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Mindfulness and the Psychodynamics in High-Reliability-Organizations – Critical-psychological Considerations for a Research on High-Tech Work

Abstract:
High reliability can be seen as a quality of collective and collaborative work activities which ensure that damages and disasters are avoided. Especially dealing with advanced technologies – like infrastructures of energy or medical supply or information processing – require high reliability since damage can be extensive. According to research conducted by Karl Weick and Kathleen Sutcliffe, this particular quality of 'high reliability' at work emerges from collaborative activities and dynamics in teams. It is called 'mindfulness' which indicates that workers are prepared to notice relevant changes in complex processes and to anticipate risk that will need intervention. However, explanations of mindfulness often refer to the individual mind only. The teams' capacity to collaborate intellectually remains the question. The theoretical problem consists in determining the relationship between the organizational and the individual plane of development. Therefore, a model to understand the psychodynamics of mindfulness in cooperation is presented and explained in view of the scientification of work. Against this background, societal problems of collaboration within competitive occupational systems or alienated forms of work are revisited.

Key words: Mindfulness, high reliability organizations, cooperative competence, scientification of work, action research, activity theory

1. Introduction: Mindfulness as a topic of Critical Psychology

High reliability can be seen as a particular quality of collective and collaborative work activities which ensure that damages and disasters are avoided. It is especially necessary in using advanced technologies for energy, medical supply or digital infrastructures. According to research conducted by Karl Weick and Kathleen Sutcliffe (2010), this quality of high reliability at work can be called 'mindfulness'. That implies that mindfulness is interpreted as an organizational feature and indicates that workers are prepared to notice relevant changes and risks in complex processes so that intervention in a timely manner is possible.

However, explanations of *mind* as well as *mindfulness* often refer to the individual mind only. Weick and Sutcliffe (2006, p. 515) citing the '*Dictionary of Psychology*' (Reber 1995), state that the mind stands for a 'totality of hypothesized mental processes' to which psychological studies ascribe 'explanatory power' regarding behaviour, or approaches seek to study 'a collection of processes' such as perceptions and cognitions which altogether would 'constitute mind'. Mindfulness, originally a topic of Buddhist religion, is then defined as the meditative experience of individuals in relation to their mind as something impermanent, to an 'impermanence of the activity of the mind itself', so that an 'actual experiential sense of no one home […] called selflessness or egolessness' is acknowledged (Weick & Sutcliffe 2006, p. 514). Both concepts, mind and mindfulness, are thus phenomena constructed from an individual-psychological perspective.

It is therefore remarkable that Weick and Sutcliffe (2006, p. 515) integrate these concepts into their organizational studies. To do so, they need to translate the concepts from an individual

to an organizational plane of theorizing. This can be observed in the following considerations: "If *mind* in the broadest sense is about a totality or a collection of processes, then mindfulness is about 'ways in which these diverse processes interrelate' (Weick et al., 1999, p. 88)." (Weick & Sutcliffe, 2006, p. 515) Thus, Weick and Sutcliffe invoke "interrelation" phenomena of the individual mind to enacted features of an organization. More precisely, they pay attention to

- how mindfulness is 'grounded in distinction making, conceptualizing, and refinement of concepts' (Weick and Sutcliffe, 2006, p. 516),
- how 'a rich awareness of discriminatory details is generated by organizational processes' (Weick & Sutcliffe, 2006, p. 516) and, finally,
- on how collectively generated 'patterns of interrelation among processes of perception and cognition "induce […] a capacity for action" (Weick et al., 1999, p. 88)' (Weick & Sutcliffe 2006, p. 515).

Like this, the authors also invoke a parallel between that meditative experience of mind's impermanence and organizing, as also the latter would be 'about impermanent special cases, impermanent fitting, and impermanent repertoires of actions' (Weick and Sutcliffe, 2006, , p. 514). They summarize five interrelating aspects of high reliability organizations to constitute mindfulness:

[T]hese organizations spend (a) more time examining failure as a window on the health of the system, (b) more time resisting the urge to simplify assumptions about the world, (c) more time observing operations and their effects, (d) more time developing resilience to manage unexpected events, and (e) more time locating local expertise and creating a climate of deference to those experts. These capabilities have been labelled mindful organizing (Weick and Sutcliffe 2001). (Weick and Sutcliffe 2006, p. 515-16)

Although this summary of enacted features of high reliability organizations is quite illuminating, the critical question must be raised whether the authors switch from psychological to organizational qualities without clarifying the relationship between the individual and the social level. Their argument assumes qualitative changes induced by individuals' mindfulness to the organizational level, yet leaves the question unanswered, whether effects are unidirectional or whether effects from the latter to the former must also be considered, and if yes, in what ways.

By referring to Lev Vygotsky's framework, these questions can be sharpened. What is important is a proper understanding of human capacities that does not imply an individual vs. society dichotomy. Rather, the entire "human development [is] interpreted as a process of enculturation and humanization, in which biological and cultural lines of development [are] interrelated through a co-evolution of the societal basis as an 'environment', on the one hand, and the individual development in different forms of social agency and activity, on the other" (Langemeyer & Roth, 2006, p. 25). Consequently, cooperation is not a special case of human activity. The production of the life of humans must be seen as social and cooperative from the beginning. However, historical developments of bourgeois society have generated forms of private individualism and atomism so that cooperation appears more or less as a particularity. The atomized individual though and its individualized and egoistic stance are mistaken as something 'naturally' or 'generally' given, as a phenomenon that would not need further explanation nor critical reflection. Theoretically, this reduction is reproduced by methodological individualism (cf. Duguid, 2005) and haunts a number of concepts in psychology and sociology (cf. Holzkamp, 2013).

Against this tendency to naturalize forms of bourgeois and capitalist relations, the issue of mindfulness shall be revisited. Weick and Sutcliffe describe by 'mindfulness' a certain cooperative capacity to act. But not only individual behaviour can serve as an explanation if we consider the societal level as influential to any concrete form of activity.

Holzkamp's (2013, p. 20-21) concept of 'generalized agency' (sometimes translated as 'generalized capacity to act'), for example, indicates analytically emancipatory developments in both, the individual as well as the societal, direction (cf. Langemeyer, 2017a). This is explained as follows: Holzkamp assumes two extremes to be discerned through analysis in every practice, forms of restrained and restricted agency on the one hand, and generalized agency on the other. Restricted capacity to act refers to "human suffering or, generally, any injury, including anxiety," which contributes to the "quality of being exposed to and dependent upon other-directed circumstances, dissociated from possibilities of controlling essential, long-term conditions, i.e. constraints on possibilities to act" (Holzkamp, 2013, p. 20). In contradistinction, the 'generalized capacity to act' highlights that someone "by attempting to obtain some discretion to act through participating in power and utilizing the allowed leeway," he or she does not "concurrently confirm and reinforce the conditions of one's own dependency" (p. 24). Rather, generalized capacity to act implies "real improvement in the subjective quality of my life" and "is synonymous with enhanced influence over my objective life conditions – that is, with my opportunities for forming alliances, i.e. uniting with others" (p. 21).

These considerations have obviously no direct correspondence with Weick and Sutcliffe (2006). Nevertheless, with the topic of organizational mindfulness some cognate concerns of Critical Psychology are addressed, especially, regarding the potential of overcoming the restraints of individual sensual perception and individualized capacity to act and to think by collective forms of knowing and problem-solving. Following this track of commonalities between mindful organizing and developing 'generalized agency', several new questions can be raised:
1. In what ways is that particular collaborative capacity to act of teams ensuring high reliability interdependent or even identical with emancipatory forms of agency? In other words, in what ways is this capacity to act related to or even grounded in societal action possibilities, which do not empower the actor(s) at the expense of the other's freedom and autonomy but in consonance with it?
2. In relation to the nature of *intellectual* cooperation, is organizational 'mindfulness' more than the sum of inner states of team members? In other words, how can the level of the organizational development and the level of the individual development be conceptualized as interdependent?

Weick and Sutcliffe's insights are thus not rejected. However, further theorizing is required with regard to (a) the psychodynamics of mindfulness dependent on societal context and (b) to collective forms of knowing. The problem that the theory of mindful organizing falls short of conceptualizing the organizational plane of knowing, the 'scientification' approach is presented (cf. Langemeyer, 2015a). Here, 'Scientification' refers to both, a change in the societal nature of work as well as a change in the workers' capacity to act. But before these theoretical issues are addressed in the next section, concrete examples of mindless and mindful organizing are described and discussed.

2. Critical incidents

On March 11, 2011, when the nuclear reactor Daiichi in Fukushima was damaged, not only forces of nature were taking effect. As one can learn from the protocols, the technically recorded data and the reports by the operational force, serious errors were made by the team of technicians in the control room. According to an analysis by Steve Burns, the core meltdown in the reactor block 3 could have been averted. To corroborate this thesis, Burns re-enacted in the documentary *'Chronic of a disaster'* by means of a computer simulation how a crisis developed among the specialists. The following insights are given: After the earthquake the electricity broke down but was restored automatically by the emergency system. For a moment, the situation in the nuclear reactor seemed under control. However, as the tsunami followed, the challenge was more significant than the team had expected. Because of the intrusion of the water mass, electricity provided by the emergency system was suspended for several hours: a period in which the team had to take important measures.

At this moment, the technicians searched for an applicable plan. It turned out to be a severe mistake that the team did not know about the fact that, in case of an electrical breakdown, the condensers of the emergency system were automatically shut down and consequently the valves of the condensers had to be opened manually. If someone had opened them immediately, cooling water would have floated to the rods. However, only two hours after the accident, operatives were sent out to check the cooling system. When they measured radioactivity, they cancelled the operation to avoid damage to their health. Thus, the approaching catastrophe was unnoticeable for a longer period. What experts at this instance assumed to be implausible, occurred already during the night: the core meltdown.

The analysis highlights how several circumstances aggravated the disorientation of the team. Hence, displays switched off after the tsunami, the technicians had no idea how fast the level of cooling water was decreasing. When they finally realised that the valves had to be opened manually, the cooling water arrived at overheated rods so that water steam returned to the condensers of the emergency system.

Fig. 1 – Screenshot from the documentary "Chronic of a disaster" by Steve Burns

Fig. 2 - – Screenshot from the documentary "Chronic of a disaster" by Steve Burns

The sensing element responded to pressure only and therefore displayed the level of cooling water incorrectly. Due to the steam, the needle signalled an increasing level although the cooling water was in fact missing. Despite recognising the escaping steam at the condensers, no one among the team was surprised about rising measuring values.

This historical disaster thus gives us an account of how security and reliability of a highly sophisticated technological system depended on the collaboration of a team. Here, mistakes and a scattered mind had tremendous effects.

The likeliness of disastrous turnarounds, the scope of damage and destruction, the possibilities to avoid or to solve problems is however often not immediately visible to those who face them. All this, as the research by Weick and Sutcliffe shows, becomes recognizable only by an intelligent communication and cooperation among the team, an endeavour to detect critical incidents or possible measures of intervention and to provide an intelligent, flexible or 'mindful' behaviour while monitoring processes with high risk.

Surprisingly, the effectiveness of this form of cooperation could be detected just 10 kilometres south of Daiichi in the sister plant, Daini. Ranjay Gulati, Charles Casto and Charlotte Krontiris (2014, no pages) come to the conclusion that the team there worked better and they underscore this argument with Weick's and Sutcliffe's concept of mindfulness. They highlight that mindful organizing is also a 'sense-making'-process, because, similar to Burns, they surmise that the main problem in the nuclear plant was disorientation among the workers after their expectations were "violently shattered". Questions like 'What happened?' and 'Was the worst over?' were tormenting them. Against this backdrop, Gulati et al. (2014) emphasize the action of the superintendent Naohiro Masuda to make sense of the workers' engagement:

To assess the damage and begin the dangerous work of restoring power to the reactors, Masuda did not simply make decisions and issue orders. He knew he had to persuade people to act—against their survival instincts. His technical competence, knowledge of the plant, and diligence helped him earn their trust. However, more important, Masuda acknowledged the evolving reality in which they were operating. He shared the burden of uncertainty and doubt, engaging in what the organizational theorist Karl Weick and others have described as the 'sense-making' process: He arrived at a common understanding with his team members by revising and communicating what they 'knew' so that they could together adapt to each twist and turn. As a result, workers at Daini did not lose focus or hope. While they acted, some things became more certain ('What's broken in the plant, and how can we fix

it?'); some became less so ('Am I in danger from radiation?'); and some remained as unpredictable as ever ('Will these aftershocks lead to more flooding?'). Until the last reactor went into cold shutdown, Masuda and his team took nothing for granted. With each problem they encountered, they recalibrated, iteratively creating continuity and restoring order (Gulati et al., 2014).

This analysis shows: Understanding this mindful capacity to collaborate more comprehensively, means to analyze how it develops. Collective capacities of acting and knowing are not identical with the sum of individual capacities which are usually (through methodological individualism) conceived of as stable and inner properties. These concepts abstract from context and social entities. What is important here is a dialectical approach. For dialectical theorizing is eligible to "highlight that the societal powers in human practice do not exist outside or independent from subjective powers but interdependently and only available through each other" (Langemeyer, 2017a, p. 43).

In that sense, science as a social practice and as a societal line of development becomes paramount. The argument concerns two aspects. First, the interpersonal function of scientific activities by which people are able to organize and re-ensure inter-subjectivity in communication and richer awareness for the situation (instead of some selected aspects of it and instead of superficial perception). Second, the intrapersonal function of science: This refers to metacognition and imagination. Thinking scientifically includes logics, but also the imagination of normally unthinkable issues, issues that contradict everyday-life experience. Ethically, this entangles also questions whether technologies like nuclear plants are to be seen as neutral, while only their particular societal use seems to be problematic.

3. Science as a joint between the societal and the individual level of development

Science's relevance to mindfulness in complex cooperative work is not immediately evident. The question can be posed as to why and how science has an impact on cooperative practice as it exists nowadays and as it transforms societal relations. Doubts that science could easily play a positive role in this context may arise however with good reason. Mindfulness is construed as a virtue that cannot simply rely on scientifically approved knowledge. Eventually, this could easily turn out to be a way of being mindless. If someone regards scientific expertise– very generally –, e.g., to be in itself 'good,' 'powerful' and available 'out there' in society, an understanding of responsibility as a personal engagement is repelled. Correspondingly, 'science' (as if it exists as a solid bloc of intelligence) is taken for granted as a societal competence to solve problems of risk in advance. A dualism between individual and societal responsibility is invoked. But these assumptions are highly problematic.

How could the many scientists scattered in different universities and institutes detect *any* possible risk and foresee *when exactly* it might threaten the well-being of humans and/or the planet and its ecosystems? Knowing and recognition, also in a scientific manner, is time and field dependent, because it always remains a subjective engagement (cf. Langemeyer, 2017b, p. 19). In addition, scientists often lack the powers to decide politically how to shift, e.g., from perilous technologies to safer ones. And, last but not least, why should they collectively strive for certain solutions, if stakeholders of the economy exert influence on scientific institutions to pursue goals in their interests?

Separating responsibility in society from scientific engagement fosters technocracy. While this might be obvious, it is not so evident that many theoretical concepts support this technicism (cf. Langemeyer, 2015a, ch. 1.6). Against this backdrop, criticism remains weak

when it perceives scientific knowledge e.g. as an antagonist to the intuitive or implicit knowledge. 'Science' (including its objectified form of technology) cannot meet expectations invoked by its overestimation as a superior problem-solver. Simultaneously, criticism of scientific practices and achievements on a societal level is immunized when the blame for occurring disasters is put on individual experts only. Against this stalemate, it is reasonable to emphasize like Weick and Sutcliffe the mindfulness as a systemic feature of a team. But how does this quality emerge systemically?

If we regard exactly these virtues as *enacted qualities* through cooperation, they are not available without the development of scientific thinking, research and inquiry from within, from the concrete forms of human development, i.e. from inside their practices that should be improved and controlled with high reliability standards (cf. Langemeyer, 2012; 2014). To state it clearly, 'scientification' then should not be mistaken as an expanding influence of experts and expert knowledge (often the term 'epistemification' is used for this 'spill-over' of expert knowledge to other practices; cf. Langemeyer, 2015b). Very roughly, this influence is then depicted as an ideational impact of 'science' onto 'society'. Instead, 'scientification' refers to the practical side of how expert practitioners (like the team of the technicians) or even laymen strive to see their problems from different angles and to make better judgements about what should be done. In relation to this kind of engagement with reality, they attempt to bring different perspectives and kinds of knowledge into a holistic or systemic view on what is going on. That means, they collaboratively try to gain an overall comprehension of reality which does not come divided into psychological, social, and technological reality.

Correspondingly, 'scientification' is a development which stems not only from a societal change driven by and embodied in technology and technical processes. It concerns as well the concrete human activities such as work activities and the workers' capacity to act as a potential and power to pursue long-term goals. It is concrete human development, encompassing people's societalization as they decentre from the first-person perspective to reach out for understanding different perspectives, meta-perspectives, exact forms of observation, rational ways of thinking, as they theoretically reflect generalizations in common sense knowledge and correct misapprehension etc. The altered psychic structure of expert practitioners is considered as equally necessary for the scientification to take place in working and organizational life. Science must become a joint between the individual and the societal plane of development.

4. Mindfulness in Cooperation

Various forms of cooperation have been an essential feature of the reproduction of our lives in modern societies. The disaster of Fukushima depicted in the previous section gives an account as to how far failures in cooperation go. Neither nuclear plants nor damages in these technologies can be controlled without cooperation. But how can we scrutinize the concrete qualities of the work practice of cooperation facing the challenges of high-technologies? It is not automatically guaranteed that concrete behaviour (including thinking and knowing) reaches higher levels of knowledge and practice just because some references to scientific concepts, methods or research results are made.

The sociology of organizations has highlighted a remarkable difference between 'organization' as a state and 'organizing' as activity thereby problematizing also the role of scientific knowledge:

A distinguishing feature of organization is the generation of recurring behaviours by means of institutionalized roles that are explicitly defined. For an activity to be said to be organized implies that types of behaviour in types of situations are connected to types of actors. An organized activity provides actors with a given set of cognitive categories and a typology of action options. On this view, therefore, organizing implies generalizing; the subsumption of heterogeneous particulars under generic categories. In that sense, formal organization necessarily involves abstraction. (Tsoukas, 2005, p. 124, as quoted by Weick & Sutcliffe, 2006, p. 514)

Tsoukas' argument highlights not only the different perspective on activity (rather than states) but also the precarious emerging quality of organizing intelligent activities in general. But according to Tsoukas, this quality is said to depend on cognition in the shape of abstraction and generalization, i.e. on thought *when this cognition is completed*. Since both, abstraction and generalization, are said to be not only cognitive schemas but also features of an organizing activity *to establish* a certain order, the quoted argument is challenging us to reflect on the practical outcome of these processes.

If abstraction and generalization are not seen as a purely mental act but also as practical and material features of organizational life, then it is not the question whether one could work either with or without them. More or less visible, they regulate practice in society. The question is therefore how abstractions and generalizations prescind from concreteness. E.g. power relations are concrete features of organizational life, but not always immediately obvious. Sometimes they become more powerful, the lesser they are conceivable. Therefore, the main point is whether generalizations and abstractions support restricted or generalized forms of agency (Holzkamp, 2013; see above). Against this backdrop, mindful organizing can further be reflected as generalized rather than restricted capacities to act.

Mindfulness is a subjective and possibly collective form of practice in which consciousness is needed in terms of a *horizon* of both, *imagination (or anticipation) and reflection*. And this imagination and reflection is simultaneously situated, generated and enacted in practice insofar as the subjective sense-making of one's activities and engagements is always related to the concrete practice. It encloses, as the scientification-approach underscores, the cognitive power of exceeding the situation as it appears immediately to its participants. Therefore, their conscious practice simultaneously tends to be *under-determined by ignorance and distraction or over-determined by positive visions (conscious or unconscious desires) and other forms of anticipation like negative knowledge, i.e. experiences of incidents that one knows as to be avoided or to prevent.* In other words, the acting subjects situated in a critical incident are constantly oscillating their states of mind according to a certain type of psychodynamic in their practice. Being present in a situation therefore can be enhanced by a certain *meta-cognition about this oscillation between anticipation and reflection* of matters while one copes with a certain situation.

This transformative quality of thinking in practice is certainly a central issue of the Vygotkian approach. But similarly, also Piaget related any development of becoming conscious of something real to the 'coordination' of behaviour when the subject is challenged to 'transform' the objects in order to 'know' them: He or she 'must displace, connect, combine, take apart, and reassemble them' (Piaget 1976, p. 12; cf. Stetsenko 2016, p. 149). But transformation is always a psychodynamic process as well. With regard to the particular quality of psychodynamics, people's conscious actions can be proficient or rather confusing, increase cooperative agency or paralyze those involved. This is what shall be scrutinized in the following section.

5. Experiencing and psychodynamics

Vygotsky (and similarly Piaget) stressed that the mind is constantly transformed by being an active participant engaging in several societal contexts, co-creating the conditions under which someone thinks and acts (a similar perspective is advanced by the 'transformative activist stance'-approach, cf. Stetsenko, 2015; 2016; cf. the clinic of activity approach by Clot 2001; parallels exist to action research, cf. Toulmin/Gustavsen, 1996; Eikeland, 2012).

In what follows, the argument will therefore concentrate on the psychodynamics of anticipation and reflection depending on someone's previous experience and cognitive development (cf. Vygotksy used the word 'perezhevanie' and determined it to be the unit of analysis of psychological research which cannot and should not be destroyed by breaking it down to its elements).

Being present in a critical situation is not just a manner of being somewhere (locally), it also means being *aware* of what matters in a certain situation – not just in terms of abstract facts, but as practically relevant sense embedded in a given practice or situation. This awareness can be conducted or 'coordinated' (as Piaget terms it) consciously by being ready to ask (oneself as well as other people in that situation) questions – for example: by doubting that immediately visible, audible or sensible aspects are sufficient to understand the whole, by withstanding seductive and distorting forms of sense-making or by reflecting unconscious expectations or pressures that someone tends to become impatient or lazy which is why one oversees important clues (for an error or a risk) in a situation. Therefore, it is reasonable to interpret different forms of the capacity to act in relation to someone's capacity to think as someone's qualitative *presence* or *attentiveness* in the world as Bengt Molander suggests:

Attentiveness belongs to the whole human being. It is not purely "intellectual". Emotions, attitudes, questions, sensory presence and much more are actually (constitutive) parts of the knowing human being, thus of knowledge. Sometimes the term "presence" works better than "attentiveness". Presence focuses on *being there,* not only sensory presence as openness to various aspects of the world, which in itself requires learning and practice, but as *being* in the world (in practices) *together with* other people (Molander, 2009, p. 68).

Being present includes being aware of one's own conduct of behaviour in relation to the task someone wants to accomplish or the action someone wants to master. This is something that also be called 'competence' or, according to Piaget, 'intelligence'. And if a person is not fully present in a certain moment and context, it can be interpreted as incompetence with regard to a particular challenge to master this situation (Langemeyer, 2015a, ch. 2; 2013).

It is important to strengthen here the argument that competence/incompetence is not constructed as an entirely stable feature – as a 'trait' in conventional terms so that one excludes the other. Rather, the understanding is psychodynamic and implies that competence and incompetence can occur simultaneously. To develop my argument here (also with regard to the initial problematic of mastering the risks and disasters of our times), I will discuss the model of a contemporary approach to personality and motivation developed by the psychologist Julius Kuhl. As a psychological model, its angle is the individual psyche, not the social cooperative action. Therefore, the next section will transform this model to a collective level and discusses its socio-critical potential.

According to Kuhl's research, the psychodynamics of personality can be theorized by means of four interacting systems. Each system is a generalization of psychic structures or functions. These functions are assumed to exist as biological entities but undergo developmental processes both, psychologically as well as socially, because of their interaction in face of real situations.

One system is called 'intention memory'. It operates as a memory for plans and is activated as long as one tries to complete an action. In general, it is adjusted to conduct serial action ('step by step'). Its activation usually stems from affects that indicate difficulties and the importance to plan instead of going-on. A second, complementary system to this first system is the 'intuitive behaviour control'. This system is not automatically activated by conscious control. Quite the contrary, it comes into play rather spontaneously and follows patterns of intuitive or automated behaviour. Affects that trigger on and maintain this 'intuitive behaviour control' are positive feelings such as joy, happiness and self-assurance.

The third system is specialized on 'object recognition', a system that helps to perceive and analyse details. It is activated by affects of pain, fear or cognitive dissonances. Similar to the first two systems, it has a complementary system: the 'extension memory'. This memory contains personal experience in terms of generalized aspects of a number of experiences that have become important to feelings of 'self' and 'self-congruence'.
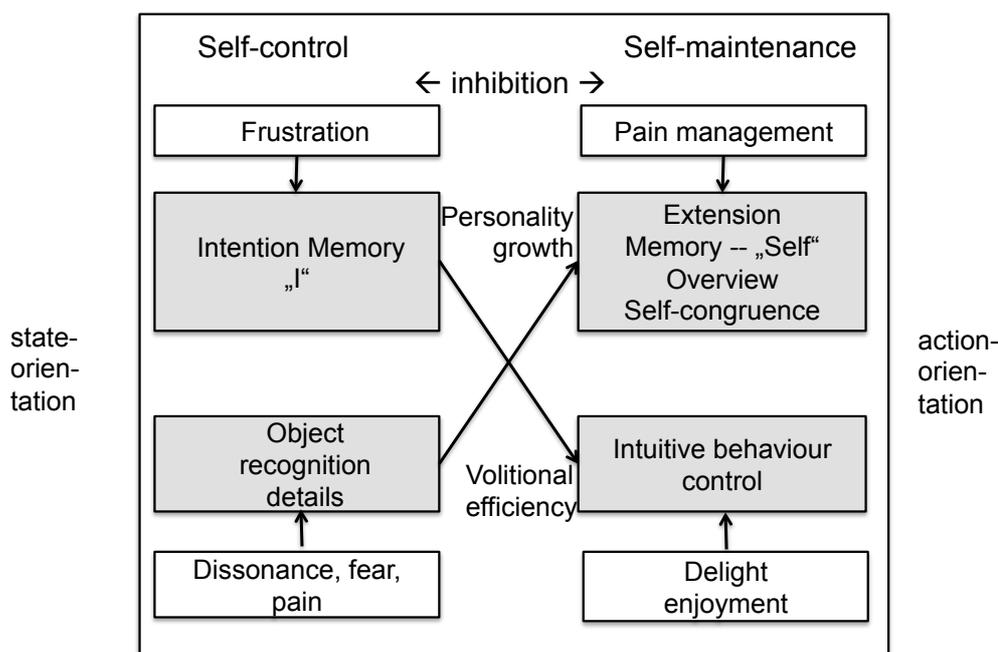
Figure 1: Model for the modulation of affects by Kuhl 2004

Kuhl argues that personality development depends in the long run on the connections between all four systems. Especially two forms of 'emotional dialectics' are however salient: the interrelation between the intention memory and the intuitive behaviour control in terms of 'volitional efficiency', and the interrelation between the object recognition and the extension memory in terms of 'personality growth'. To explain these emotional dialectics, not only their 'functioning' but also their failure is illuminating.

In contrast to desirable forms of development, Kuhl's research has revealed that people can suffer from a fixation on planning and thus from an inhibition of impulses to leap from planning to action. The development of volitional strength takes place when fixations or inhibitions are overcome and the subject's action are in line with its intentions. Similarly, Kuhl's research has shown that fixations on reflecting pain, fear or dissonances can impair personality growth. On the plane of psychodynamics, this is explained as an inhibition of the extension memory while the object recognition system is activated. The disadvantage of this inhibited dynamic is that the intuitive support for decision-making or for gaining an overview in a complex situation is restrained. Empirical studies demonstrate that people suffering from this inhibition are more vulnerable to misjudge what options would increase self-determination and self-coherence and what options are chosen due to internalized constraints. They regret more often the choices they made than people with a good integration of their extension memory (i.e. with higher 'self-congruence').

This model of psychodynamics is now used as the grounds to elaborate a concept of mindfulness as cooperative competence and to explain why the scientification for individual as well as social development plays an important role.
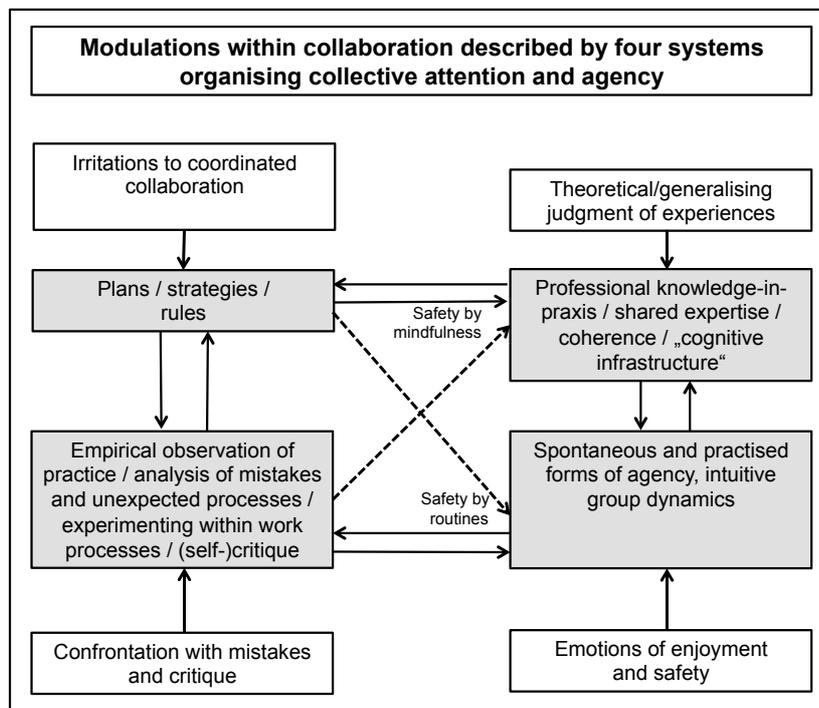
Figure 2: The Knowing of Mindfulness, Langemeyer 2015

For this purpose, four systemic aspects of cooperation – similar to the four psychic systems – are described. The first aspect (in the figure 2 the grey box up on the left) captures the inscription of plans, strategies or rules into collective practice. The second aspect (the grey box down on the right) depicts all spontaneous and practiced or routinized forms of behaviour that participants in a team perform. Thus, it can also refer to intuitive group dynamics. According to these aspects, one task of cooperation is to coordinate and ensure that a certain plan is executed. This coordination develops and can be enhanced when team members develop volitional efficiency. It also aims at ensuring greater precision and effectiveness with it. But within changing situations, a plan can always turn out to be 'wrong', i.e. that it falls

short of resolving the problems at stake. This turns out to be a core problem when teams are dealing with complexity and high reliability at work.

Organizing reliability by routines and pure training these routines is therefore quite conventional, although, in many contexts, their effectivity is already approved (Aggarwal et al. 2004). On an individual level, this type of training depends on volitional efficiency or volitional strength. However, as an organizational strategy, that type of training has a great affinity to the visions of technical rationality where the goals of a concrete practice are undisputable. This may likely unravel contradictions if the respective routines and trainings largely deny or violate against changing influences as well as personal needs and habits.

Therefore, this form of organizing reliability can be contrasted by mindfulness that stems from a scientification of the team's capacity to act. Here, the cooperating team members frequently dedicate their efforts to analyses of failures and mistakes or to experiments with particular (e.g. unexpected) processes to gain a sufficient empirical basis for generalizing critical knowledge and developing a holistic or systemic view of the practice (3rd aspect, grey box down on the left). That means that they spend time primarily on the critical evaluation and construction of their knowledge (relevant to that particular practice) so that they are no longer bound to mere appearances or restricted to isolated (i.e. private) ways of thinking and feeling. Instead, the construction of their knowledge is a product of collaboration, because the cooperating team is ambitious to constantly challenge their own knowing and comprehension by means of various unresolved problems and unpredicted outcomes. The team is keen to work with generalizations but simultaneously to overcome the shortfalls of confusing the abstract with the concrete. Self-critique is embraced by them as a necessary cathartic moment which is why striving for self-determination is a key. This commitment does not indulge to the 'habit of "cheating with reality" in organizations' (Bonnefond et al., 2016, p. s44). Along with it a kind of flexible, vigilant and agile knowing emerges boosted by several crises of practical and theoretical experiencing which shall be termed 'professional knowing' or 'professional knowledge-in-practice' (4th aspect, grey box up on the right).

To summarize the arguments:
A team's knowing/knowledge-in-practice is defined as
- a form of presence or awareness of a certain matter – mentally produced and organized by mutual action,
- a way of organizing thinking and opening one's awareness so that a particular form of mindful capacity to act is activated – this is achieved by making a more generalized (or holistic) goal or perspective emotionally and motivationally relevant, in other words, by making it subjectively reasonable and attractive as it contributes to self-determination, and finally
- it is an awareness about other possible orders (or systems) of theorizing, so that it is possible to interrelate different perspectives (while collaborating with others for example) and to overcome idiosyncratic or partial ways of knowing.

Mindfulness is then a form of knowing
- when people's awareness is not congealed by a certain state of mind (allegedly as the only possible one) or by a passivisation (affects that induce passiveness),
- when people's awareness is not foreclosed to unexpected or undesired processes,
- when people's capacity to act is not inhibited by surprise or by dissonance, pain and frustration and when they manage to reorganize their concentration and agility to manage the unexpected turns of a critical situation.

The psychodynamic perspective on cooperative agency thus helps to analyse disastrous shortfalls in teamwork like in the case of Fukushima's nuclear plant Daiichi. Here, the technicians' feelings of being under pressure were accompanied by the problem of being mentally and thus practically disoriented without the information provided by electronic control and safety devices. Instead of looking for possibilities to gain holistic or systemic insight into the processes to bring under control, the team was assumingly fixated on isolated objects such as displays or prescriptions from a manual. Their imagination and anticipation were not open to search for orientation and action possibilities independently and "off the beaten tracks". Fearing radioactivity, they were not ready to go out of the control room to search for relevant insights about the risky processes going. Mentally, they were probably stuck in efforts to remember relevant pieces of advice and to search for prescriptions to follow. Thus, they were distracted from being present in that situation and by searching for holistic or systemic comprehension of the processes to bring under control.

Accordingly, we can describe more generally psychodynamics that bring about similar impairments to mindfulness in cooperation.

- Teamwork can become ineffective and careless when its members fixate on prescriptions, controlling and planning processes, or on blatancies, personal advantages, petty jealousies etc., but do not pay attention to the changing conditions and influences. The team focuses on an assumed state, regularities, or on an ideal plan without considering possible intervening conditions or reflecting possible misjudgements. The team is not ready to revise judgements timely and to undergo a cathartic process of experiencing and reflecting errors and therefore is driven by a distorted self-confidence (sometimes fixated on the erroneous persuasion that their plan is correct and will work out or that symbolic compensations are necessary). In sum, the team is not able to reflect their knowing as time and field dependent.

- Another problem can be that cooperation is organized without providing the participating actors with relevant insights into the societal or socio-technical work relations and the real forces to bring under control. Then the workers suffer from under-education. If time-pressure, goals of economic rationalisation or hierarchical orders dominate the situation, the cooperating actors may (quickly) execute a plan or react spontaneously to a situation but they are not prepared to search effectively evidence for the causes for unexpected errors, tensions or breakdowns. They may likely feel irresponsible for the situation as they have become used to being degraded to cogs in the wheel. Their capacity to imagine theoretically alternative explanations may not be developed and they lack ideas as to how they could test the validity of different explanations and assumptions. They are not experienced in generating realistic imagination and anticipation. They have no shared professional knowledge and experience with this so that they cannot discuss these problems thoroughly or effectively with others in their team or with experts from outside.

- The cooperating actors may have professional knowledge, but they do not know each other well. They lack personal relationships which means that they have no experience of understanding each other when solving together complex problems. To mutually comprehend how the other defines the problem and how they envisage the necessary steps to undertake a transformation of the entire situation, also metacognition is paramount. Given the capacity to reflect one's one thinking and its references, team members identify more easily the background of the other's way of thinking and knowing. This form of experience includes insights about why and when to make one's own implicit forms of knowing explicit to others.

The development of collective knowing and mindfulness is however interrelated with forms of both, either restricted or generalized forms of capacity to act, unfolding its particular shortcomings or potentials.

6. Concluding remarks

These issues and problems of cooperative competence and mindfulness raised here can be reinterpreted and deepened in the light of the research of Klaus Holzkamp and collaborators on 'generalized agency' (cf. Schraube & Osterkamp, 2013; Schraube, 2009). Internationally, it is also important to see alliances with cognate approaches like Anne Edwards' work on 'relational expertise' (Edwards, 2005; 2012), Anna Stetsenko's work on the 'transformative activist stance' (Stetsenko, 2015; 2016), Cathrine Hasse's work on the 'Anthropology of Learning' (2015) as well as Yves Clot's work on the 'clinic of activity' (Clot, 2001); all their perspectives contribute to deeper insights (cf. Langemeyer, 2015; 2017a). The particular research on mindful cooperation however tries to take this kind of research further to understand not only the 'functioning' and the construction of power in cooperative agency but also to reflect thoroughly the challenges of collaborative knowing and mindfulness within the concrete developments of the scientification of work. It emphasizes dialectical theorizing to scrutinize the reciprocal effects between someone's capacity to act and someone's capacity to think as well as reciprocal effects between the individual and the social/societal level of development. Thereby, it is also part and parcel to research on the concrete transformations of a high-tech world. It renews the questions of emancipation and self-determination as urgent to engage collectively with the general or the whole of society as we may long for and imagine it.

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