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Content

1 Introduction

This overview of the research field "Organizational health and safety" forms part of a series of literature reviews being accomplished within the frame of the Integration research program on the merger and integration process of former Statoil and Hydro (2008-2010). As such, it constitutes one out of seven main research themes.

The literature on mergers & acquisitions (MAs) is large, so is the field of organizational safety. The challenge is, however, that these research fields seem to be separate and studies focusing on potential consequences for safety of deliberate change are lacking. Main purpose of this review will be to look into the 'state of the art' conceptualizations of organizational safety; dimensions or facets which have shown to be of relevance for safety in general, the relations between safety, trust and distrust and the potential impacts of organizational change or mergers on safety.

The review starts with an outlining of the most common conceptualizations and origins of the terms *safety culture* and *safety climate*, the links between *safety climate* and *safety performance*, what role *trust* and *distrust* may play in relation to safety, and how trust dynamics may function as central coping mechanism during change. Then, concepts that have shown to be essential both in mergers and for safety will be summed up, and finally, our main conceptual work model within the research program will be outlined.

2 Safety culture and safety climate

Safety research constitutes a cross-disciplinary field, and as such it draws upon theories and concepts from different perspectives and disciplines; mainly sociology, anthropology and psychology. The term safety culture first appeared in the International Nuclear Safety Advisory Group's report on the Chernobyl accident (INSAG, 1986) and it has been defined as: "That assembly of characteristics and attitudes in organizations and individuals which establishes that, as an overriding priority, nuclear installation safety issues receive the attention warranted by their significance" (INSAG 4, 1991). Since the INSAG definition of safety culture, several others have been made,, most of them deriving from the organizational culture literature. Before we head for the safety culture and safety climate concept pairs, we will have to take a detour and have a look at the concept of (organizational) culture.

The culture concept has its roots in sociology and anthropology and there exist numerous definitions of it. Most of them are related to some kind of sharedness with regards to norms, rules, attitudes or practices within or across organizations, ways of thinking, feeling and reacting, sense making and sense giving, meaning construction processes etc. (Geertz, 1973; Rohner, 1984; Weick, 2001; Alvesson, 2002; House et al., 2004). Geertz views culture as an ordered system of meaning and symbols in which social interaction takes place, while the social system could be seen as the pattern of interaction itself. Culture then becomes the fabric of meaning in which human beings interpret their experiences and guides their actions. Frost et al. (1991) in an attempt to reframe the concept of organizational culture divide it into three main perspectives: Integration, Differentiation and Fragmentation. Subcultures and conflicting interests are often treated as a threat, especially within the integration perspective, which asserts the importance of unity, strength and agreement. The differentiation perspective put into

focus the existence of several sub-cultures within one single company, often living harmonically side by side within the same organization. In the fragmentation perspective, sub-cultures, ambiguity and fragmentation are given more weight. The same event or act can be interpreted differently by different people, and conflicting interpretation frames may constitute an important part of an organization's real life - dividing the organization in various sub-cultures.

Pidgeon (1991) argue for instance that safety culture should be understood as the constructed systems of meanings through which a given worker, or group of workers, understands the hazards of their world. As such, it is deemed to have relative stability and not to change on an hourly, daily or weekly basis (Cox & Cox, 1996). Gherardi & Nicolini (2000), on the other hand, bring the safety culture concept towards the "communities of practice" and define it as "the collective ability to produce organizational and inter-organizational work practices that both protect individual welfare and the environment". Safety is then considered to be a competence realized in practice (Gherardi & Nicolini, 2000:8). This (safety) competence, knowledge or expertise is then viewed as circulating in webs of practices and coincides with the ethnography Geertz (ibid.) formulates. A "safe" culture then would reflect mindfulness, robust and heedful practices - enabling groups, organizations or societies to protect themselves, the environment and other members from harm. Systems of meaning are not always shared, however, and may vary both within and across organizations and populations (Frost, Moore, Louis, Lundberg & Martin, 1991). Perceptions of what is regarded as risky or not is also discussed as being socially constructed and varying across cultures – and not only within organizations (Douglas & Wildavsky, 1983).

Safety climate, on the other hand, is often used to describe employees' *perceptions* of how safety is dealt with at the specific workplace. These perceptions are often measured by questionnaires and provide us with a "snap shot" of the current state of safety (Mearns & Flin, 1999). Zohar (2008) argue that safety climate refers to shared perceptions regarding safety policies, procedures and practices, and that safety climate tools should, as far as possible, reflect policies in-use (enacted policies) rather than their formal counterparts. In addition, safety climate tools should reveal real management priorities of safety when safety is under pressure – referred to as "acid-test-indicators" of "true" priorities of safety by Zohar; e.g. competing operational demands, safety versus production, time schedules/pressure etc. (ibid.). Measurement sensitivity could also be enhanced by developing industry or sector specific items.

Both research on safety culture and climate argue for the importance of getting as close to the natural social unit as possible (Gherardi & Nicolini, 2000), or to find the right level of analysis or natural social units of people working together (Zohar, 2003). Further, safety climate is either defined as a sub-component of safety culture (Glendon & Stanton, 2000; Zohar, 2003; Cooper & Phillips, 2004) *or* as a reflection of the actual safety culture by others (Cox & Flin, 1998; Mearns & Flin, 1999; Guldenmund, 2000). Here we lean on the last view; that safety climate should be regarded as a reflection of an underlying safety culture of a work group/unit, plant or an organization. How near this reflection is to the actual safety culture, will depend on the quality of the instrument trying to measure it. Safety culture is considered to be of a more complex and enduring phenomenon than safety climate, which, to some extent may reside in organizational and societal culture (Mearns & Flin, 1999). It follows by this that safety culture is often examined and complemented with qualitative methods, while safety climate studies are covered by quantitative tools, techniques and methods.

According to Cooper and Phillips (2004), the last 25 years of safety climate research can be split into the following four directions: (1) The design of psychometric

measurement instruments and their underlying factor structure, (2) development and testing of theoretical safety climate models to ascertain determinants of safety behavior and accidents, (3) the examination of relationships between safety climate perceptions and actual safety performance; and (4) exploration of the links between safety climate and organizational climate (Cooper & Phillips, 2004). The field is dominated by the search for the right inventory or dimensions able to grasp the 'true priority of safety' (Dedobbeleer & Beland, 1998; Anderson, McGovern, Kochevar, Vesley & Gershon, 2000; Cox & Cheyne, 2000; Flin, Mearns, O'Connor & Bryden, 2000; Griffin & Neal, 2000; Guldenmund, 2000; Zohar, 2003; Cooper & Phillips, 2004). The most frequently used statistical method to determine the dimensional structure of safety climate is factor analysis and yet there exists no agreement on which dimensions safety climate consists of or how it should be defined. However, safety management and colleague involvement dimensions have been found in several studies (Zohar, 1980; Zohar, 2003; Flin et al., 2000; Guldenmund, 2000; Rundmo, 2003). Safety management and involvement have also been found to play a crucial role in the implementation of behavioral safety interventions (Lingard & Rowlinson, 1997; Depasquale & Geller, 1999; Krause, Seymour & Sloat, 1999; Geller, 2001; Johnson, 2003; Lund & Aarø, 2004; Cox, Jones & Rycraft, 2004; Seo, 2005). Other common dimensions are safety management systems, procedural compliance, work pressure, competence and risk (Flin et al., 2000), but also trust have shown to be of crucial importance and will be further discussed below.

3 Safety Climate and Indicators of Safety Performance

In safety research, it is hypothesized to be a link between safety climate and performance; i.e. that the employees safe or unsafe practices are a function of the underlying organizational safety culture and the 'reflected' or measured safety climate. However, it has been difficult to establish causal links between them (Zohar, 2003; Cooper & Phillips, 2004). Some have suggested that the relationship might be mutual or that "the climate-behavior-accident path is not as clear cut as commonly assumed" (Clarke, 2006; Cooper & Phillips, 2004:497). A mutual relation implies that safe behavior may lead to a safer culture or reverse. Accidents may also urge the organization towards a safer culture and better scores on safety climate measures. Furthermore, better safety culture may also paradoxically lead to better incident reporting and hence an apparent worsening of safety performance.

Safety performance can, however, relate to different aspects and levels (individual, group, organizational, industrial, national), and the development of sound safety indicators in a company, an industry or a sector depends on careful design. According to Hopkins (2009) some of the most used concepts like "lead" and "lag" indicators are not fully understood, used inconsistently and are problematic. In an interesting debate among 19 safety researchers and practitioners (Special issue of *Safety Science*, 2009), Hopkins demonstrates a tendency of conflating personal and process safety, and uses examples from the Baker report on the Texas City refinery accidents and the UK HSE guide to show his points. Mainly, mixing up personal and process safety, he argues, stem from a misinterpretation of the Heinrich triangle (1931), implying that minor accidents are precursors to major accidents (Hale, 2001; Hopkins, 2009). While process safety indicators refer to hazards arising from the processing activity in which a plant may be engaged, personal safety hazards are related to hazards that may affect individuals and have little to do with process safety. Process safety accidents may, typically, damage or threat to damage a plant and cause multiple fatalities. Hence,

personal safety indicators will not tell you how well you are managing process safety. Process safety accidents are quite rare, fortunately, while personal injuries happen more frequently. Also, defences regarding personal safety hazards may be few, while process safety hazards are typically engineered to at least three levels of (technical) defence (Hudson, 2009:483). Another concern, Hopkins delineates is the fact that once there are incentives or consequences attached to any kind of key performance indicators (leading or lagging), there is an incentive to manage the indicator itself instead of the phenomenon it is an indicator of.

Among safety researchers it is commonly agreed that the correlations between personal and process accidents is limited, if existing. Hopkins (2000) have for instance shown how companies may be in control of their injury rates (personal safety), while at the same time managing major hazards (process safety) poorly. Hudson (2009), however, argues that there actually exists a level of commonality, but that this relation is to be found at an abstract level; at the level of organizational culture where prioritization of safety may affect both personal and process safety. The BP organizational culture at the refinery in Texas City results on the 23rd of March 2005 in one the most serious workplace disaster in the US with 15 deaths and more than 170 injuries (Baker, 2007). The accident investigation clearly shows an organization with a non-compliance culture at many levels undermining both its personal and process safety (Hudson, 2009). The problem was neither lacking personal safety information nor insufficient process safety indicators, but the organization's willingness or ability to treat them as important and real.

Hopkins sorts the lead/lag and personal/process safety in a two-by-two table, which shows that both personal and process safety indicators can be lead or lag (ibi.:461). It is worthwhile to point out also, as Hopkins does, that indicators are indicators *of something*; a surrogate for a more latent phenomena, and in the case of lead/lag they are indicators of something like "the state of the safety management system" (ibid.:509). Safety management systems are put in place in order to protect people and property from harm, and, intuitively then, most of us will agree with the idea that lag indicators are direct measures of harm, while lead indicators are in some ways precursors of harm (ibid.:461). From the Leading performance indicator guide for Health and Safety in the UK oil and gas industry leading indicators are defined as "something that provides information that helps the user respond to changing circumstances and the actions to achieve desired outcomes or avoid unwanted outcomes" (Step Change in Safety, 2001:6, from Mearns 2009:491). Leading indicators, then, provide us with information regarding the current situation which can affect future performance. Lag indicators of personal safety are mostly unproblematic and usually refer to injuries or fatality rates.

As the interesting debate among the 19 researchers/practitioners in the special issue of Safety Science show, there still exist disagreement regarding the lead/lag distinction and how to conceptualize it. One of the main issues at stake relates actually to the challenge of establishing suitable indicators which leads us into a common problem among safety researchers: What characterizes actually a valid and reliable safety performance indicator – at what level? Kjellén (2009) goes back to Rockwell's (1959) definition of the concept. He puts up the following characteristics as necessary: It should be (a) quantifiable and permitting statistical inferential procedures, (b) valid or representative of what is to be measured, (c) provide minimum variability when measuring the same conditions, (d) sensitive to change in environmental or behavioral conditions, (e) costs of obtaining and using measures is consistent with the benefits and (f) comprehended by those in charge with the responsibility of using them. Fatalities happen for instance infrequently and, hence, do not constitute a suitable indicator at a company level, but

may constitute a good industry or sector level indicator. Some suggest that the lead/lag distinction is irrelevant, and that we should rather look for indicators which are valid, makes it possible to measure trends measures, refer to the right level of analysis, show causal links with negative safety outcomes, in short we should search for precursors with predictive qualities (Grote, 2009:478).

Safety climate has been conceived of as a "leading" indicator of safety performance. Instead of digging into the challenge of defining once and for all leading versus lagging indicators, Mearns (2009) suggests that safety researchers rather should move into the exploration of what the antecedents to positive safety climate are. Also, rather than investigating further what safety climate consists of, one needs to examine how safety climate is linked to other organizational climate aspects, as suggested by Zohar (2008). As such, this thesis fall within this scope and below a working model for the thesis has been set up. The model indicates anticipated links between precursors, mediators and successors of safety climate.

4 Trust and distrust as coping mechanisms in MAs

Trust is commonly treated as a corner stone in the construction of social order (Luhmann, 1979) It implies positive expectations about others intentions and behavior, is supposed to reduce complexity and conflict, and involve vulnerability and risk, and interdependence between different types of actors (Rousseau, Sitkin, Burt & Camerer, 1998). Hence, during change, "social order" and predictability may be perceived as more "chaotic" and trust relations will most likely be affected at various levels. In general, mergers and change processes will most probably interfere with employees' feeling of predictability and at a more concrete level disturbance of or an impact on trust relations may emerge as consequences in various respects.

Research on trust has shown to have positive outcomes on several organizational aspects like; competitiveness (Seppänen, Blomqvist & Sundqvist, 2007), communication and knowledge exchange (Andrews & Delahaye, 2000), mutual learning (Bakker, Leenders, Gabbay, Kratzer, & Van Engelen, 2006; Gubbins & MacCurtain, 2008; Nonaka & Takeuchi, 1995). It has also been demonstrated to have positive impacts on organizational safety and safety performance (Burns, Mearns & McGeorge, 2006; Conchie, Donald & Taylor, 2006; Conchie & Donald, 2006; Conchie & Donald; 2008; Hale, 2000; Reason, 1997). With regards to operational flexibility and change, trust building is treated as a central coping mechanism. The importance of trust in the management of change is widely reported, particularly in the practitioner and popular literature (Morgan & Zeffane; 2003, Cashman, 1998). Mutual trust is consistently presented as an essential feature of successful change and best achieved through consultation, participation and empowerment. Khan (1997), for example, notes that empowerment is an ongoing interpersonal relationship that fosters mutual trust between employers and employees.

In the organizational trust literature it has been argued that managers have considerable impact on trust building (Whitener, Brodt, Korsgaard & Werner, 2006) and that confidence and trust in leaders are influenced in part by the extent to which the leader's behavior is relevant to the individual's needs and desires. On the other hand, too high degree of distrust, as with abusive supervision, has been found to be associated with lower job and life satisfaction, lower normative and affective commitment, higher conflict between work and family and psychological distress. Trust within safety research has formerly been linked to a transformational leadership style – a style which

is supposed to reflect concern and respect for workers (Dirks & Ferrin, 2002). Transformational leaders have been characterized as being supportive, involving, honest, genuine etc., styles which are closely linked to the traits integrity and benevolence introduced by Mayer et al. (1995).

Over time trust depends on risks being kept under control, which is of crucial importance in high-risk systems and organizations (Weick, Sutcliffe & Obstfeld, 1999). Reliability may, according to Weick (1987), be enhanced by creating collective requisite variety, which is higher when people trust each other. A solution to this could be to treat both confidence and doubt as important in the production of reliability and to keep an eye on the limits of trust (Weick, 1987) *and* the benefits of doubt or distrust (Tharaldsen, Mearns & Knudsen, 2009). Recent safety research suggests that both trust and distrust may be functional as well as dysfunctional, depending on how it is performed. Too high or "blind" trust is regarded as negative for safety, while functional distrust is valued as beneficial (ibid.). However, when diversity increases, trust becomes more difficult to sustain. Results have also shown that for contractor workers who experience a more unpredictable work life, colleague trust and high safety compliance lower employees' exposure to involvement in incidents. All in all, we expect that organizational restructuring and change will increase diversity and variety and – temporarily – decrease individual and organizational trust. However, trust relations will probably still increase in importance. One may also find that new and parallel trust relations are built – both in interpersonal relations and as organizational tools.

Mayer et al. (1995) has developed a much used definition of trust - that trust is not taking risk *per se*, but a willingness to take risk: Trust is *to be vulnerable to the actions of another party based on the expectation that the other will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party* (Mayer et al., 1995:712). Distrust is viewed as a parallel concept implying negative expectations of another's conduct which typically manifest as a tendency to attribute sinister intentions to, and desire to buffer oneself against, another's conduct (Luhmann, 1979). Luhmann presupposes that systems of higher complexity need more trust. In securing trust, organizations in general depersonalize such mechanisms and in order for systems to remain functional, members should possess an understanding of how to make use of trust and distrust without placing too high demands on the persons who finally shows trust or distrust (Luhmann, 1979).

Trust building and promoting related factors has also been linked to individual characteristics like ability, integrity, benevolence, being truthful, open, showing respect etc. (Seppanen et al., 2007, White & Eiser, 2006). Some authors identify a single trustee characteristics, while others delineate as many as 10. Mayer, Davis and Schoorman (1995) compress these factors into three attributes: *Ability, Benevolence* and *Integrity*. *Ability* refers to the trustee's skills and competencies to do the job and should be regarded as a dynamic characteristic. *Benevolence* is the extent to which a trustee is believed to want to do good to the trustor, aside from an egocentric motive. The relationship between integrity and trust *involves the trustor's perception that the trustee adheres to a set of principles that the trustor finds acceptable* (Mayer et al., 1995:719). Integrity has also been linked to concepts like moral integrity, consistency of the party's actions, credible communications, a strong belief in the trustee's sense of justice and congruence between his or her words and actions. Mayer et al. (1995) treat the three traits as interrelated and as varying independently of each other.

The general view of trust and distrust as a bipolar construct, together with the normative view of trust-distrust as respectively good and bad, has been attacked both within

organizational research (Adler, 2001; Dirks & Ferrin, 2001; Lewicky et al., 2006) and safety research (Burns et al., 2006; Conchie et al., 2006; Conchie & Donald, 2006; Conchie & Donald, 2008; Conchie & Burns, 2008; Hale, 2000; Jeffcott, Pidgeon & Walls, 2006: Poortinga & Pidgeon, 2004; Reason, 1997). In the bipolar perspective, trust and distrust are conceived of as existing at opposite ends of a single trust-distrust continuum (Lewicky et al., 1998). Low trust expectations generally become indicative of high distrust and distrust is being treated as a psychological disorder that should be corrected. Two core tenets are presented to replace these assumptions (Lewicky et al., 1998). First; relations should be treated as complex and multifaceted. Hence parties may hold different views of each other, views that may be accurate, but still inconsistent. And second; balance and consistency are more likely to be temporary and transitional states. Relations are most likely dominated by inconsistency and imbalance, implying tensions which often do not promote quick and easy fixes. Lewicky et al. (1998) also argue for taking into account the bandwidth and richness of ongoing relationships; the broader the experience across multiple contexts, the broader the bandwidth. Hence, trust may vary in scope as well as in degree.

5 Managing safety during MAs

Mergers and organizational change processes in general have become common strategic tools in order to increase company competitiveness. In organizations with high risk exposure safety is of a primary concern, and a crucial challenge is to keep high reliability of operations during change. Change processes often require extra resources, disturb the workforce, and divert focus from daily tasks, such as tasks critical for safety (Serck-Hanssen 2002). Both organizational safety and M&As have received much attention in the research literature, separately. Nevertheless, there is seemingly still a lack of research focusing safety outcomes following deliberate organizational change on safety outcomes (Koukoulaki 2009; Lofquist 2008), especially concerning safety during mergers and acquisitions.

Research on Mergers & Acquisitions (M&As) and organizational safety in general have shown that management commitment and worker involvement are important for organizational effectiveness and safety performance (Clarke, 2006; Clarke & Ward, 2006: Flin, Mearns, O'Conner & Bryden, 2000; Guldenmund, 2000; Rundmo & Hale, 2003; Steiro et al., 2004; Zohar, 1980; Zohar, 2003; Zohar, 2005). Research on the relation between organizational change and safety appear confined, as noted, and there exists only limited evidence that radical organizational changes should result in increased risks or major accidents (Grote, 2008). However, organizational change processes have been regarded as critical factors in accident investigations, and might be highly relevant to the level of both process and worker safety (Baker, 2007; Grote, 2008). Deregulation, which often involves some degree of organizational change, has also been found to have a significant impact on corporate culture, management and organizational issues that are essential to safety (Bier et al., 2001). Serck-Hanssen et al. (2002) assert the importance of giving higher focus on safety during change processes, especially due to the fact that normal operations have to continue while a lot of focus is diverted towards the change process. Hence, effective and careful management of change is regarded as important when assessing an organization's safety level in change processes (Grote, 2008; Steiro et al., 2004). Furthermore, safety-critical competencies are regarded to be of crucial value during change. Findings also suggest that strategic organizational change exerts an important influence on safety in a High Reliability Organization (Lofquist, 2008). Information flow may also be disturbed in change

processes, and people may feel insecure or anxious of sticking their necks out to report unsafe events or processes. A sound reporting culture is anticipated to make a substantial part of a safe organizational culture (Reason, 1997), while insecurity and negative sanctioning of reporting may as such lead to underreporting and hampered organizational learning.

6 A conceptual work model – relations between organizational dimensions and safety performance

The above conceptual clarification has revealed that several human and organizational aspects may be relevant for organizational safety. Within the research program such dimensions have been included in a questionnaire and survey tool named the "Integration Monitoring Survey" (IMS). In addition to the IMS, the company accomplishes a yearly survey covering a broader range of work environmental aspects the "Global People Survey" (GPS). On the basis of data from IMS and GPS we have put together a conceptual model visualized below - which will be statistically tested along the way.

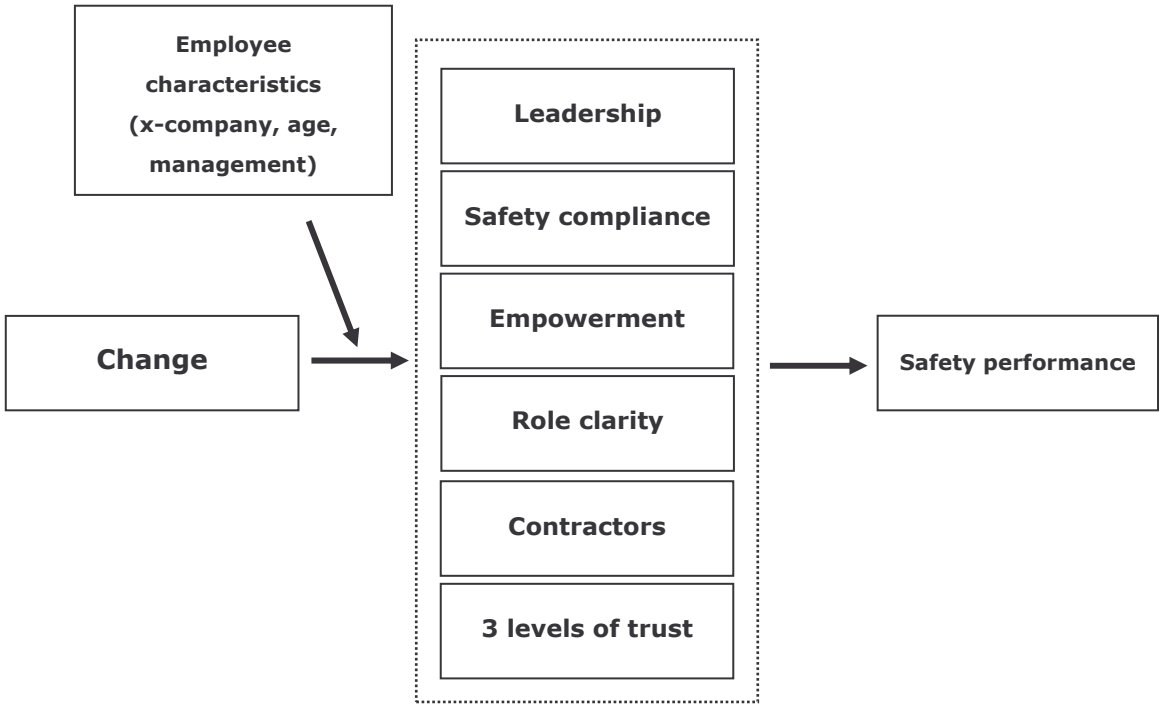

Figure 1 Anticipated dynamics between organizational change, criteria variables and organizational aspects on safety performance

This review has pointed out the importance of careful management of change, including worker involvement and empowerment during the change processes with regards to achieve a successful merger, integration and change process. One of our main

expectations is that phases with high degree of organizational change will affect employees' sense of predictability and social order, which again could influence trust relations on both a general and a more concrete level and, finally, have an impact on organizational safety performance. As such, the change process may affect basic organizational dimensions negatively. However, a parallel organizational counter force of organizational support during change, may also lead to reduced organizational uneasiness.

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