2.1 Government, Regulations, and Associations

Regulation is a defense against organizational accidents [33, p. 182], as it bridges the gap between public interests and the market. The purpose is to protect employees, customers, and society, among other stakeholders [18].

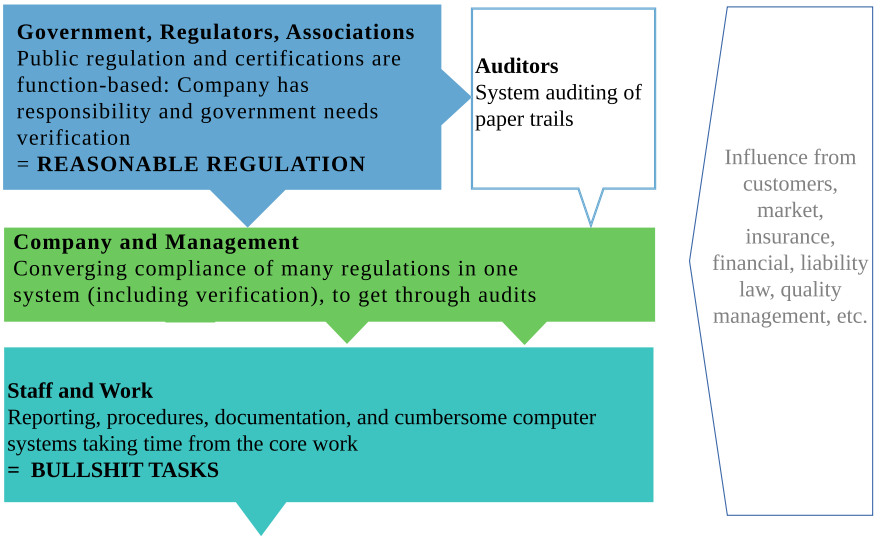

Fig. 4.2 An illustration of the sociotechnical system involved in safety management, inspired by Rasmussen [32, p. 185], but going from reasonable regulation to bullshit tasks

Most quality and safety management regulation and certification schemes are goal- and function-based, such as the ISO standards for safety, quality, and risk management, as well as national and regional HSE regulations and a range of industry-specific standards. It is typical for organizations to mimic each other's ideas of management routines, especially when a solution appears to be the natural way of solving a problem [6, 10].

Function-based regulations mostly call for internal control through management systems. The safety management system must fit a company's specific activities, but also be verified and documented by auditors. These two parts of the regulation—practical systems and verification—are often in conflict, and regulatory traditions lead the verification to trump practical systems [35]. Auditors have been given the power to ensure compliance of safety management and quality management. Verification has been described as a clever touch for regulators to give the companies the responsibility to both self-enforce the regulations, and to internally control and externally demonstrate their accountability [16, 27]. The regulations urge organizations to implement documentable tasks [24], as documentation is an easy basis for checking compliance superficially [19]. However, function-based regulation and system auditing may lead to a "checkbox mentality", as it does not uncover whether a management system adequately fulfills its intentions [2, 21]. Hence, functional regulations and superficial audits can result in bullshit tasks at the expense of core tasks and of trust [30].

4.2.2 Management and Company

The managers in the various industries—like ship owners, construction managers, HSE advisors, purchasers, and CEOs—want good operations, but also to comply with regulations. Grote [16, 17] and others argue that companies should implement procedures with a balance of stability and flexibility. However, documentation of operations has become the favored approach to demonstrate accountability [20].

Managers are expected to show paper trails to safety regulators, quality management auditors, financial supporters, insurance companies, and a line of stakeholders [4]. Liability law can therefore result in extensive management systems, because management wants to protect itself through detailed descriptions of task operations [22]. This may include complex computer systems that cover documentation and reporting information at the same time as an employee is completing their purchases. For example, a catering order goes to the canteen for making food, to the management for having control over projects, and to the financial department for sending the bill. Or, a medical diagnosis is registered in the patient medical journal, and at the same time feeds into hospital payment, statistics, management, and planning of resources and hospital beds.

When managers design the safety management system with tasks for the operational personnel, they often overestimate what the personnel has time for and the variation in situations they need to handle [40, p. 455], thus implementing more

routines and procedures than what is possible to accomplish in practice. Also, as audits and accidents often show weaknesses in the managerial system, it is common to add documentation tasks [1], which can increase the number of steps in a management system or procedure. These managerial measures may create non-sense or bullshit tasks, which seem to be reproduced across organizations and industries.

4.2.3 Work and Staff

From the operational personnel's side, common safety management is not only producing routines for safety, it also often produces work that may conflict with safety due to the introduction of *bullshit tasks*. In many industries, safety management systems' extensive documentation requirements may suppress the attention on and time available for safe work [3, 5, 7, 8, 16, 19, 30]. As this captain contemplates in an interview referred to in Størkersen [35, p. ii]:

> I sometimes reflect upon that. We've got the papers in order, but is it really better? Do we only produce paper?… The Maritime Authority's statistics are as bad as before, we run ashore just as much.

Safety management tasks not directly ensuring safety are also referred to as safety clutter [31]. When there are many safety management tasks, they clutter or saturate the operations for the personnel, thus decreasing system performance [40]. Tasks that are seen as unfitting, seemingly without value, and unnecessarily time-consuming, are perceived as bullshit tasks. They contribute to overloading the capacity of the personnel, who must carefully consider which tasks to do and which procedures to follow. When management systems include many bullshit tasks, operational personnel's adaptation and competent decision-making may be essential in order to get the core tasks done [25, 40]. This demands the personnel to remove themselves from the tasks that management expects them to perform. In some organizations, both managers and operational personnel jointly experience procedures to be mainly there for liability reasons, meaning that they in practice can be ignored [35]. Many employees are frustrated with computer systems that are difficult to use, because they require new information or checking of multiple boxes to do simple tasks. These systems tend to be characterized by drop-down menus leading the user through the procedures, while also functioning as gates, stopping the process if a certain box is not ticked correctly. This becomes a source of frustration in cases where the menu fails to offer adequate alternatives to the situation, and in practice stops the work until the "problem" is solved [12]. All in all, the safety management tasks are often viewed as external to the core work, constituting two parallel trails of tasks—*the real work* and *safety management*—as illustrated in Fig. 4.1. The first is seen as primary tasks and core work, and the latter seen as secondary tasks, including clutter and bullshit tasks [11, 36, 38].

4.3 Managing Through Human-Peripheral Systems

We have seen how seemingly reasonable regulations make companies implement measures that may result in unintended and perceived meaningless tasks for the operative personnel. In the previous sections, we have argued that the sociotechnical system is vital to understanding why safety management can result in bullshit going against safety. Organizations need to comply with a line of regulations and expectations, all requiring management systems, documentation, and system auditing. This gives an entanglement of safety management, internal control, quality management, responsible procurements, and accountability in the organizations' systems.

While most workers embody their primary tasks, they usually find it more difficult to keep track of the required secondary safety management tasks (see Fig. 4.1), and thus wish for support systems. However, management systems come with more than support. The logic of management systems focuses on the technological aspects, not only as rigid procedures and processes that become even more rigid when digitalized, but also as instrumentality increasingly separated from the sphere of human experience [23, p. 296]. As such, the parallel trail of safety management is not only time-consuming, but also challenges the professional judgment of staff, as it works according to different procedures and logic, calling for other skills than those needed for the core work.

While most agree that professional judgment in some cases necessitates safety procedures adhering to a different logic than the judgment being supported (such as the jet pilot's pretakeoff checklist), problems can arise when such checklists become systems that determine how a professional should perform their job. Not only because they create bullshit tasks that steal time from the "real job", but because they force the job to be performed according to procedures adhering to the logic of the management system rather than that of the professional human being. The separation between the two trails of tasks (see Fig. 4.1) increases if the tasks are produced by a system not built according to points of professional judgment in the workflow of the ones doing the job, but rather by a system architecture distant from this sphere of human experience. However, even if the system is designed from a point of view in the real workflow, it tends to lack the flexibility, openness, and ability to prioritize associated with professional human judgment. When the operational personnel are so occupied with safety management tasks that it is difficult to find time to do the core tasks, they find themselves in an ineffective system, where they need to make decisions based on their bounded rationality or in a hurry, and not based on the thorough calculations of management. "Knowing when to bend the rules is one of the hallmarks of an experienced decision maker" [28, p. 76], but improvised decision-making is rarely in anyone's favor if it occurs because of a malfunctioning system. Further, as such systems are created to secure a form of control at a distance for management, they tend to be designed to operate by control rather than trust. Trust necessarily implies risk [34], which is something compliance systems normally are designed to eliminate. The danger, then, is that trust may diminish as a resource, as being given trust tends to be a premise for acting in a trustworthy manner [39]. Again, we can see a step

in the separation of human and management system, as trust moves from human to system.

On the other hand, the concept of bullshit tasks taps into the sphere of human experience, expressing frustration emerging from the experience of meaningless tasks cutting into one's real work and time. Even though some of these tasks are regarded as external to the real work, they become real as they conquer the time and attention of the staff. Further, as it tends to be the trails of these tasks that are visible further up in the organization, they tend to gain ontological weight and thus cause a transition in what is regarded as "real", from the actual work to the representations of it, where the representations end up being perceived as more real than the real work itself [26]. However, seen from the perspective of the frustration giving rise to the term *bullshit task*, the production of the management systems we have discussed here can be seen as steps along a process where we, as Tim Ingold puts it, become "the authors of our own dehumanization" [23, p. 311].

4.4 Stepping Out of Inertia

As we have seen, bullshit tasks are defined by their unproductive appearance, their unwanted and non-meaningful nature, and their nonetheless common presence. Although organizations have made an effort to get rid of them, they are persistent because of traditions in how to comply with regulation, such as audits, documentation, or technology to provide for audits and documentation [9, 14, 31, 38]. This may be the case for management of many values and is particularly apparent in the safety management area. What is evident *in organizations* is poorly working systems, computer programs, and reporting taking up valuable time. And what is evident *across organizations* is that a fundamental change needs to come at the policy-making level—in how regulations are made, enforced, and audited. However, it should also be possible to decrease the time spent on bullshit in each organization as it is.

Although organizations obliviously point at regulation and auditors, managers surely must possess some leverage and tools to decrease the number of bullshit tasks. By paying attention to this phenomenon, the number of bullshit tasks experienced in an organization can be reduced. If the personnel and management together identify and analyze the existing bullshit tasks, some of the tasks could thereafter be relabeled, moved away, or completely deleted. Some suggestions:

Relabeling the Task: If some tasks are important, but perceived as non-sense because it is not communicated why they need to be done by exactly the persons associating them with bullshit tasks, they really are not bullshit tasks. For example, certain types of reporting are extremely useful for the people who receive the reports. When reports are made and submitted through computer systems, this can result in the "black-boxing" of both the receiver and the intentions, thus alienating the sender. As was already stated by Karl Marx, it is essential to humans to know the purpose and

context of their work [29]. Thus, through educating each other on the value of certain tasks and understanding how they are vital for others, some tasks can be relabeled from bullshit to valuable tasks. However, the relabeling will not be successful if someone tries to relabel a task that really *is* useless or could be done in a smarter way or by another department.

Moving the Task: Some tasks may be important for the organization, but not necessarily performed by the personnel that identify them as bullshit tasks. Such tasks can be filling in documents or entering information into computer forms. Such tasks could be moved to other places in the organization, or in many cases be automated. Of course, this generates more tasks, and one should be careful not to generate new bullshit tasks.

Removing the Task: The boldest managers may understand that some of their tasks are bullshit, for example defensive documentation in order to satisfy easy audits. These tasks can be removed. However, it may demand some work and preparation, for example communication with and education of regulators and inspectors and internal auditors, to avoid regulative capture and ensuring a shared understanding of what is compliance and what is bullshit. It is vital that external actors do not approve systems or tasks that obviously are implemented for superficial compliance and not to improve operations. This act of removing bullshit tasks in cooperation with auditors is a possibility for companies that really look ahead.

This process most certainly demands a level of maturity of the actors involved. What is necessary, what is only defensive documentation, and what is required in audits will differ within an organization. Finding out which tasks are perceived as bullshit tasks while "really" being useful, may call for discussions and negotiations. Personnel could negotiate when to comply and what is really not important to comply with. These negotiations would need some form of dialogue between those doing the job and the regulators to reveal, on the one side, which audit outputs are necessary for the regulator, and, on the other, how any given audit affects the "real work" and professional judgment of those doing it. In this scenario, the regulator approaches the role of consultant more than that of inspector.

As a conclusion, we want to underline that this chapter is a contribution toward improved management and organizational life. The management methods of organizations today are astray. For years, personnel in different industries have seen that safety management and quality management also result in something that is not safety and quality. In addition to safety and quality, the practice is entangled with bullshit tasks, merely adding chores to already full time-schedules. The same picture may be drawn for transparency, accountability and now also sustainability, and probably many more trendy terms armed with good intentions. We want a world where people can experience doing a good job. Today, a more common experience seems to be that you almost never do a sufficient job, because you have so many tasks, and some of them are not necessary, but they are the ones your management urges you to do.

Our exploration of the road from reasonable regulation to bullshit tasks is a step toward the potential to do a good job. If someone understands how to reduce their bullshit tasks, they are probably on the way toward a more reasonable future.

Ethics Statement Informed consent was obtained from all informants interviewed for this work, and their identity has been anonymized. The study protocol was approved by the Norwegian Agency for Shared Services in Education and Research (Sikt references 51197/3/LB; 637386).

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Chapter 5
Ambiguity, Uncoupling, and Autonomy: The Criminology of Organizational Middle-Management

Paul Almond

Abstract The criminological study of corporate crime provides a source of insights into the key role of middle-managers in navigating the tensions between compliance-based and initiative-based approaches to safety. From an initial focus on individual and organizational motivations, the discipline has moved to highlight instead the influence of breakdowns in the connections between individual and organization. Three such grounds of disconnection (problems of ambiguity, structural uncoupling, and autonomy deficits) will be explored, and their implications for understandings of middle-managers' role will be analyzed.

Keywords Middle-management · Criminology · Ambiguity · Uncoupling · Autonomy

5.1 Introduction

The interrogation of safety-related behavior from different disciplinary perspectives can allow for familiar issues to be examined in a new light, and draw attention to the organizing assumptions that shape and limit the ways the field of study is perceived. While consideration of organizational compliance has traditionally fallen within the disciplinary domain of regulatory studies, it has also long been of interest to criminologists, whose focus on crime and offending has encompassed a concern with rule-breaking within organizational contexts [1]. The criminology of corporate offending provides insights into the conditions and circumstances in which behavioral "deviance" occurs within organizations, and thus has a lot to offer in trying to understand why practices might depart from established rules. Within the context of this collection's focus on the differences between compliance-based safety processes (or safety "work-as-imagined") and initiative-based safety behaviors (or

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safety "work-as-done" [2]), this becomes particularly valuable in thinking about the role of individual decision-makers in the shift from one to the other.

Adopting an approach that starts by thinking about such shifts as a form of "deviance" or criminality might seem antithetical to safety science's prioritization of learning-oriented safety cultures over the pursuit of punishment or blame in safety-critical settings like healthcare, aviation, and other high-hazard industries [3, 4]. But it should be noted that this criminological focus is not solely (or even primarily) concerned with criminal *deviance per se*; rather, because it is acutely aware of the constructed and contingent nature of criminalization, it has a broader interest in what drives *deviations* in behavior, such as organizational rule violations, and in the ways that this is responded to, via reactions both internal and external to the organization. It is also interested in the interplay between individual motivations (agency) and organizational power relations and context (structure) in shaping these behaviors, and particularly in relation to middle-managers. Criminological approaches to these issues will be set out, and their relevance to the compliance/initiative debate highlighted. Specifically, three analytical themes will be explored: the ambiguities of meaning that exist within regulatory processes; the structural uncoupling that can occur between individuals and organizations; and the autonomy deficits encountered by those who turn imagined work into work done.

5.2 The Importance of Middle-Management

It is worth briefly explaining why this contribution has focused on middle-management and how this relates to the collection's focus on the articulation between compliance and initiative in safety. Criminology typically takes a subject-oriented approach to questions of collective and institutional behavior, drawing on the interactionist traditions of the discipline [2: 168], and this is reflected in the attention paid to both corporate crime as a matter of offending both *by* and *within* organizational settings, but also to white-collar offending as a form of individualized rule-breaking occurring in these settings [5]. This dual model of thinking about "deviant" corporate behavior as something that occurs at the intersection of organizational and individual action draws the focus toward middle-managers, the critical decision-making individuals exercising professional autonomy at the intersection of organizational policy and practice. Their status as intermediaries who act on behalf of organizations, but also as independent actors, makes them a natural locus for assessment of the "work-as-imagined/work-as-done" dichotomy. There is a strong tradition of analyzing the role of "sociological citizens" who occupy intermediary positions of this sort, particularly due to the interactional influence they wield [6].

Corporate criminological analysis identifies that organizations are often characterized by fundamental tensions over the distribution of responsibility and autonomy within their structures. This tends to place responsibilities for issues like safety into the hands of frontline individual employees and, in doing so, shifts responsibility away from the organization itself. At the same time, however, these frontline actors

are often not equipped with a level of autonomy commensurate with that responsibility, and so cannot truly act with *authority* in the areas that are their *responsibility* [7–9]. One result of this is that accountability processes tend to focus on individuals and leave deficits at the organizational level. So when we analyze the relationship between "work-as-imagined" and "work-as-done", we are also interrogating the distribution of responsibility, agency, and accountability, and it is at the level of middle-management that these distributions intersect. Initiative-based safety behaviors involve the exercise of agency in choosing to depart from compliance with established safety policy, but render those who use that agency in order to discharge their responsibilities accountable for having done so.

It is worth mentioning at this point that "compliance" has a different meaning in relation to the concept of compliance-based safety (obedience to written rules) that forms the basis of "work-as-imagined" than it does in relation to corporate criminology, where "compliance" is generally taken to refer to processes of adopting flexible, self-determined, self-regulatory measures by organizations in order to meet their legal obligations in ways that suit their needs; quite the opposite of following prescriptive standards and obligations. Terms like "compliance" and "innovation" are thus complex and do not necessarily impose universal value judgements in terms of their desirability. So while some criminological explanations of "non-compliance" may derive from unlawful offending, their application within the context of "work-as-done" need not necessarily judge behavior as "criminal" in the same way. In that sense, we are learning from criminological explanations of *deviation* from formal expectation or rules, rather than of crime.

5.3 Foundations of the Corporate Criminological Tradition

Two longstanding, and normatively very different, traditions within corporate criminology have both tended to regard offending behavior as a product of motivation and the choices, desires, and interests of those who perpetrate it, albeit that these choices are shaped and constrained by social interactions and contextual factors. Each approach emphasizes the importance of the choices made by different actors to deviate from rules, but interpret those choices in different ways.

5.3.1 Individual Motivations

One strand of corporate criminology has drawn on broader individualistic and rationalistic "motivational" explanatory factors of human behavior. On this view, managerial offending results from a failure to contain the tendencies of "bad actors" within corporate settings. These actors make rationally informed choices to engage in non-compliant, or "deviant", behavior on the basis of assessments of strategic benefit and

the likelihood of detection, but also their internal capacities, including a lack of individual self-control, or capacity to inhibit impulsive and risk-taking behaviors when presented with opportunities [10, 11], and of their individual risk factors, such as childhood conduct disorders, exclusion from school and structured working opportunity [10], or deficit of control in their life [11]. Lastly, elements of personality, such as psychopathic personality disorders (resulting in disinhibited, egocentric, and manipulative behavior, and a lack of remorse) and anomic reactions to blocked opportunities to conform to professional values are also associated with offending [1: 170].

Rational-choice-based explanations of middle-managerial offending behavior suggest that a decision to deviate from a compliance-based approach to safety and exercise initiative would tend to derive from the risk-taking, impulsive, and disinhibited nature of the individual who takes that decision; it reflects a tendency toward ungovernability and a disregard for, or inability to cope with, authority and supervision. Initiative-based safety would thus occur as product of the way that risk managers with this type of personality presentation would deal with obstacles, problems, or opportunities. At the same time, however, this same "ungovernable" risk-taking tendency also predominates among entrepreneurs, political and technological disruptors, and "innovators" of all sorts, suggesting that the presence of middle-managers who take such an approach can be an asset rather than a liability. In any case, individualistic explanations alone fail to explain differentiated distributions of deviating behaviors, collective or systemic offending, and how "ungovernable" individuals manage to reach positions of workplace authority, suggesting a broader set of factors are at play.

5.3.2 Organizational Motivations

The antithesis of "bad actor" individual-based explanations are those relating to "bad organizations", which attribute departures from behavioral norms to the self-interested tendencies of corporate actors themselves. This represents a more critical corporate criminology tradition, regarding organizational offending as a product of the criminogenic structural necessities of contemporary capitalism [12], or of the influence of industry-wide cultures of motivation, opportunity, and control [13]. Clinard's classic study of middle-management offending identified a range of internal corporate factors as drivers of deviant behavior, with the most important being the decisive role of top management in setting ethical standards and placing performance pressure onto middle-managers [10, 14]. Further, structured anomic discrepancies can arise between cultural social norms and the institutional capacity of firms to abide by these norms; rule-breaking arises where organizations encounter pressures (recession, economic distress, political pressure) that undermine their ability to meet the expectations of investors, customers, and the law [15]. In both cases, hierarchical and contextual pressure overrides the capacity of individual actors to exercise

moral decision-making in order to achieve organizational goals. Individuals are less ungoverned risk-takers, and more victims of the systems they are part of.

Corporate criminology usually views this dynamic operating in relation to large-scale breaches of the law, and as such, tends to be suspicious of regulation and business-led voluntarism [1: 170]. But it may also prompt innovation-based responses to safety challenges. Organizational motives for (non-) compliance extend beyond the "economic rationality" assumed by critical theorists, to encompass normative and social drivers such as an internalized commitment to obeying the law (a "duty to comply"), and externalized concerns around reputation and the social license to operate [16]. Corporate actors follow formal policy and rules because doing so leads to the fulfillment of these underlying interests, and so they are perceived as legitimate. They depart from rules and compliance behaviors when they are seen as ineffective and so illegitimate. On this account, the adoption of initiative-based safety behaviors by middle-managers reflects the limits of rules as a means of fulfilling the "best interests" of the corporation, either because those interests involve rule violations, or because the rules do not work.

5.4 Connective Factors: Key Insights from Criminology

As discussed previously, middle-management decision-makers are of particular relevance to the tensions between compliance-based and initiative-based safety behaviors precisely because they occupy an intermediary role, translating hierarchical organizational requirements into action and formalizing issues identified through front-line practice. Most accounts of corporate offending, and of middle-management offenders, emphasize the cultural interactions between these two levels of action—a clash between the structural and the agentic which gives rise to a culture characterized by disconnections within which deviations from expected behavior can occur. Three types of disconnection are identified here, relating to ambiguities of meaning, to structural uncouplings, and to autonomy deficits.

5.4.1 Ambiguities of Meaning

Middle-managers sit at a "between-point" within organizations, and thus have to negotiate meaning as ideas, initiatives, and imperatives pass up and down the hierarchy of the corporation. In doing so, these meanings give rise to ambiguities and areas of uncertainty, as the gaps between layers of the hierarchy open up, and these intermediary actors are charged with closing those gaps. A safety policy may lack sufficient detail to deal with a problem encountered in practice, or two different policies may contradict one another. For instance, should workers at height follow rules about wearing protective eyewear, even in rainy weather when droplets on the goggles obscure their vision? Does the safety benefit of non-compliance outweigh the risk

that the rule was meant to control? Sometimes ambiguities reflect the presence of "*principled disagreements*" and "*incompetence*" within firms or in relation to their attitude to legal requirements [17], but more often, they emerge from the spaces that the autonomy of middle-management allows for—gaps in processes of surveillance and reporting, or contestations around what compliance with rules actually entails [14: Chap. 8]. Rules create uncertainty, and it falls to intermediary actors to resolve ambiguities via processes of "legal endogeneity" which allow for the blurring of organizational and legal logics and the complication of compliance [18].

Two key points are worth emphasizing. First, ambiguities may be presented as if they are unfortunate by-products of complexity, but in actual fact they are often *manufactured*, and sometimes deliberately; ambiguity over the scope and reach of a rule, over how it is monitored, and over the way that responsibility for departure from it might be attributed, often results from calculated choices on the part of rule-makers [1: 174–5]. For example, the Grenfell Tower fire in the UK, where a blaze in a high-rise residential block caused 72 deaths, demonstrated that regulatory systems, organizational processes and decisions, and legal rules governing fire safety and product approval, were all constructed in ways that sought to increase flexibility and reduce regulatory burdens, but also served to disperse responsibility and reduce accountability for the decisions that contributed to the fire [19]. Here, as elsewhere, middle-managers were partly capitalizing on the gaps to innovate away from compliance with safety rules, and partly in filling these gaps with new (and more favorable) rules. Second, ambiguities exist at levels above that of tasks, roles, and organizations. Those that arise within broader industries, sectors, and regulatory contexts play a major role in shaping employee behaviors, as in the example of the Deepwater Horizon oil spill [13], where the industry culture implicitly tolerated non-compliance with rules and regulations, seeing it as a by-product of doing business and so giving rise to ambiguities of motivation, opportunity, and control.

5.4.2 Structural Uncoupling

A second connective driver of middle-management departure from rule-compliance lies in the structural uncoupling of the goals and interests of the organization from those of the individuals within it. In criminological terms, breaches of rules arise as an unintentional outcome of the breakdown of organizational dynamics, including system inertia, unnoticed breakdowns within complex bureaucratic structures, and the "normalization" of offending within the business environment [14, 20]. Within complex organizational systems, structure and hierarchy create differentiations between individual and group interests that tolerate or encourage behavioral departures. The organization comes to prioritize something that is incompatible with the "normal" values of individuals, and may depart from social and legal norms, and so individuals are either socialized into identifying with organizational goals [10: 537], or have to resolve this difference either by departing from organizational values or by reconciling themselves to them. The criminological term for this type

of uncoupling is "differential association", social learning processes through which meanings that run counter to formal norms are internalized among individuals within that relational context. Differential associations within corporate settings have been seen to arise via sociocultural factors, such as gender, organizational identity, and organizational cultures [10, 14, 20].

Two responses to this type of uncoupling are possible. One is that individuals pursue their own values and interests, or those of subgroups that they are socialized into, rather than those of the organization. As an example, individuals within functionally- or locationally defined teams or groups may develop their own safety practices and ways of working that depart quite radically from the organization's formal safety rules. This might be because those rules are perceived as inadequate in reflecting the needs of the job, or the group might "deviate" away from a commitment to safety altogether. The second type of reaction to differential associations is the use of "techniques of neutralization", or justifications and rationalizations that individuals draw on to avoid acknowledging that they are committing acts of wrongdoing to fulfill organizational requirements [20, 21]. By rationalizing behavior that departs from rules as "normal" for the team/organization/sector, or as harmless, or as taken-for-granted organizational practices, individual employees avoid recognizing their actions as unethical and/or illegal, and reconcile their own beliefs to the contextual norms of non-compliance [20, 21]. The uncoupling of individual and organizational values creates a space within which behaviors can depart, for good or ill, from "work-as-imagined".

5.4.3 Autonomy Deficits

Lastly, while the granting of autonomy or space to exercise decision-making capacity is a defining feature of middle-management, and so links to the presence of ambiguities and uncouplings, it also acts as a driver of behavioral deviation by virtue of its *absence*. Flexibility and accountability exist in a tension within organizational and regulatory systems [22]; the appropriate allocation of autonomy is necessary to ensure that operational individuals are empowered to take decisions and respond to problems, but that these decisions are appropriately owned by, and subject to the oversight of, the organization. Middle-managers with safety responsibilities generally possess agency to go beyond their immediate contexts and to experiment and adapt in order to fulfill their professional roles; they must be aware that they have the capacity and the authority to do so, and they must have dialogic relationships with organizational systems that are responsive to, learn from, and take ownership of, their actions in order to manage safety risks appropriately [6, 7: 9]. But while autonomy is central to the successful operation of complex systems, it also presents risks to organizations and so tends to be managed closely. Organizational desires for internal accountability and external legitimacy both serve as drivers toward the use of mechanisms such as audit and monitoring, and certification or standardization, that curtail autonomy and exercise power over individual action [23]. One result of this

quest for control is that individual managers may not possess the authority needed to perform the role they are responsible for; departures from compliance with formal rules arise as a means of getting things done within the restrictive parameters the organization sets.

More significantly, because these processes of accountability focus on the visible measurement and signaling of attitudes of compliance with law and commitment to safety discourse, they turn the exercise of individual autonomy into an issue of *responsibility*—and subsequently view "work-as-done" and initiative-based behavior as managerial deviance rather than as reflective of systemic or structural issues [7–9]. The reasons for departure from rules are smoothed away, and individual decisions are purposely not "owned" by organizational procedures and policies, because to acknowledge complexity and "real problems" in the work environment would undermine organizational claims as to certainty, control, and legitimacy [23: 1028]. Crucially, while middle-managers are given responsibility for operational performance and outcome delivery, and bear individual accountability for failures and breaches of rules, they are not given the authority or capacity to fulfill these roles and may be disavowed by the organization when they do; this hierarchical distance insulates managerial levels of the organization from similar exposure to responsibility for risk at the front line [7: 14]. Prosocial rule-breaking also reflect the same processes of "responsibilization" and insulation [8]; going "beyond compliance" to implement higher standards than required, acting as a whistleblower to externalize concerns about non-compliance, and acting as regulatory intermediaries to implement requirements at the local level, reflect the same absence of autonomy within the middle-manager role [6].

5.5 Conclusion

The crucial lesson about "work-as-done" and "work-as-imagined" to be taken from criminological research is that departures from formalized rules, regulations, or practices occur as a result of the ways that individual and organizational factors interact within our prevailing regulatory governance culture. Flexibility, diffusion, and empowerment are central to the creation of embedded, self-regulating safety cultures and practices, but they also create ambiguities of scope, structural uncouplings, and autonomy deficits. Responsibility for compliance and rule-following are distributed downward to the levels of the organization where knowledge and involvement are pooled and where implementation can be effectively owned (decisions should be made at the "lowest competent level"). But across all three of these headings (ambiguity, uncoupling, autonomy), the responsibility that middle-managers are given for the implementation of safety management is restricted by the constraints that organizational power structures introduce. Oversight methods such as layered systems of audit and monitoring, create conditions for ambiguity and uncoupling (between practice and *reported* practice) to exist, and contain responsibility for them at the operational level and in the hands of middle-managers [23]. And processes of

accountability-allocation locate responsibility for departures from policy and rules, as well as failures and deviations from safe practice, at lower levels of organizations, while the authority and autonomy to exercise responsibility effectively are retained at the top-tiers [7]. It is the failure of organizational power structures to integrate these levels that leads to middle-management rule deviation.

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Chapter 6
The Effects of Top Managers' Organizational Reliability Orientation

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Abstract The implicit theories that top managers hold about organizational reliability potentially exert strong effects on how frontline employees approach the task of managing reliability and, hence, on reliability-linked outcomes. Specifically, such implicit theories ("orientation" for short) can be thought of as varying along a continuum ranging from *modular* at one end to *systemic* at the other. A more modular orientation leads to a stronger organizational emphasis on strict compliance, whereas a more systemic orientation emphasizes local initiative by enabling employees to go "above and beyond" formal rules when appropriate. I describe the two ends of the continuum and their implications for organizational reliability. I then point out recent trends that warrant a shift toward a systemic orientation across industries and discuss some initial implications for research and practice.

Keywords Organizational reliability · Compliance · Resilience · Top management teams

6.1 Introduction

The escalating societal dependence on organizations for critical services and products brings into question, especially in the wake of major accidents, the dependability of organizations. As a result, organization capability to reliably operate risky technologies under challenging conditions remains a major topic for research, policy, and practice [1]. As used here, *organizational reliability* encompasses multiple distinct and related concepts such as performance consistency, service continuity, safety, recovery, and resilience [2]. It refers to the organization's ability to continuously provide a critical set of products or services of predefined quality without disruption by intentionally managing the risks to the safety of processes and people within and

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without the organization. In addition, it also refers to the organizational ability to respond to and recover and learn from adverse events [3].

Researchers from multiple disciplines continue to investigate the antecedents and consequences of organizational reliability. Given the intensely local nature of the activities that constitute reliability management, much of this research has understandably focused on the immediate or local context for hazardous operations. That is, most studies have tended to focus on the characteristics of technologies and of the people and teams that operate them. In doing so, however, a key aspect of the organizational context has received relatively less attention—top management teams (TMT) or the group of influential executives at the apex of an organization, i.e., the CEO and their direct reports. By widening the focus from individual leaders to the senior leadership group, this term captures the reality that top management is typically a shared activity [4].

The limited attention to the role of TMTs in enabling organizational reliability is surprising given that several organizational studies suggest that top management can exert strong effects on the choices and actions of frontline teams and employees [5], and, hence, organizational reliability. These effects come about by the choices of top management in setting strategic agenda that in effect conveys the ordering of organizational priorities including reliability management, allocating resources including attention, designing the formal organization and incentives, and enacting the organizational culture.

6.2 Method

Drawing on my research and consulting work around patient safety with top management teams in US hospitals over the past two decades [6], I propose that "implicit theories" that top managers hold about organizational reliability have a significant impact on how frontline employees approach the task of managing reliability and, hence, on reliability-linked outcomes. Specifically, I argue that such implicit theories ("orientation" for short) can be thought of as varying along a continuum ranging from *modular* at one end to *systemic* at the other. Further, a more modular orientation leads to a stronger organizational emphasis on strict compliance whereas a more systemic orientation emphasizes local initiative by enabling employees to go "above and beyond" formal rules when appropriate. I describe the two ends of the continuum and their implications for organizational reliability (Table 6.1). I then point out recent trends that warrant a shift toward a systemic orientation across industries and discuss some initial implications for research and practice. I offer these comments as speculative hypotheses to stimulate discussion at the workshop.

Table 6.1 Features of TMT orientation toward organizational reliability

Shared assumptions about…	Modular/Operational orientation	Systemic/Strategic orientation
Operations	Stable, unchanging, and uninterrupted	Dynamic, evolving, and disruption-prone
Work	Complex; rarely uncertain or ambiguous	Complex; frequently uncertain and ambiguous
Interdependence	Formal coordination is adequate	Informal collaboration is also necessary
Risk	Rules, incentives, and supervision are adequate	Improvisation is also necessary
Reliability in relation to other priorities	A standalone lower priority	An interconnected co-equal priority
Frontline rule-related actions	Reliability is the result of unvarying compliance	Reliability is the result of a mix of compliance and initiative

6.2.1 TMT Organizational Reliability Orientation

My core premise is that TMT's choices and actions profoundly shape the organizational pursuit of reliability in ways that are insufficiently understood and, therefore, warrant further research. In particular, top managers' shared orientation toward organizational reliability (i.e., their shared understandings or mental models about what is needed for an organization to be consistently reliable) can exert strong yet invisible effects on the rule-based actions of frontline employees. This orientation, which is typically implicit, often differs from what TMT might explicitly espouse. Speaking of the TMT in her hospital, a nurse told me, "I know the senior leaders genuinely care about patient safety. I just don't think they *get it* though". She elaborated, "they keep saying the right things like safety is everyone's responsibility. But everything they do when something goes wrong screams that they actually believe that it is the responsibility of a few people". Therefore, organizational reliability orientation is best inferred from TMT's observable patterns of behaviors, e.g., the metrics they attend to regularly and their response to adverse events.

6.2.2 Modular Orientation

The following are some of the key assumptions underlying what I call a modular (or subsystemic) TMT orientation toward organizational reliability. Examples in parentheses refer to corresponding observable TMT choices and actions as reported by lower-level employees.

- *Operations are highly stable and routinized* (e.g., emphasis on rule making and standardization; rules and process-related and outcome-related metrics reviewed by TMT rarely undergo revisions)
- *Work can be highly complex, but it is unlikely to be highly uncertain or highly ambiguous* (e.g., reliance on large set of very specific rules and SOPs to manage complexity; exceptions are treated either as a variation that can be costly or as a violation that can expose the organization to risk; employees infer this from how TMT asks only about how to prevent recurrence, and not about whether the exception was justified)
- *Interdependence can be adequately managed through formal coordination mechanisms such as schedules and protocols* (e.g., absence of any visible efforts to encourage collaboration)
- *Reliability is an individual responsibility* (e.g., reflexive TMT questions about "who is accountable?" whenever there is an adverse outcome that strongly suggest that they are looking for a few specific names)
- *Risks can be proactively managed through incentives and supervision* (e.g., linking extrinsic rewards to meeting "safety targets"; performance evaluations discuss instances of employee non-compliance with rules)
- *Growth, profits, and innovation represent more pressing priorities than organizational reliability* (e.g., responsibility for reliability-related outcomes such as safety, quality, or risk management are assigned to lower-ranked persons in the organizational chart; reliability-related metrics are monitored less frequently by TMT compared to financial metrics; less time is allocated to discussing reliability during TMT meetings).

6.2.3 Systemic Orientation

The following are some of the key assumptions underlying what I call a systemic TMT orientation toward organizational reliability:

- *Operations are dynamic, evolving, and subject to disruptions* (e.g., regular review and revisions to metrics that are reported to TMT, not infrequent changes to rules and SOPs)
- *Work is not only highly complex, but can occasionally also be highly uncertain and ambiguous* (e.g., exceptions are treated as inevitable features of the nature of work and used to revise rules and protocols including dropping some rules if necessary; TMT response starts with "why did the employee deviate from the rule?")
- *Managing interdependence requires both formal coordination mechanisms as well as informal collaboration* (e.g., TMT efforts to create psychologically safe environments to encourage information sharing; relying on incentives beyond extrinsic rewards to encourage employees go "above and beyond" the requirements of their formal roles and rules)

- *While many risks can be proactively managed, some risks will require improvisational response* (e.g., greater autonomy to frontline employees, reliance on guidelines rather than on overspecified rules, TMT praise for employee initiative that comes to their attention)
- *The pursuit of reliability co-occurs with the pursuit of other potentially conflicting organizational goals such as growth, profits, sustainability, and innovation, and with other organizational pressures such as speed, efficiency, and costs* (e.g., discussions about reliability-related issues rarely occurs in isolation nor limited only to people directly tasked with managing reliability; people at all levels discuss reliability in tandem with other objectives).

TMT orientation varies along this continuum ranging from modular to systemic. It potentially affects organizational design, performance measurement and incentives, and incident investigations in ways that can either widen or bridge the gap between how frontline employees experience work demands and how they can respond to such demands. For instance, a modular TMT orientation makes it more likely that the organizational design will tend toward the mechanistic (i.e., high formalization, standardization, and centralization), supervisors will emphasize rule-following, safety might more likely be relegated to the status of a lower-level operational concern that is monitored infrequently if at all by TMT. It is conceivable that in many settings such an orientation might not have any significant adverse effects on reliability. Indeed, in many settings a modular orientation can perhaps even enhance organizational reliability.

Several basic questions arise in the wake of this framing: Do these assumptions generally hold together as a coherent orientation as they do in our sample? How is the TMT location on this continuum related to outcomes linked to organizational reliability? What can account for why some TMTs are nearer one end of the continuum than the other? If a more systemic TMT orientation to organizational reliability is preferable as suggested by our qualitative work, how costly is it? Is TMT orientation outlined above related to the different context-specific safety models?

6.2.4 The Case for a Systemic Orientation

Based on data from a small sample of TMTs from a self-selected set of hospitals that espouse strong commitment to patient safety, I would expect a significant majority TMTs in US hospitals to cluster toward the modular end of the continuum. If that's the case, it suggests that most hospital TMTs overemphasize compliance and constrain local initiative even when such initiative does not violate any regulatory or evidence-based guidelines but is critical for reliability.

However, several recent trends call for an increasingly initiative-driven approach to organizational reliability, i.e., an urgent shift toward a more systemic TMT orientation. First, the growing turbulence and disruptions in the post-Covid world as evidenced by sudden changes in employee work expectations and turnover shows

few signs of abating or sparing any industry. Therefore, even industries that were operating in relatively stable task environments suddenly face the need to encourage their employees to adapt by improvising if necessary ("do more with less"). Second, public intolerance for organizational errors and lapses continues to intensify. Healthcare veterans talk about how simple non-harmful medication error that would have been dismissed as a normal part of delivering care even as recently as ten years ago is more likely to be viewed as unacceptable. In other words, the margin for error in shrinking. Third, the advent of social media has dramatically accelerated and amplified the costs of even small mishaps. As a result, even as the margin for error keeps shrinking, the potential costs of smaller errors keep rising.

Fourth, even as the above trends impose higher expectations about organizational reliability, organizations are being increasingly held to multiple standards rather than to a single metric such as earnings or stock value. Consider healthcare delivery. Effective care is defined as care that is at once safe, efficacious, efficient, equitable, timely, and patient-centered. The emergence of ESG is another example that now requires organizations to pursue multiple competing priorities while also operating reliably. In short, organizations are expected to become even more reliable even as they are evaluated on other priorities. Compliance-driven organizing is unlikely to meet these demands.

Finally, and especially in the US, there appears to be a rising chorus of calls for "organizational accountability" in the aftermath of major accidents. A particularly dramatic example was the deadly explosion of a gas pipeline operated by PG&E in San Bruno. NTSB's investigation concluded that this was "an organizational accident" thereby forcing the media and the courts to ponder about what it means to causally attribute an accident to an organization. In a subsequent unrelated court ruling involving a wildfire set off by faulty PG&E equipment, the company was held criminally negligible. Such rulings, at least in the USA, portend a quick shift to assigning primary agency to organizations rather than to its individual employees. A modular TMT orientation toward organizational reliability seems difficult to defend from a legal perspective.

Given the need for a shift in TMT orientation, it is perhaps useful to briefly consider what can account for prevalence of a modular orientation. As a business school professor who has taught MBA students and executives for over two decades, I would start with how managers are taught and trained especially in business schools. Simply put, management education is essentially silent about organizational reliability. The implicit assumption seems to be that understanding organizational reliability is not critical to becoming a business leader and that organizational reliability will be managed by "non-managerial" specialists. Similarly, academic courses on organizational design focus almost exclusively on designing for efficiency, innovation, and agility. Moreover, several courses in finance and economics routinely emphasize individual agency and the primacy of incentives, formal rules, and metrics for managing coordination and performance. As a result, holding individuals accountable for adverse outcomes is almost a reflexive response even when such actions are carried out in the context of interdependent teamwork.

Another reason could be that most TMTs remain psychologically distant from the operating core, the frontlines of organizational reliability [7]. Psychological distance includes temporal distance (*when* something happens), spatial distance (*where* it happens), social distance (to *whom* it happens), and hypothetical distance (whether it is *likely* to happen). High psychological distance can cause TMTs to view reliability in abstract terms rather than in concrete terms and in ways that reinforces a modular orientation. As a result, TMTs might pay attention to the details underlying organizational reliability only when things go wrong. In other words, TMTs with a modular orientation often think about organizational reliability only in response to things going seriously wrong and that too in the context of emotion-laden and lawyer-guided discussions about costs, risks, and accountability. Behaviors with respect to pre-existing rules become the basis for analysis and the response and the learning tend to reinforce the importance of compliance.

6.2.5 Toward a Systemic Orientation

Shifting TMTs toward a more systemic orientation presents challenges and opportunities for research and practice. How can we get TMTs to revise their assumptions about the nature, significance, and the practice of organizational reliability? Foundational to addressing this question is gaining a better understanding of the roles that TMTs in the enactment of organizational reliability. Although several studies have identified the importance of "top management support" and "top management commitment" for aiding the frontline staff, much remains unknown about the conditions under which some TMTs simultaneously promote compliance as well as initiative.

Equally, there is an urgent need to develop training programs for TMTs and their boards about enabling, enacting, and enhancing organizational reliability. Additionally, organizational reliability needs to be incorporated as an essential component of general management education. Another option, which we explored in one of our studies, is to periodically reduce the psychological distance of TMTs by creating opportunities for them to first-hand observe and perhaps even experience the challenges of managing organizational reliability. Finally, it is important to figure out ways to routinely link discussions of reliability to competing priorities especially costs. For example, in healthcare, discussions of quality and safety of care typically proceed without reference to costs, the reduction of which is right at the top of the agenda of most hospital TMTs. Efforts to reframe the discussions around the notion of value (outcome per dollar spent) accompanied by other enabling interventions (e.g., integrated organizational units, more relevant metrics) show some initial promise in helping providers to simultaneously improve quality (including patient safety) while also reducing costs. A key takeaway from these studies is that linking quality and costs can lead to a more flexible and collaborative approach to rule-following.

6.3 Conclusion

Top management teams exert important yet understudied impact on organizational reliability broadly defined. A particularly important avenue for research is examining the role of TMT orientation in positioning the pursuit of organizational reliability in reference other organizational priorities such as growth, innovation, sustainability, and profits. In other words, under what conditions does organizational reliability emerge as a strategic, not just an operational, priority?

Ethics Statement Informed consent was obtained from informants interviewed for this work, and their identity has been anonymized. The information reported is a result of interviews and observations carried out as part of a study approved by the Social Science IRB at Purdue University, USA (protocol #0606004052).

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Chapter 7
Interlocking Surprises: Their Nature, Implications, and Potential Responses

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Abstract Safety organizations need to manage their working conditions continuously and effectively while dealing with constant surprises [1]. This chapter calls attention to an increasingly prevalent phenomenon, which I term *interlocking surprises*. While not completely new, this phenomenon is not fully understood and carries significant implications for research and practice. In conceptualizing interlocking surprises—their nature, implications, and potential responses—my aim is rather simple. It is, to paraphrase social theorist Norbert Elias, to take some steps toward developing the conceptual models and overall vision by which we—academics and practitioners—can make comprehensible in thought what we experience in our everyday realities [2].

Keywords Surprises · Disruptive innovations · Ecology · Overlapping crises · Process ontology

7.1 The Nature of Interlocking Surprises

I originally coined the notion of interlocking surprises in 2018 to characterize several interaction patterns that I observed in my research on the turbulent smartphone industry around the 2007 introduction of the iPhone. Briefly, some actors in the industry experienced several consecutive and cumulative surprises, both internal and external to their organizations, some of which were responses to their own previous surprising moves. While I will refer to this business context on occasion, I found the following recent quotations particularly useful for introducing the topic to safety audience:

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J.-C. Le Coze and B. Journé (eds.), *Compliance and Initiative in the Production of Safety*, SpringerBriefs in Safety Management,
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1. "This is what living with climate change will look like: Not just an epic, Katrina- or Sandy-scale catastrophe every few years (though probably that, too), but a relentless grind of *overlapping disasters* [italicization my own], major and minor. The number of disasters that FEMA is handling is about twice what it was three years ago …." [3].
2. "The traditional disaster management cycle had a rhythm of prevent, prepare, respond, recover (known as PPRR), with breaks in between to rest and recuperate, but lately we've experienced a constant COVID event with an *overlay of flood and fire* [italicization my own] that is essentially merging" [4].
3. "*We have been confronted with a series of crises, one more grave than the other*," [italicization my own] President Macron said in a televised speech to the nation late last month. "The picture that I'm painting is one of the end of abundance," he added. "We have reached a tipping point." [5].

These diverse commentators—and others from business, government, and academia—call attention to emergent developments that they observed or experienced, as well as to the intersections of these developments. These developments involve unexpected elements and demonstrate parallels in accounts of discoveries and innovation, such as the emergence of ChatGPT [6]. For this reason, I refer to them through the more neutral term "surprises", as opposed to other related terms, such as crises or disruptions. Indicating gaps between expectations and reality, surprises occur mainly when the expected does not happen and the unexpected does instead [7]. Beyond being surprising, these developments often display other features, such as being complex and interlocking, evolving, recursive, multiplex, cumulative, and nested. I refer to them simply as "interlocking surprises", a term that seems to resonate with both academic and practitioner audiences and which I define below.

The concept of **interlocking surprises** refers to sudden, unexpected developments that are potentially interlinked in *space* (e.g., across several industries, nations, geographies, or spheres—such as political or economic), in *time* (e.g., one surprise overlays or leads to another, or to several), or in *scale* or level (e.g., a surprise external to an actor that leads to a surprising self-discovery, or a local surprise that constitutes a microcosm of a broader failure).

Consistent with contemporary views on ecological surprises [8], interlocking surprises describes and helps explain how surprises (and related notions, such as disruptions) evolve, circulate, and compound in an ecology of action. For instance, the March 2011 tsunami in Japan subsequently led to an earthquake, followed by a crisis at Japan's Fukushima nuclear power plant, and then to a subsequent cover-up of an alarming increase in local radiation levels so as to not interfere with the 2020 Tokyo Olympics. Similarly, the COVID-19 pandemic—which is still not fully behind us—involved multiple waves of infections, new variants emerging on a regular basis, successive lockdowns, growing civil unrest, and international tensions. When the tsunami happened, nobody predicted its potential downstream effects; similarly, when COVID-19 began to spread, its social and political consequences were largely unforeseen.

As these examples illustrate, interlocking surprises can vary in form and degree alike. We know relatively more about a single or "bounded" surprise affecting a focal organization, such as when an infrastructure company needs to combat a security breach. Once we move from this baseline example, we enter the realm of "interlocking surprises" in which there are few subcases about which we know less. A relatively known instance of this phenomenon involves a focal organization encountering several surprises simultaneously: A perfect storm (*looking at space*). Another case involves surprises affecting a focal organization when these evolve and are concatenated, cascading, or escalating (*looking at time*); or when an organization is both an instigator and recipient of surprise (*looking at scale*). While such developments are often causally related, our formulation extends to cases where they simply co-occur, yet are experienced as interlocked by the recipient system or organization.

Furthermore, each of the above cases can also involve multiple and potentially interconnected systems or organizations. Here, too, we know relatively more about how such networks may be affected by a relatively "bounded" development—a common cause of failure, such as a cyber-attack—but less on how they address interlocking surprises over time or scale. To be sure, these different forms of surprises, either bounded or interlocked, do not necessarily imply a particular degree of severity—a single "bounded" but extreme surprise or disruption, or a very rapid sequence of repeated "small" developments, may overwhelm a focal system; in contrast, multiple but mild overlapping surprises over time may not. Furthermore, interlocking surprises may cancel each other out rather than reinforce one another.

The ecological concept of interlocking surprise reflects a new *ontology* of surprise: It highlights surprise as indicative of a *process* rather than a discrete *episode*, and as a *relationship* embedded in complex networks of beliefs and practices as well as in feedback loops rather than a *linear* and atomistic or *isolated* event.

In terms of *process,* interlocking surprises often feature an event chain—i.e., a set of events that are temporally and causally connected. These events and developments may occur or incubate prior to the onset of the surprise and in its aftermath (e.g., grasping its significance and downstream effects and the possibility of an adaptive or morphing threat or opportunity), and subsume "perfect storms", or multilateral developments, as special cases. In contrast to viewing surprise as a reaction, where it is bound to a few seconds, viewing surprise as a development extends to a much longer period.[1]

The concept of *relationality* stresses surprise as a "moment" in ongoing interactions, as a circuit rather than a stimulus–response sequence, and as a struggle rather than a disruption.

Thus defined, the notion of interlocking surprises highlights a key dimension of turbulent environments related to but distinct from dimensions such as the speed and amplitude of change, uncertainty, and non-linearity. It differs from standard

[1] For many purposes—both analytical and practical—there are advantages to viewing surprise as a process or development. Noticing an unexpected event, understanding its potential significance, devising an effective response to it, and carrying it out—these phenomena do not occur at once. While they may overlap, each phase has its own duration and should be considered to be part of the same whole.

accounts of change as either being gradual or featuring a punctuated equilibrium: While it involves discontinuities, importantly, these are experienced as being overlaid rather than appearing episodically. As such, there is no stable or dull moment.

Interlocking surprises are a particularly timely concept. Surprises, shocks, unexpected strategic shifts, and disruptions can happen in relatively serene settings. However, they are more likely to happen as organizational environments are increasingly characterized by multilateral competition and conflict, complex yet fallible products and platforms (e.g., smart cities, the Internet of things, and autonomous cars), rapid-onset climatic events, digital convergence, and the blurring boundaries of industries and fields.

While these and other systemic features of contemporary environments are likely to normalize surprises, they also make it more likely that surprises will interlock with one another rather than occurring as localized, singular external events compressed in time. The growing interconnectedness within and between humans and devices, in addition to the tighter coupling of humans and their natural environment, will provide further opportunities for applying the notion of interlocking surprises as a descriptive term, an explanatory device, and a boundary object for communities of practice. Treating surprise as an isolated, linear phenomenon may no longer suffice.

Finally, salient developments, such as rapid-onset climate change and the COVID-19 pandemic, have sensitized us to the interlocking nature of surprises as well as to their potential to devastate existing systems, test their limits, and bring them to a halt. Often, these salient developments are viewed as root causes for subsequent interlaced developments. However, from a broader ecological perspective, this root cause attribution may not be as straightforward as it appears. For instance, as research has shown, the anthropogenic destruction of wildlife and natural ecologies for agricultural purposes can contribute both to climate change and—through their transmission by animals—to a faster spread of diseases and pandemics. Similarly, while they experience surprises and shocks, organizations such as nuclear plants and gas infrastructure entities may also act as agents or conduits of calamities to other affected parties.

7.2 Key Implications

Interlocking surprises heighten several distinctive and interrelated considerations beyond those imposed on organizations by simpler surprises:

1. **Operating at or Beyond Limits:** Any system, even a relatively robust one, has limits; when it experiences environmental variation outside its tolerance, it can become vulnerable or brittle [9]. Capacity is particularly stretched when surprises build on one another either spatially or sequentially, turning local crises into global ones. Extreme developments—and particularly the so-called "compound extremes"—are challenging, as systems are not designed to meet them; therefore, they may lead to a tipping point, a breakdown, or a painful restructuring.

2. **Complicated Resource Allocation:** A central challenge inherent to disaster recovery is the need to address short-term needs quickly, but with sufficient foresight to avoid creating new (or worsening existing) long-term vulnerabilities. Policies, rules, and models concerning a current salient threat or surprise may limit the allocation of resources needed for longer-term (and yet uncertain) challenges. Organizations often design reliable capabilities aimed at addressing a typical challenge, and these designs may lead them to view upcoming challenges as akin to the wars or issues they are accustomed to fight.[2] A myopic focus may also lead to under investment in longer-term strategic response capabilities (such as responding to the current energy crisis in ways that undermine investment in renewable energy). Furthermore, due to uncertainty, leaders face one of the toughest decisions any general has: when to deploy the reserves (assuming they exist).

   Politicians, too, must prioritize resource allocation across multiple systems. In addition to the known tradeoff between production goals and safety or maintenance goals, leaders may increasingly need to allocate even scarcer resources across multiple overburdened systems and to be able to better discern, in the context of widespread complexity, any potential errors of omission and commission.
3. **Strained Attention Allocation:** Attention is a scarce key resource that professionals and leaders alike need to allocate. Our mental models are accustomed to serial processing; however, multiple, simultaneous, or cumulative developments can lead to divided attention, attention deficits, and derivative blind spots, particularly since there is no central entity that can sense, address, and respond to them. Prioritizing, too, becomes more difficult when organizations face several intertwined surprises. Furthermore, managers often associate surprises with external events and developments. However, surprises also emerge within organizations due to factors such as complexity, underinvestment, skill decay, inadequate maintenance, and turnover; or—in the case of a network of organizations—because of fault lines between different parties. This added internal focus may further strain decision-makers' attention and resource allocation.
4. **Ineffective or Narrow Response Repertoires:** Due to uncertainty and ignorance, decision-makers may not be in the best position to allocate resources effectively. This deficiency may be exacerbated when surprises morph and adapt. Organizations may also lack the skills and capabilities needed to address new types of surprises (such as when cyber-attacks became prominent). Furthermore, when surprises and crises escalate and exhibit nonlinear, multiplicative dynamics rather than additive effects, there may be a tendency to underestimate the extent to which and speed with which the system needs to respond, and a potential for runaway or avalanche dynamics. Similarly, the way surprises are interlinked may not be fully understood, which can lead to unanticipated outcomes and overlooked side effects. When multiple disasters occur in quick succession, periods

[2] See, for instance, the tragic Germanwings Flight 9525 incident.

of response, recovery, and preparation for future risks may take longer than originally expected.

5. **Incomplete Learning Cycles:** When surprises and crises pile up, organizations and individuals do not have enough time to reflect and learn from their successes, failures, or near-failures. As a result, new rules and practices may be added ad hoc and patched without adequate testing of their relevance and effectiveness. Some lessons remain unheeded and are not fully absorbed.
6. **Shifts in Boundaries and Charters:** The potential blurring of challenges and surprises may require organizations to adjust previously stable interorganizational (as well as intra-organizational) boundaries and charters. For instance, a rescue organization designed for combating fires and flooding may need to reconsider divisional jurisdictions when these two types of disasters overlap. Moreover, intelligence services used to view terror attacks and enemy plans as their main charter; now, they understand the need to include phenomena such as the spread of famine and the climate crisis as important parts of their agendas. Similarly, several previously disconnected organizations may be required to coordinate their responses to tackle common disasters. Boundary issues also occur since instigators of surprise often target the interfaces between established jurisdictions. Furthermore, as they impinge on traditional specialties, boundary shifts also impinge on the safety function within organizations, requiring them to revise their charters.
7. **Resource Decay and Organizational Fatigue:** Accumulated stress leads to eroding organizational resilience and increased fragility. This erosion can manifest itself through fatigue, burnout, paralysis, despair, and the associated losses of trust, alertness, and mindful responses. Furthermore, redundancy measures which ordinarily help with recovery and facilitate flexible responses may dry up, leaving the focal organization exposed with fewer degrees of freedom, margins of error, and lines of action. When individuals do not see the light at the end of the tunnel, they feel less in control and can become cynical and demoralized. Consequently, organizations increasingly approach an upcoming surprise, crisis, or disruption with a deficit rather than a surplus of resources.

7.3 Potential Remedies

Received wisdom suggests that given economic, technological, and political factors, a foolproof and robust system is an idealized rather than a real possibility. While interlocking surprises do not lend themselves well to easy solutions, recognizing their nature and increasing awareness of the distinct challenges they present are important first steps.

Beyond this, one can consider two broad and complementary strategies for mitigating the potentially negative effects of interlocking surprises: (1) *building requisite variety* and (2) *employing smart solutions.* Each of these umbrella strategies—as well as the more detailed solutions they encompass—needs to be evaluated with caution:

One needs to specifically consider their feasibility, potential downsides, and the possibility of their interacting with other solutions.

7.3.1 Building Requisite Variety

In this first broad approach, the focal organization or system attempts to build in the requisite variety needed to address the unique challenges presented by interlocking surprises (in addition to those presented by "simpler" surprises).

1. **Anticipation, Mapping, Sensing:** Organizations and individuals can use tools such as system dynamics, event system models, dynamic simulations, and graph theory to form visual and even dynamic representations of how different surprises are linked across space, time, and scale. For instance, graph theoretical models may be used to distinguish between developments that affect other developments, that are affected by other developments, or both. Scenario construction expands managers' horizons from a linear "official future", which may fit recurrent or bounded surprises, to different alternative futures in which uncertainties and surprises are combined (e.g., both COVID-19 and terror attacks). This technique also turns attention to "wild cards" in the form of relatively unknown types of surprises. Scenario planning and other methods, such as pre mortem analysis, can then help identify the capabilities and responses needed to deal with these future contingencies and their differential proneness to failure. These anticipatory measures may then be reinforced in training programs and drills particularly designed to address interlocking surprises.

   Viewing surprises as interlocking also opens up the possibility that a focal firm might be able to better prepare itself by observing the responses of other actors affected by surprising developments either in adjacent settings or at an earlier time.

   Organizations may also use "issue management" systems that help them monitor newly unfolding developments in real time, categorize them, and prioritize them according to their immediacy, expected duration, and anticipated degree of severity. It may be particularly useful to consider the image of "living documents" that are continually revised and updated. This image, best exemplified in an online version of a news or media article that can be amended on an ongoing basis, may help promote dynamic monitoring and more flexible forms of agenda setting and resource allocation.
2. **Structural Solutions:** Interlocking surprises require better coordination within and across organizations, as well as the ability to use temporary organizing to flex boundaries quickly. Premised on overlap, some types of organizational arrangements—such as matrices, loose couplings, and heterarchy—may be considered as means for coping with the complexity associated with interlocking surprises. To better prepare for the unexpected, organizations need to cultivate solutions beyond a mere sense of paranoia. The latter can be institutionalized

in organizational mechanisms, such as red teams and other forms of organized contestation.

3. **Resources, Skills, and Capabilities:** Interlocking surprises require a broader menu of skills and capabilities. When these are not immediately available, they require the development of new ones, either internally or through alliances with other organizations. Organizations also need to be able to mobilize resources rapidly, allocate them across different time scales, and recombine and repurpose them. Furthermore, due to the cumulative nature of interlocking surprises, some resources and capabilities may atrophy only to be needed again at a later point in time. For this reason, organizations need to exercise caution when thinking of completely abandoning or outsourcing capabilities and relationships that they may need to reactivate in the future.
4. **Coupling the External Focus with an Internal One:** As much as they need to heed external developments, leaders and other members of a given organization also need to be attuned to internal developments, and particularly to more gradual, less obvious developments. In most cases, what will determine a system's success in coping with a situation is the interaction between external stressors and internal capabilities. Having an internal orientation requires an honest assessment of strengths and weaknesses—including current mental models and assumptions—and their potential resilience across different scenarios. Individuals and organizations are reluctant to admit to their internal failures and often resort to facades designed to impress or calm external audiences. Furthermore, organizations are often more motivated and better equipped to fight other organizations or to combat nature rather than confront their own "dark" sides or demons, such as those manifested in inertia, hubris, and stagnation. For these reasons, the qualifier of "honest" becomes even more important for an organization.

   Honest audits may be facilitated by incorporating an outside-in focus, which involves seeking the opinions of outsiders, such as "shortlists", as well as respecting whistleblowers. Such audits need to heed more than merely what is easily measured and quantified. Similarly, organizations may do well to examine the relevance of prior rules originally designed or adopted under different circumstances and challenges, and, in turn, to explore their potential side effects under a new contingency. A periodic "house cleaning" is required, too, as it helps verify rules' continued relevance under varied conditions. Overall, an internal orientation along the above lines may not be easy to implement; it may require a cultural change within an organization and a different balance between control and a learning orientation.

7.3.2 "Smart" Solutions

While they may sometimes also offer requisite variety, "smart" solutions tend to be synthetic and creative and thus often contain elements of "good" surprises. I will consider some relevant examples below:

1. **Robust Responses:** A robust strategy in the face of multiple interlinked developments and uncertainties enables a firm to do well in the context of different possible future scenarios. While it does not provide the best design to suit *all* circumstances, it provides improved solutions overall. In the literature on strategic responses to uncertainty, this orientation is also called "no regret" moves. Using such an approach, organizations may develop generalized capabilities and responses that may be deployed across more than one development or surprise.

   Beyond addressing variety, robust solutions may be able to address multiple temporalities. For instance, organizations may time their responses depending on the anticipated peak load in each development. Furthermore, solutions addressing the short term may also be effective in the longer term. Developed prior to the onset of COVID-19, Moderna's mRNA technology platform is designed to address other outbreaks and illnesses in the future. Emirates Airlines, too, has designed security checks with useful applications beyond the COVID-19 pandemic. Generalized solutions may not necessarily be technological; changes to organizational culture can be useful across several distinct challenges.

   At a broader level, and often depicted as contradictory, safety-related solutions and efficiency-oriented solutions may be regarded as complementary; for instance, when a business case can be given for a safety-enhancing solution.
2. **Breaking Affinities:** The human mind—as well as organizational belief systems—tends to associate certain means with certain outcomes, couple specific problems with specific solutions, and link known causes with known effects. Over time, these duplets coalesce into tightly coupled affinities and rigid configurations. The process of breaking existing affinities [10] is a powerful means for repurposing, recombining, and rearranging terms and practices. It involves loosening tight affinities, dissociating them from their familiar contexts and companions, and reaffiliating and reshuffling elements in new ways. While considered to be a broad process of discovery and creativity, this may be particularly helpful in dealing with interlocking surprises. For instance, organizations usually consider their missions and charters through the lens of their products and services. A productive alternative may focus on organizational resources and inputs instead. An energy company that has developed an internal high-speed communication network may view its business as encompassing communications, too. During the COVID-19 pandemic, non-traditional players such as Dyson and Ford developed pandemic-related solutions, making them new, unconventional players in healthcare. Such bricolage can extend to the individual level, recombining their specific skills, relationships, and the like.

   More broadly, breaking affinities supports the idea of considering conceptual (and practical) substitutes. For instance, as safety professionals well know, anticipation and resilience may partially substitute for one another, culture and values may provide partial substitutes to strategy, and trust, norms, and values may substitute for formal rules.
3. **Mitigating Surprises Through Innovation and Experimentation:** Innovation and surprises are close allies, both conceptually [11] and, as evidenced by their joint operation in cyber-organizations and at the Defense Advanced Research

Projects Agency (DARPA), practically. Considered a surprise from the perspective of the defender, the practice of using airplanes as weapons in the tragic events of 9/11 could be seen as an innovation by the attackers. Because of their capacity to probe the future, experimentation and innovation may be effective in anticipating surprises. This suggests that the difference between the originator of surprise and the organization experiencing it can be viewed as a "delayed discovery". Had the target of surprise been innovating effectively, they would have been less surprised and perhaps become the disruptor themselves.

In addition, while common forms of experimentation are not feasible in safety organizations, other types may be highly effective. For instance, organizations may practice "intelligent experimentation" [12]: This results from thoughtfully planned actions that have uncertain outcomes, are modest in scale, are executed and responded to with alacrity (eagerness), and take place in domains that are familiar enough to permit effective learning. The case of interlocking surprises may also highlight the need to design intelligent experiments with an eye to potential interactions and side effects.

7.4 Concluding Comments

While they may vary in their specific manifestations, interlocking surprises are here to stay. While on their face, dealing with them seems quite hopeless, this is not necessarily the case. A better understanding of the nature of interlocking surprises, their key implications, and potential responses thereto may thus provide useful stepping stones. Other, even more effective responses are likely to evolve from safety organizations and individuals themselves as they learn how to better cope with this more complex breed of surprises.

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Chapter 8
Resolving the Command–Adapt Paradox: Guided Adaptability to Cope with Complexity

David D. Woods

Abstract The Command–Adapt Paradox arises from the long-standing tension between two perspectives. The central theme of the centralized control perspective is "*plan and conform*". The central theme of the guided adaptability perspective is "*plan and revise*"—being poised to adapt. In the former perspective, operations are *pressured* to follow rules, procedures and automation with the expectation that success will follow as long as the sharp end personnel work-to-rule, work-to-role, and work-to-plan. The latter perspective recognizes that disrupting events will challenge plans-in-progress, requiring adaptations, reprioritization, and reconfiguration in order to meet key goals given the effects of disturbances and changes. The two perspectives appear to conflict; therefore, organizations must choose one or the other in safety management. Empirical studies, experience, and science all reveal that the paradox is only apparent: "good" systems embedded in the complexities of this universe need to plan *and* revise—to do both. The paradox dissolves, in part, when one realizes guided adaptability is a capability that builds on plans. The difficulty arises when organizations over-rely on plans. Over-reliance undermines adaptive capacity when beyond-plan challenges arise. Beyond-plan challenges occur regularly for complex systems. The catch is: pressure to comply focuses only on the first and degrades the second. The result is systems with excess brittleness that is evident in the recurring stream of economic and safety failures of complex systems embedded in turbulent worlds.

Keywords Complexity · Adaptation · Resilience · Safety management · Guided adaptability · Safety by compliance · Limits of plans human as source of resilience

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8.1 Introduction: Failure Is Due to Brittle Systems

Failure is due to *brittle* systems, not erratic components, subsystems, or human beings. Of course, such entities are limited due to constraints on resources, a world that continues to change and grow, and the necessity to navigate trade-offs between critical but conflicting purposes [1, 2]. But new science has emerged drawing on results from diverse fields all studying how human systems adapt to complexities. The new science highlights how real systems can build and sustain their adaptive capacities to overcome the risk of brittle collapse.

One classic finding is that increasing *pressure* for compliance with plans, standards, and procedures inevitably increases brittleness and degrades the ability of the system and organization to adapt to challenges ahead. This is a fundamental property of how the world we occupy functions and malfunctions as revealed empirically in studies, experientially in practice, and formally in proven science such as the Robust yet Fragile Theorem (e.g., [3]).

What is brittleness? Descriptively, brittleness is how rapidly a system's performance declines when it nears and reaches its boundary. Brittle systems experience rapid performance collapses, or failures, when events challenge system boundaries. Due to the universal constraints of (a) finite resources and (b) the inherent variability of its environment in a continuously changing world, each system has an envelope within which it is capable of *competent* performance. Because *competence envelopes* are bounded, a core question for all systems is—how does the system perform when events push it near or beyond the edge of its envelope? When a system is unable to "stretch" when challenges arise in the boundary regions—when they are slow and stale to adapt—the risk of brittle collapse rises [4]. With the right forms of adaptive capacity, systems have capabilities to *anticipate* bottlenecks ahead, to *synchronize* activities across roles and layers for mutual assistance as stress grows, and possess the *readiness-to-respond* to reconfigure and reprioritize activities to fit the challenges [5].

The risk of brittle collapse is evident all around us in today's worlds which operate at scale with extensive interdependencies across layers, roles, and organizations. The list of events is extensive and expands almost weekly (e.g., as this chapter was being written, the SpaceX Starship launch failure of April 20, 2023 is a vivid illustration of many dynamic patterns related to brittleness). The events are potentially "viability-crushing" for the organizations involved, whether the event in question leads to injuries/deaths as in the two Boeing 737 Max accidents in 2018/2019 (346 fatalities), or to sudden large financial losses such as the now classic example of the failure of the Knight Capital financial institution in 2012. Other examples include repeated IT infrastructure failures in multiple airlines leading to losses measured in hundreds of millions of US dollars, most recently Southwest Airlines' service meltdown during the Christmas holiday in 2022. A notable brittle collapse with both many deaths (estimates range from a minimum of about 120 to as many as 600) and large financial losses was the February 2021 collapse of the Texas energy system,

with losses spreading beyond Texas to ratepayers in other states not connected to the Texas grid (estimates of losses start at $200 billion).

8.2 The Command–Adapt Paradox

The Command–Adapt Paradox has persisted across time, societies, organizations, and industrial sectors. The paradox arises in the tension between two perspectives originating at different layers of a network organized to carry out valued, critical, and risky activities. One perspective is located at the upper echelons/layers of this network looking down toward sharp end layers where units-of-action confront the dynamics, uncertainty, and challenge of real operations.

With this perspective, the tendency is to adopt a *centralized* command orientation where the broader echelons/layers closely direct activities of the sharp end through plans that *specify* actions and contingencies in detail. On this side of the paradox, operations are *pressured* to follow rules, procedures and automation with the expectation that success will follow as long as the sharp end personnel work-to-rule, work-to-role, and work-to-plan. Challenges that disrupt plans-in-progress are handled by engaging roles at upper layers who revise plans to accommodate the disruptions and transmit the updates to the sharp end. Incidents and failures generally are diagnosed as failures of operational personnel to work-to-rule/role/plan which then leads to new pressures to conform. This is the systems *architecture* that underlies an emphasis on rule compliance in safety management.

The central theme of the centralized control perspective is "*plan and conform*". It assumes that challenges to plans can be (a) identified/modeled clearly so they can be handled with contingency plans, (b) are relatively infrequent, and (c) when challenges do go beyond the limits of plans, these develop clearly and slowly enough for upper echelons to devise/implement new plans.

The second perspective is located at the sharp end layers where units-of-action are looking, first, at the dynamics, uncertainties, and challenges they confront when trying to manage the complexities of real operations. In order to cope with or tame these complexities, sharp end roles, then, look around (horizontally) or upward (vertically) for support. The emphasis here is on adaptive capacity [6]:

> *Adaptive capacity* is a system's readiness or potential to change how a system currently works—its models, plans, processes, behaviors, relationships—to continue to fit changing situations, anomalies and surprises.

The concern is how to keep pace with changing situations to mitigate the risk of brittle collapse. The key is how do other roles, connected both horizontally and vertically, *support* sharp end roles under stress as challenges occur, tempo accelerates, and disruptions spread over lines of interdependencies? Rules, standards, plans function differently from this perspective. They serve as resources for action and as a baseline for adapting to achieve goals when events disrupt plans-in-progress. From this perspective, safety staff support sharp end roles by putting in place organizational

features that allow mutual assistance, or reciprocity, as situations deteriorate in the face of challenges [7]. In this perspective upper echelons guide adaptability at the sharp end to achieve mission goals despite goal conflicts, trade-offs, and uncertainty [8].

The central theme of the guided adaptability perspective is "*plan and revise*"—being poised to adapt. This perspective recognizes that disrupting events will challenge plans-in-progress, requiring adaptations, reprioritization, and reconfiguration in order to meet key goals given the effects of disturbances and changes. It is based on findings that (a) inevitably challenges will arise that surprise plans, (b) plans can never be complete and up to date, (c) surprises occur regularly that demand highly responsive interventions, and (d) surprises are handled by adaptive behavior of human roles [6, 9].

The two perspectives appear to conflict, which gives rise to an apparent paradox: organizations must choose one or the other perspective in safety management. Empirical studies, experience, and science all reveal that the paradox is only apparent: "good" systems embedded in this universe need to plan *and* revise—to do both. And the necessity of both is evident in the need to manage the risk of brittleness while coping with the side effects of growth and change.

The paradox dissolves, in part, when one realizes guided adaptability depends in part on plans. The difficulty arises when organizations over-rely on plans [7]. Over-reliance undermines adaptive capacity when beyond-plan challenges arise. Beyond-plan challenges occur regularly for complex systems. The catch is: pressure to comply focuses only on the first and degrades the second.

To do both, the fundamental surprise for organizations is:

- *first*, one has to build and sustain adaptive capacities, which takes resources; then,
- *second*, one develops the capability to guide deploying these capabilities *when* needed, as situations arise which demand movement beyond the baseline of planful, highly automated activities operating across roles, echelons, and scales [10].

8.3 Classic Findings on the Limits of Plans, Procedures, Automata

The classic findings had become clear by the mid-1980s despite having roots that stretch much further back.

8.3.1 Can Plans Completely Specify Actions?

The point of departure is the belief that plans, however embodied, are *nearly complete specifications of actions*. If plans can fully specify actions, or nearly so, then work-to-rule/role/plan is sufficient for productive and safe systems. Assuming this is possible leads to safety management by centralized command.

> Finding 1. The potential for surprise when plans are deployed is always higher than assumed or projected.
> Finding 2. Plans are underspecified and incomplete relative to the variability of the world [11]. This means gaps will arise that require local adaptations for systems to function smoothly [12].
> Finding 3. Plans inevitably become stale in the face of new information, new capabilities, new relationships, change, and growth.
> Finding 4. Plans have difficulty coping with changing tempos of operation at multiple parallel scales (even plans embodied in automation). Keeping pace with events invokes skills, forms of cognition, and coordinated activity over multiple roles that cannot be specified in procedures.

The potential for surprise is determined by the answer to the question: How will the *next* anomaly or event that a system experiences challenge predeveloped plans and algorithms? To assess how plans survive or fail to survive contact with events, one searches for the kinds of situations and factors that challenge the *competence envelope* for a field of practice [13, 14]. This finding dates at least to 1832 with Clausewitz's treatise "On War" which highlighted (a) the potential for surprise, (b) the role of *friction* in putting plans into action, (c) how plans become stale quickly, and (d) the necessity for organizing around guided adaptation. The lessons have been relearned repeatedly in the history of military operations; see the contrasting cases in Finkel's book "On Flexibility: Recovery from Technological and Doctrinal Surprise" (2011).

Generating and updating plans takes effort/time in the face of limited resources. The beyond-plan challenges drive up the tempo of operations so that there is more to monitor, more to do, more to analyze, and more to consider ahead. As surprises occur that challenge plans, assessing and revising plans/procedures takes time and resources. As a result, (a) plans will miss the potential for bottlenecks, overload, and oversubscription of key assets and contingency backups (this is the risk of saturation) and (b) plans will always tend to lag change in the real world. And modifying plans will lag the changes already underway. These are ubiquitous risks that demand investing in and sustaining adaptive capacities since all operations at all scales are limited by time—constraints on activities that play out over time and over multiple time scales (which really is all activities).

There is a third risk; ironically, it arises from organizational and technological efforts to expand capabilities—from "success" (see, for example, the rise of high-frequency trading in financial markets). Growth expands the network of interdependencies that accompany improved subcapabilities, productivity, and efficiencies.

As a result of the extensive interdependencies, challenge events arise from or expand over these lines of connection so that *hidden* interdependencies come to the fore. Hidden interdependencies are a potent source of saturation and lag as problems in one area push saturation to others, diagnostic work has to track *effects at a distance* from the originating disruption, and an expanding set of roles and players have to coordinate and synchronize their activities, often across organizational boundaries, to resolve losses of valued services [10, 29, 31]. This is seen vividly in the incidents where there is a loss of valued services that which arises from breakdowns in critical digital infrastructure [15, 16], since this resource underpins the growth of capabilities, productivity, profitability—and safety—in every sector.

Safety does not lie separate from the processes of growth and change. The efforts to improve capabilities, productivity, and efficiencies are intimately connected to safety, especially through the resulting complexities that arise. Handling threats to safety and threats to economic viability ultimately derive from the risk of brittleness, and the same adaptive capacities are needed to overcome both risks.

8.3.2 Rationalizations

The above factors and dynamics are particularly true for plans intended to support operations under degraded conditions—yet operation under degraded conditions occurs much more regularly than planners, technologists, and managers expect. When beyond-plan challenges occur, after-action reviews often find the contingency plans were disconnected from the real dilemmas and difficulties, providing little or no support. For examples, see studies of beyond-surge capacity events in emergency medicine [17].

When beyond-plan challenges are handled poorly with negative consequences, after-action reviews often focus on identifying a flaw in a subsystem, component or operator to repair. But all incidents that threaten failure will reveal component weaknesses. When an incident occurs, the limits of some components have to be part of the story (a) given the trade-offs that were necessary since resources are limited and goals conflict and (b) given that the system and its environment continue to change.

But just seeking component weaknesses narrows focus and blocks the ability to see emergent system properties and risks such as brittleness (see The Stella Report [15]). In complex worlds with extensive interdependencies, emergent system properties drive system behavior and performance. Architectures that sustain adaptive capacities produce systems that operate reliably, robustly, and resiliently as a dynamic whole as the systems and the world around it continue to change [16]. New science has shown how this can happen despite the fact that all systems are composed of individual components/subsystems that are highly constrained by tangible performance trade-offs in a changing open world [3, 18].

The usual response from organizations to these classic findings is simple: my world is stable and not like space operations, military operations, and emergency

or critical care medicine. In my world variability can be blocked or suppressed, minimizing the need for adaptation since work-to-plan/role/rule will reliably produce desired outcomes. This rationalization makes several assumptions that are erroneous everywhere given the complexities of the modern world:

- Believes surprises only occur rarely ("corner" cases), whereas actually, challenge events regularly occur at the boundaries of plans, automata, and procedures (the definition of surprise is events that break plans in smaller or larger ways).
- Believes it is easy to recognize conditions which would signal the need to modify plans and procedures; whereas, actually, this recognition is difficult and challenges arise from unexpected directions.
- Believes the time required to put modified plans into action is short (or shorter than the pace of change in the world), whereas actually, disruptions accelerate tempo increasing the risk of being slow to revise and stale (and disruptions increase pace, data overload, workload peaks/bottlenecks, cognitive load, and coordination demands).
- Believes interdependencies can be limited as new capabilities are deployed, and additional ones that arise can be identified and treated by expanding analysis and modeling efforts.
- Believes the effects of surprise can be compartmentalized, whereas actually, surprises compound and spread over the extensive interdependencies in all modern systems.

These beliefs are rarely true—and even if true for the moment, processes of change and growth will make them moot. Yet, these beliefs lead organizations to over-rely on compliance. In the aftermath of incidents and breakdowns, the assumptions lead to increased pressure for compliance rather than learning the importance of guided adaptability. Pressure for compliance undermines the adaptive capacities needed to mitigate risks that arise from brittleness.

Again, these are classic findings that have been rediscovered repeatedly through both experience and research from many scientists from many fields and perspectives (too many to reference all here).

8.4 Reconceptualization

The result of the classic findings was a conceptual reframing in four parts:

1. Plans are Resources for Action

   The finding that plans only function as *resources for action*—not specifications is generally traced to Suchman [11]. She highlights work that documents how plans can never be complete given the variability of the world. This is highlighted in definitions of skill: the ability to adapt behavior in changing circumstances to pursue goals despite trade-offs.

Plans and planning contribute to but cannot fully encompass the skills, forms of expertise, and coordinated activities needed for high performance given the characteristics of this world: dynamism, variability, messiness, change, growth, uncertainty, scale, extensive and hidden interdependencies.

2. Plans are Necessary to Recognize Anomalies

About the same time as Suchman, my work on how people diagnose and respond to surprise revealed the importance and difficulties of anomaly recognition. Recognizing the unexpected is hard [19, 31]. To see events and changes as *unexpected* requires a strong appreciation of what is typical, standard, or even "normally" abnormal (especially to see the absence of an expected change as an unexpected "event"). Seeing what doesn't fit your model of what has been going on, or what should be going on, or what usually happens is a form of insight (see Chap. 8 of Woods and Hollnagel [20] for a synthesis). This form of insight is built on the foundation of plans, procedures, standards that represents a plan-in-progress:

- how a plan has played out over *time* (how the progression fits the plan and plan's intent despite variability),
- how it is playing out now as *updates* occur in the form of incoming information as context changes,
- how to *look ahead* as context changes, as new events occur that block or facilitate progress, and as trade-offs arise.

3. Plans (and Automata) are Competent but Brittle

In the 1980s, there was a wave of hype over the potential for deploying advances in artificial intelligence (AI). Studies looking at *joint* systems of people and AI or operators and advanced automation revealed the fundamental brittleness of automata regardless of the underlying technology [13]. The finding actually dates back at least to 1950 in warnings from Norbert Wiener about the new technology for automation he was pioneering. Basically, the problem identified was the way the new capability was deployed produced *competent but brittle* systems.

Critically, the technology advance enabled new competencies, but developers failed to see its limits, how success would create new interdependencies at new scales, and how these follow-on changes would produce new forms of challenges and vulnerabilities to break down (the story has reappeared across multiple waves of new technologies, e.g., Woods [2]). The new capabilities could have been designed to support adaptive capacities that offset brittleness. However, those who developed and deployed the new capabilities discounted findings of brittleness with previous waves of technology, insisting that newer algorithms, in and of themselves, escaped risks of brittleness at their boundaries. They were incorrect. Risk of brittleness is universal. Ironically, studies of complex adaptive systems looked into biology and found biology abhors competent but brittle systems. Biology makes provisions for systems to sustain future adaptive capacity in the firm knowledge that the future will produce changes and stressors that threaten its viability despite past successes.

4. People (with the right help) Provide the Extra Adaptive Capacity to Mitigate Brittleness

   The initial work on resilience studied biological, ecological, human, and human–technology systems that are well adapted to flourish despite the risk of brittle collapse. These lines of inquiry shared a common starting point shifting the focus away from—"why did a failure occur?" Instead, the question posed was—"how do systems handle (or even flourish from) challenges to its basic competencies so that the organization can function in the face of changing sources, forms, and levels of stress?" The studies revealed adaptive capacity coming into action by looking at the interplay between the challenges that occurred and how people were able to handle the difficulties so that overt consequences were averted.

The studies used methods to deal with the consequences of the *Fluency Law*: "Well"-adapted activities occur with a facility that *hides* the difficulties resolved and the dilemmas balanced [20]. The results of these studies revealed the difficulties and dilemmas showing that (a) challenges occurred much more often than stakeholders realized, and (b) people in some roles were the critical source for resilient performance despite the stresses, risks, uncertainties, threat of overload, and bottlenecks (e.g., see studies of emergency medicine adapting to handle beyond-surge-capacity events successfully).

Synthesizing across these diverse lines of inquiry produced general lessons. Systems possess varieties of adaptive capacity which can be built, sustained, or degraded, and lost. Adaptive capacity is the potential for adjusting patterns of activity to handle future changes in the kinds of events, opportunities, and disruptions experienced; therefore, adaptive capacities exist before changes and disruptions call upon those capacities.

The studies reinforced and explained the previous findings about the limits of plans and automata. All systems are developed and operate with finite resources and live in a changing environment. As a result, plans, procedures, automation, agents, and roles are inherently limited and unable to completely cover the complexity of activities, events, and demands. All systems operate under pressures and in degraded modes [21]. As a result, all systems are subject to the risk of "brittle collapse", and *people* adapt, stretch, and extend operations to meet the inevitable challenges, pressures, trade-offs, resource scarcity, uncertainties, and surprises [12, 22, 23]. This is resilience-as-extensibility, and this capability is universally necessary for resilient performance [1].

These findings generalize across system scales. All adaptive systems possess this capacity to stretch or extend performance when events challenge their normal competence for handling situations through a variety of properties such as initiative, reciprocity, and others. Without this capability for extensibility, brittle collapse would occur much more often than it is observed [6]. Pressure for compliance undermines these properties and they trade-off with pressure for near-term efficiency gains [6].

Being poised to adapt, a system develops a readiness to revise how it currently works—its models, plans, processes, and behaviors [6]. Adaptation is not about always changing the plan, model, or previous approaches but about the potential to

modify plans to continue to fit changing situations. Building a system that is poised to adapt requires investment to build a readiness-to-revise and a readiness-to-respond to events and contexts that challenge the boundaries of normal work as specified in rules, policies, standard practices, and contingency plans. The readiness refers to the dynamic capacity to *reprioritize* over multiple interacting goals, and to *reconfigure* and resynchronize activities across roles and echelons.

Space mission control is the definitive exemplar for this capability, especially how space shuttle mission control developed its skill at handling anomalies, even as they expected that the next anomaly to be handled would not match any of the ones they had planned and practiced for [24]. Another highly productive natural laboratory for learning the basic patterns and laws of adaptation has been emergency and critical care medicine (e.g., [17, 25, 26]).

8.4.1 Plan and Revise: Guided Adaptability

How can organizations shift to function and operate in the mode of "plan and revise" versus "plan and conform?" Compliance cultures focus on how behavior doesn't fit plans. Under guided adaptability, organizations monitor how plans no longer fit the world the organization operates in because change continues.

Checking (and pressuring) behavior to fit plans makes a strong assumption: the plan is a good fit for the world the organization operates in. The new science shows that this assumption is *guaranteed* to be wrong in the future, regardless of how well the plan has guided performance in the past. The timing on this guarantee is linked to the pace of change within and around the organization and how those changes expand the tangle of interdependencies it exists within.

The first step forward toward guided adaptability is remarkably simple to state: adopt practices to recognize when events challenge the assumption that planful behavior fits the world. But an organization cannot begin to take this step as long as the organization, through the pressures it exerts on behavior, is committed to the assumption that problems arise from failures to work-to-plan/role/rule. Instead, the organization has to be able to ask and re-ask: Do our plans/competencies/automata still fit the world the organization operates in as change continues within and around us?

The irony is you can only monitor how well plans fit the world by understanding how people have to adapt to fill the gaps and holes that inevitably arise as variability in the world exceeds the capability of plans and the competencies built into any system [12]. Remember this is necessary because of the Fluency Law, but this law also makes it harder to carry out this monitoring in practice.

Being able to question the fit of plans to a changing world prepares an organization to be *poised to adapt* when the guarantee about the future comes to pass—plans will become *mis-fit* as change continues Actually, the goal is to see misfits before the evidence is definitive so that adaptation occurs before visible incidents threaten or accidents create costly brittle failures.

Monitoring how people adapt to make the system work does not constitute approval that these adaptations are the "best" given the trade-offs faced in different situations. What is "best" is itself a dynamic judgment that can and should change as challenges vary—reprioritization rebalances goals in the trade space to fit the situation. One of the long-noted problems with compliance pressure is that it drives adaptation underground in covert work systems at the sharp end because these adaptations are seen as deviations from plan [27] (Perry and Wears 2015). The covert adaptations may "work" to cope with complexities locally, but adjustment may have limited impact more broadly or represent steering too close to a different vulnerability in the trade-off space. Driving gap-bridging adaptations underground also makes it harder to recognize how plans do not fit the changing patterns of variability in the world. Thus, compliance pressure drives a "vicious" adaptive cycle blinding organizations to evidence that contradicts the assumption of high plan fitness until a major visible failure punctures their overconfidence [27], or to put it more colloquially, "everyone has a plan until they get punched in the mouth".

Once an organization is able to start to look at adaptations to bridge gaps, what do they look for? The second step toward guided adaptability is to learn and track over time how your system adapts. Recognizing what adaptations are going on allows one to see how your competencies/plans/automata are partial and incomplete for the worlds they operate in. Recognizing what adaptations are going on allows one to see the resources—physical, cognitive, collaborative, and others—that people draw on to produce resilient performances in the face of challenges small and large.

How can organizations monitor their adaptive capacities? First, the world is providing a steady stream of smaller and larger incidents that reveal the gaps as people adapt to fill them. The information is there for the taking! But only if one invests in building the ability to see the information flowing by. This process is the *Learning from Incidents* movement, or LFI, particularly active in critical software infrastructure.[1]

LFI *reframes* the standard perspective on what is an incident and what is important to learn from analysis and synthesis across sets of incidents (e.g., The Stella Report [15]). The standard view focuses on events with high severity and, for each, one at a time, uses one of a variety of methods to identify one or a couple of "causes" for remediation. Guided adaptability turns this around: Examine how incidents are handled so that severe consequences are mitigated or avoided. Study how people in various roles adapt to handle challenges so that you can extract patterns (a) about challenges that recur in general even though the specifics vary in individual events and (b) about the ways people work and coordinate to handle challenges. The combination will reveal the adaptive capacities needed for beyond-plan events and generate information about what supports and what hinders these capacities [29, 31].

This process is a way to put into action Hollnagel's call for studying what goes right instead of what goes wrong [30], which is at the heart of adopting the Safety II approach. But notice: Studying how plans fall short and how people adapt to cope with

[1] See, for example, the Stella Report [15], Cook and Long [28], and the learningfromincidents.io website.

complexity generates knowledge about all of the functions an organization carries out for all of the goals the organization pursues across all of the external relationships that affect these functions. It goes far beyond just attempting a couple of repairs after events occur that harm people. If safety is about "repair after something goes wrong", no organization can keep up with the pace of change, growth, and scale of modern systems and activities [32]. If safety is reframed as guided adaptability, then organizations become more dynamic and poised to adapt in a world with extensive and hidden interdependencies operating at new scales which reveal new forms of systemic vulnerabilities in our turbulent world.

How can organizations learn about the limits of their competencies/plans/automata? This form of learning has a built-in difficulty. After an incident highlights a limit to plans or automata, a common response from people in the organization can be paraphrased as follows:

> If we had understood that this limit to or gap in our plans was important, we would have modified the plans to mitigate the issue. But we did look for and found limits to our original plans, and we did build-in mechanisms we had reasons to believe would mitigate the limits we identified. Yes, there can be other issues, but we made reasonable choices about priorities given real and pressing trade-offs we had to navigate, the information we had and the perspectives on priorities.

At one level this is a legitimate position, but it misses the fundamental point about how to operate in changing seas of complexity revealed by the emergence of Resilience Engineering. However effective your organization has become, however you have developed and deployed new capabilities to grow, whatever your record of past improvement in reliability/productivity/efficiency, and whatever the promises of new capabilities to-be-deployed, the world, in the near future, will produce challenges that go beyond the competencies embodied and require adaptive capacity to stretch.

Actually, this guarantee about the future will occur *because* the developments and deployments are valuable, and other people in various roles/entities will adapt to take advantage of those valued services in ways that increase the interdependencies, scale, and complexity the organization faces (see the Law of Stretched Systems [20]). Will you be poised to adapt when what has worked well or better than before no longer fits the world you operate in? The question is poignant because the processes of change are omnipresent in the form of brittleness leading to breakdowns in unexpected areas from unexpected directions. This process is vivid all around us in the form of regional, national and global reverberations of external events—extreme weather, migrations, pandemics, conflicts, and in far reaching unexpected consequences from deploying new technological powers as people adapt the powers in hard to anticipate ways (e.g., ransomware, disinformation campaigns, drone warfare, AI chatbots).

If you can track how people adapt as the world finds the limits to your plans/competencies, then you can take on the mission of re-architecting your organization for guided adaptability. You will have to establish the continuous feedback/learning loop in order to *adapt how you adapt*. In other words, you will be able to steer or guide how more sharp end layers adapt to beyond-plan challenges on demand. You will empower and participate in dynamic reprioritization/sacrifices over conflicting goals and provision fluent reconfiguration of activities and relationships at or ahead of the

pace the world imposes. Even more importantly, you yourself at the upper echelons will demonstrate adaptive capacities—continuously reprioritizing and reconfiguring your organization in the larger network of interdependencies at new scales. Guided adaptability requires skillful, coordinated adaptive activities going on at multiple scales synchronized in parallel (as studies on how biological systems sustain future adaptive capacities have revealed).

The pragmatic guidance for architecting guided adaptability in workaday organizations is substantial, growing (e.g., [8] and the LFI movement in critical digital services), in part, because some of the techniques have been discovered before. Nevertheless, the methods are not as mature as past approaches to organization design. The issue isn't a shortage of pragmatics derived from the new science (the opportunities are widespread and are detailed in other papers). The difficulty is the ability of organizations to adapt to the new scale and new outside pressures as complexities grow with capabilities. For organizations to re-architect themselves is a high bar, even in times of regular and vivid turbulence. New architectures and transition paths are a topic for another day as we grow the body of knowledge about the basic rules that govern all adaptive systems in the human sphere.

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