

TRAINING FOR OPERATIONAL RESILIENCE CAPABILITIES

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Abstract

Based on the SAFERA¹ project *Training for Operational Resilience Capabilities (TORC)*, this paper describes a conceptual approach to operational and managerial training of resilience. The project aim is to develop a generic training program that constitutes generic *capabilities of resilient functioning in the context of a compliance-oriented safety regime*. Hence, TORC aims to develop an innovative training concept that enables organizations to appreciate, nurture and improve their inherent resilient and adaptive capacities, while being under the imperative of predominantly compliance-oriented safety regulations and standards. Training is addressed both at the operational and managerial level, including guidance for the calibration of such a training program in order to adapt it to the specific organizational context (history, aspiration, constraints, etc.). The overall initial framework and thinking (rationale, objectives, training philosophy etc.) as well as key concepts will be described, aiming for a parallel piloting activity in different industries and European countries. The methodological approach, including the concept and framework development based on the pilot projects, will be discussed, as well as the potential contribution to the understanding of Resilience Engineering.

1 INTRODUCTION

Successful adaptation to surprise and complexity is a situated practice that cannot be expected to recur in the exact same way. Resilience in organizations is an ability that benefits from training and rehearsal, but there is always a possibility of (adaptive) failure. Training should aim at strengthening capabilities that prepare individuals, teams and organizations to cope with challenges of variability in their environment and in their own functioning. Managerial mediation, intervention and intent are necessary to provide accountability, legitimacy and a defined space of manoeuvre. Managerial mediation of resilience is a capability that also benefit from, even require, training and a memory of successful practices.

2 THE TORC (TRAINING FOR OPERATIONAL RESILIENCE CAPABILITIES) PROJECT

2.1 Project background and structure

The TORC project is conducted by the SAFERA TORC Consortium of experts and practitioners and include collaboration with industrial partners in all the three countries (Norway, The Netherlands and France), including offshore petroleum exploration and production, railway operation and maintenance and air traffic

¹ <http://www.safera.industrialsafety-tp.org>

management. The specific *resilience in context* point of departure of TORC is thus appreciated both in terms of formal SAFERA evaluation of the TORC project proposal, as well as the broad industry participation.

2.2 Rationale and objectives

Resilient properties of an organization emerge during operations. Most likely, they are destined to unfold under the imperative of compliance to rules or procedures inherent to management systems of organizations with high risk operations. This may imply that also resilience training must be conducted and orchestrated with a defined relation to prevalent safety (that is, compliance-oriented) training, aiming for a delicate balance between prescribed behaviour and adaptive abilities needed to cope with the unexpected. Such a training constellation comprises opposites that may appear as counter-intuitive, but practical experience suggests that "rudimentary" resilience in terms of tacit or silent adaptive practice is easier to appreciate when resilience as a principle (denoted "Safety II" by Hollnagel et al. 2013) is contrasted with the prevalence of compliance-based safety thinking (denoted "Safety I" by Hollnagel et al. 2013). This applies not at least from a managerial point of view, implying a shift of attention to alternative modes of control in terms of articulating a space of manoeuvre to field staff, and thus also to increased reliance on and trust in their resilient capabilities. The appreciation of such "rudimentary" resilience, and the need to strengthen it, may be accentuated and made explicit by simulation or by reflection on action. This is seen as a very valuable point of departure when resilient properties needs to be further enhanced and developed, e.g. through training of key actors involved.

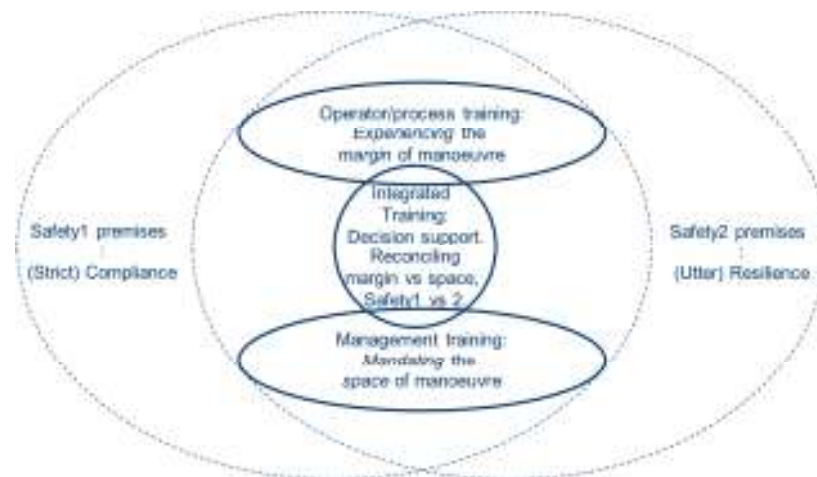


Figure 1. Three types of TORC training; distinctive but coherent. The precondition for using the TORC approach is that the "compliance base" (e.g., procedures) is well-defined, with a corresponding training activity in place. "Safety 1" corresponds to "Safety I", and "Safety 2" corresponds to "Safety II" in Hollnagel et al. (2013)

TORC discriminates between three types of training aimed at operational and managerial levels, and in their combination (Figure 1). The objectives are diverse, but mutually coherent in relation to the TORC rationale. In short, operational training invites the articulation of an *experienced and practiced margin* of manoeuvre, managerial training invites the articulation of a *mandated space* of manoeuvre that takes into account the possibility of adaptive failure, while integrated training aims for the harmonization and verification of the operational premises for these to meet in a manner in which resilient operations is aligned with the actual technical foundation, company mission and actual risk picture.

2.3 Aim and approach

TORC aims to develop an innovative training concept that enables organizations to appreciate, nurture and improve their inherent resilient and adaptive capacities, while being under the imperative of predominantly compliance-oriented safety regulations and standards. However, it is important to note that this is confined to the aspiration of enabling organizations to operate and *function more resiliently* under such circumstances, thus becoming able to cope with variability and surprise. Hence, the aim is *not* to transform them on the whole according to idealized forms of resilient systems, but to support them to develop resilient capabilities in a compliance-oriented context.

The approach is therefore to seek, identify and address actionable contexts in which organizations and their operations need to function resiliently in a compliance-oriented context. This is accomplished by interviewing

and assessing cases of participating organizations. Rooted in evaluations of real and anticipated cases, the TORC aim can thus be pursued and operationalized. For that purpose, the TORC concept is founded on the presumption that the 'Compliance versus Resilience' (CvR) ensemble of relations (Grøtan 2015) encircles or resonates sufficiently with such a pragmatic context. TORC is developed and piloted in collaboration with industrial organizations that recognize the CvR relations as a relevant pragmatic context, and that strive for balancing compliance driven management with an adaptive complement and strategy. This attempt signifies not only an appreciation of the problem of predominant belief in the powers of prediction and rulemaking as a way of controlling operations. It also recognizes the limits of a more overarching and institutionalized imperative of "ruling by rule" that manifests in a whole range of situations and contexts for an industrial system, e.g., in design, commissioning, operation and maintenance.

It is important to note that by implication from the overall TORC approach, the concept of CvR relations carries no claim of explaining the functioning of a resilient system as a whole in relation to concepts of, e.g., advanced control loops, complex adaptive systems or other functional abstractions derived from systems science. Nevertheless, this does not preclude that TORC can take advantage of, e.g., Resilience Engineering as a rich source of concepts and issues. The condition for doing this is however that the selected parts can be applied into the CvR context, and that they can be combined with recognized principles for training in general.

3 TORC FOUNDATIONS

3.1 Oppositions as (dialectical) drivers for progression

Bieder and Bourrier (2013) warn against "trapping safety into rules". The TORC point of departure is that resilience will unfold in a context of a "rational facade" urging for proof of control by relying on compliance to rules. This "facade" poses a shadow not only on the conditions *for functioning* resiliently, but also a potential shadow *hiding* the potential *merits* of resilient practice. Hence, resilience as an organizational property is positioned in the "contextual shadow of compliance" (Grøtan, 2013) where even its positive and needed contributions may remain unappreciated. This imperative of compliance is ubiquitous at every level, both inside and outside an organization seeking to develop its (rudimentary) resilience further.

Balancing the CvR relations is thus the primary underlying orientation for TORC, but this stance does however not purport to accommodate neither the full picture nor all nuances of safety in complex environments. It is first and foremost considered to be a useful position for the purpose establishing an actionable and pragmatic context for addressing and developing adaptive and resilient capacities under the imperative of compliance. It provides a scope of training in which a deliberate and dynamic reconciliation between adaptive coping practices and rule adherence/guidance is sought and practiced, including attention to dilemmas and preparation for the "unexpected", beyond anticipation.

The second underlying theoretical position is the distinction/opposition between "Work as Imagined" (WAI) and "Work as Done" (WAD). Also this opposition rests on an underlying asymmetry with respect to status and impact within the organization; WAD is primarily associated with the realm of the operational, while WAI is primarily associated with the realms of design, engineering and management paradigms. A potential imbalance in this relation, e.g. that WAI by management and rule makers is predominantly and ingenuously compliance-oriented, while WAD is resilience-oriented but may lack managerial appreciation and attention to what is actually happening, is only one example of what may be detrimental for the attempt to benefit from the potential of resilience capabilities when adaptability in operations is needed to perform a task or mission.

The very foundation for the TORC approach is thus that resilient functioning can be gradually built by means of reconciling those two perspectives of opposing principles in a continuous and vigilant manner, however without insisting on permanent or persistent alignment. That is, the TORC approach is founded on the presumption that the appreciation of the inherent dialectics embedded in the two opposites may be a key driver for being able to keep pace with the evolving challenges posed by complexity and emergence in high-risk systems. On these premises, the TORC training will be designed to enable field staff and management to deploy resilient capabilities when needed.

3.2 Aspiration levels for expression of resilient functioning

Resilient behaviour can be associated with a repertoire of action. This is regarded as instrumental in order to train and develop for capabilities of resilient functioning in a gradual, stepwise and accumulative way. Available conceptualizations (e.g., Woods 2014/2015, Longstaff et al. 2013) are however regarded as too specific and comprehensive to be positioned as fully normative in the specific CvR/TORC context. However,

they can be mobilized and offered as a theoretical inventory further down the road of a TORC training process, e.g. for the purpose of elaborating and deepening the pragmatic context as (TORC) training creates higher awareness and maturity, allowing companies and trainees to further elaborate the identification of routines, rules or knowledge based actions as the point of departure for resilient action. A TORC specific set of levels/grades will be used to signify a progression of resilient functioning (*in the context of compliance*). These may assist in setting the levels of, e.g., decision support needed for allowing additional space of maneuver for adaptive alternatives needed to cope with unforeseen situations. The TORC levels are as follows:

- R1.** *Defend* normalcy (preferred mode of operation)
- R2.** *Build* robustness to anticipated disturbance
- R3.** *Stretch* and rebound in an (isolated) surprising situation/episode
- R4.** *Sustain* resilient functioning over time.

Hence, aspirations to fully exploit the resilience potential of an organization range from R1 to R4. The scale thus commence (R1) from a comparatively simple notion of a well-defined and confined response based on a specific protocol. At the other end, resilient functioning may take the form of a more boundless intra- or inter-organizational mobilization; as an ultimately emergent response to a novel challenge or demand.

3.3 Bringing the resilient "emerging fresh produce" under managerial accountability

Resilient functioning (and even "resilience") may be seen as an "emerging fresh produce" which must be maintained, refreshed, reinforced and renewed. Training and rehearsal is an essential part of this, including feedback of experience, e.g. by after action review of resilient operations. This makes tacit behavior explicit and identifies relevant findings that need to be memorized and transferred to the organization's management, in order to improve or expand resilient capabilities. TORC aims to enable and facilitate a systematic effort of training in order to bring forward, recognize, label, nurture, develop and bring resilience under managerial influence, control and accountability, in a stepwise and measuredly balanced way. The intended effect is to facilitate a process by which resilient functioning as an organizational property, despite its inevitable "bottom-up" character, is appreciated, explicated and brought out of the "contextual shadow" of compliance, and also brought under a measured degree of managerial intent, supervision and accountability.

3.4 Extended focus; CvR reconciliations

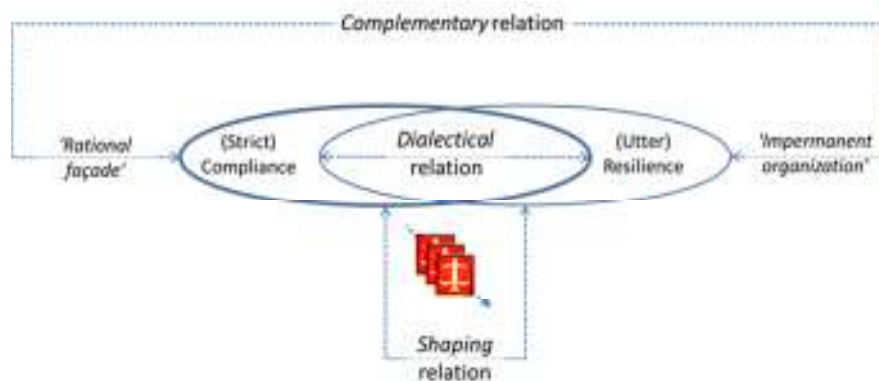


Figure 2. The CvR complementary, dialectical and shaping relations (Grøtan 2015)

With resilience positioned also in a *shaping* relation with compliance (Figure 2), the rationale for TORC is not confined to resilient functioning in the strictest sense. TORC also aims at being a vehicle for a productive co-creation of functional and effective rules (that is, compliance) and trustworthy and reliable adaptive capacities (that is, resilience), in conjunction. CvR reconciliation thus also implies an act of mutually measured CvR calibrations, aiming for increased resilience, complementing optimization of rule effectiveness and efficiency. While the "rational facade" tend to rest on a machine metaphor (Morgan, 2006) for the stable and enduring organization, the resilient contribution rests on a more organic and adaptive organizational metaphoric, ultimately pointing towards "organized impermanence" as described by Weick (2009).

3.5 The presumed non-linearity of resilient functioning

The TORC aspiration scale (R1-R4) is as non-linear as the more precise definitions it is inspired by. The very

character of the challenge encountered and resolved will change along the progression. Hence, also the characteristic of the stepwise resilience capability achieved by an organization may have to be revised in a longer perspective. Some key implications can be envisaged through the Law of Stretched Systems (Woods, 2014), by seeing consecutive episodes of resilient practices and an increased set of capabilities and real adaptations as a manifestation not solely of increased control, but also of shifting boundaries of complexity, and potential new origins of future surprises.

TORC training progression will nevertheless imply a premise of a dynamically changing orientation underlying the resilient functioning, commencing with explication of the adaptive practices that are associated (e.g.) with rudimentary resilience, proceeding with the successive needs for interpretation and then reduction of equivocality by means of sensemaking (Brown et al. 2015), and ultimately ending up in a situation of stability-focused intervention in terms of sheer improvisation; to act, sense and then respond further.

3.6 Training and learning

The TORC approach discriminates between three types of learning and reflection.

- Rule-centric learning: translating adaptive experiences into rules, procedures or protocols that enhance the chances of coping with similar events at a future occasion
- Adaptation-centric learning: preserving key features of adaptive experiences in ways that enhance the chances of success at a future surprise.
- Reconciliation-centric learning: improving the understanding of the CvR balance, and learning to identify reconciliations that provide a good climate for responsible trade-offs implying, e.g., a decision support framework and available resources to be mandated to respond in a resilient way.

Narratives are seen as important as containers of experiences. They may be distilled into rule-centric or adaptation-centric aspects, but they are not at least potentially useful for representing the combined and reconciled, including the managerial influence and facilitation. Facilitating reflection on action and preservation of results in repositories of experience and evaluations of effective resilient operations, is therefore an important part of intra- as well as inter-organizational utilization of the TORC approach.

3.7 Key issues for a TORC-based training program

Given that the "strict compliance" is recognized as a management paradigm denying the pragmatic context of everyday operations, operational experience must be brought to the fore to understand, legitimate and appreciate rudimentary resilience, which subsequently may be characterized/assessed along the R1-R4 scale. From then, improved resilient functioning (R1-R4) can be gradually introduced in the context of procedural training. During training, changing orientations (explication, interpretation, sensemaking and communication) will be encountered, but also a changing imperative ranging between, e.g., (a) the rule-centric reconciliation: how does resilience support compliance? and (b) the adaptation- centric reconciliation: how do procedures provide a resource for resilience?

This implies that TORC aims both at preparing for resilient dynamics in practice but also at reflection on action, explicating experience of coping with challenges by adaptive behavior. The knowledge elicited gives input to the resilience memory or repository being used for further developing the organizations performance, e.g. for training, changes in rule making and opening up spaces of maneuver by changing strategies to benefit from improved resilience capabilities.

4 STRUCTURING A TORC TRAINING PROGRAM

4.1 Underlying structure aiming for reuse, sharing and mutual development

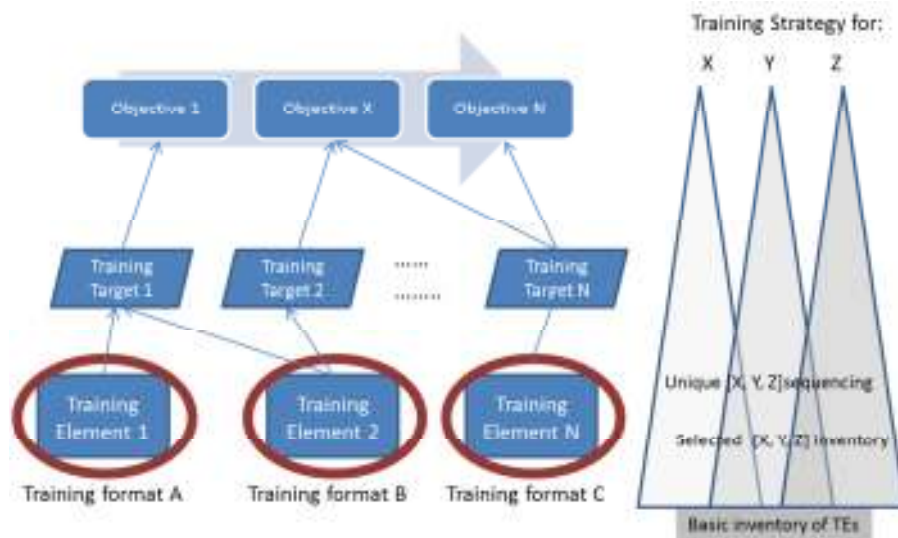


Figure 3. TORC training structure. Training Objectives, Targets, Elements, Formats and Strategies". Strategies X, Y, Z also signifies potential reuse across different industries

The TORC project will structure the activities and document the results according to the structure in Figure 3. The (generic) Training Targets (TT) are operationalizations of the TORC rationale and objectives for practical training purposes. A Training Element (TE) is a unit of distinct training aiming at one or more TTs. A Training Format (TF) is a specific way of conducting a TE (e.g. by off-line training, on the job, gaming etc). Training Elements chosen may be aimed at sensemaking, organizing decision support, team communication, deployment of resources (etc). Training targets of TORC are aimed at training both sharp end (field staff) and blunt end (management), separately and together.

Specific Training Elements (TE) and Training Formats (TF) constitute generic entities for implementing specific TTs in a manner that can be re-used across companies. A Training Strategy (TS) is a compilation of TEs (and TFs) that is arranged and conducted in a training design for the purpose of a specific organization, its needs and preconditions.

Hence, connected Training Strategies (TS) can be built from common objectives, shared TTs and generic TEs/TFs, based on a basic/minimum TE inventory. The TORC pilots may thus be seen also as TS pilots, building on a shared repository of TT, TE and TF being aimed at strengthening particular capabilities sought by participating companies. A guideline will be developed on how to make a subset of these objectives, TT and TE/TF as a part of the "priming" for a TORC training program design. A shared repository of generic TEs will also be proposed. However, the TORC structure is designed for the purpose of being used also after the TORC project and will be published, inter alia, by FonCSI.

The TORC project will also seek to tailor this generic structure to more specific contexts in terms of (1) normal operation, (2) emergency training and (3) management of unexpected situations.

3 RELEVANCE FOR MANAGING RESILIENCE

The relevance for managing resilience is constituted by the description of a distinct and grounded managerial position related to the aspiration of "control" over resilience in the pragmatic context of the "rational facade", both by operations at the sharp end and management at the blunt end. Although the CvR and TORC approach clearly does not claim to be "true" for the purpose of Resilience Engineering in general, the offering of a CvR-based management training program on TORC capabilities, in conjunction with operational training, is considered an important contribution for learning to be adaptable and proactive in an unpredictable world.

4 CONCLUSION

TORC addresses managerial practices and training in conjunction with operational training, emphasizing that this should be conducted in an organizationally coherent manner and being adaptable to local context. The

TORC training approach to resilient capabilities is thus expected to be relevant and applicable for a wide range of organizations as well as researchers that are occupied with reinforcing, creating and sustaining resilient functioning. The training pilots will take place in concurrent company developments, and will seek to explicate a resilient experience repository, supported by experience feedback and evaluations for further progress in resilience capabilities. The TORC project transfers practical experience and knowledge provided by a cooperation of research institutes with participating companies in the domains of off/on shore oil drilling, a high speed infrastructure provider and a railway contractor.

The TORC approach is meant to be supportive of Resilience Engineering² in a "compliance context" (Grøtan 2015), with a deepened association with the social sciences. In the latter sense, TORC resonates not only with Giddens' (1987) "double hermeneutic" position from the more distant realm of the social sciences, but also - more importantly - with renowned scholars in the field of safety science, e.g. Weick (2009) and Perin (2006).

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² 'the scientific discipline that focuses on developing the principles and practices that are necessary to enable systems to function in a resilient manner' (Hollnagel, 2014, p.183)