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Modeling attitudes and perceptions as predictors for changing safety margins during organizational change

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ABSTRACT

This study describes the relations between different dimensions of leadership commitment, safety climate and attitudes toward change, and how these affect employee perceptions of safety during organizational change in a high risk environment. We collected data from a European national air navigation services provider during a volatile 3-year corporatization process that ended in the sudden collapse of a deliberate change implementation project. Surprisingly, despite visible signs of internal and external stress caused by the volatile and disruptive change process, we did not observe any change in the traditional safety metrics of incident and accident reporting during the study. The study is based on a large survey ($n = 422$) of individual attitudes and perceptions of safety climate, perception of leadership commitment to safety, attitudes to organizational change, and perception of safety. The data support the claim that perception of safety at least, in part, depends on individual perceptions of the leadership's commitment to safety, and the safety climate in place at a given point in time. The model shows how employee perceptions of the leadership's commitment to safety and safety climate are related to both attitudes toward change, and to perceived safety.

1. Introduction

The purpose of this study is to present an alternative approach for measuring safety in a high reliability organization during a period of deliberate organizational change using a combination of leadership survey data and safety climate survey data to test a conceptual structural equation model as a leading indicator of eroding organizational safety—over time. The findings of this article are based upon data gathered during a 3-year longitudinal case study of a national air navigation services provider during a turbulent corporatization initiative that ended in collapse. Yet, despite the intense internal conflict that raged within the company over a 2-year period, we did not observe any change in traditional safety metrics (Lofquist, 2008, 2010).

Various studies have used safety climate survey responses to describe employee attitudes based on the underlying contextual architectures (Zohar, 1980; Cox and Cox, 1991; Cox and Flin, 1998; Cheyne et al., 1999). Safety climate has been described as a surface feature, or manifestation, of an underlying safety culture that provides an understanding of the attitudes and perceptions of a workforce at any given point in time (Schneider and Gunnarson, 1991; Cox and Flin, 1998). Appropriately, Flin et al. (2000) have described safety climate as a snapshot of the state of safety in an organization, and that it represents the underlying safety culture of a group, unit or organization (p. 178). In addition, it has been argued that safety culture, by its nature, is difficult to operationalize within a measurement instrument (Hale and Hovden, 1998). However, safety climate is a more valid measure using psychometric questionnaire studies. This also indicates that safety climate, in contrast to safety culture, is more sensitive to local conditions and will, thereby, provide a more timely measure of eroding conditions. One area of increasing interest in measuring the latent risk in emerging safe systems is the use of proactive measurement techniques that can provide leading indicators that supplement the traditional measures of trial and error learning.

This article considers an alternate approach to safety measurement in High Reliability Organizations (HROs) during periods of deliberate organizational change where the traditional measures of incident and accident reporting have historically failed to capture the latent risk evolving in safe systems prior to disaster. Safety is an important, and often vital, outcome for companies operating in high-risk industries. But the concept of safety has proven difficult to define, and even more difficult to measure or predict using the traditional safety metrics of incident and accident reporting (Lofquist, 2008, 2010). This is particularly true for high-risk organizations that rely heavily on the human element in socio-technical systems, sometimes referred to as High Reliability Organizations

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(Rochlin et al., 1987; Weick, 1987; Roberts, 1990; Weick and Roberts, 1993; Weick and Sutcliffe, 2006).

Measuring safety becomes even more challenging under periods of deliberate organizational change when stable safety processes are stressed in unexpected ways (Turner, 1976). High profile theoretical and empirical studies examining disastrous events, such as: Three Mile Island (Perrow, 1984), the Tenerife Air Disaster (Weick, 1993), the Challenger (Vaughan, 1996) and Columbia (Gehman, 2003) Space Shuttle accidents, have all concluded that organizational change in high-risk industries can adversely affect emerging safe systems. This often leads to unexpected failure. Yet, the adverse effects of change on safety processes often go unnoticed mainly due to the subtle nature of safety as an emergent quality of a complex socio-technical system (Hollnagel, 2006). This erosion of safety processes often manifests itself gradually, over time, and this has been described in terms, such as: incubation periods (Turner, 1976), procedural and organizational drift (Rasmussen, 1994; Elsmore, 2001; Dekker, 2006), cultural deviance (Vaughan, 1996), or even the formation of latent conditions (Reason, 1990) that eventually lead to a disastrous event. However, these same studies also revealed that indications of eroding safety processes were, in fact, both present, noticed and even reported upon within the organizations involved without triggering corrective action from the leadership responsible for safe outcomes prior to failure (Vaughan, 1996; Gehman, 2003).

One explanation for leaders not reacting to these warnings could be that they fell well outside of the traditional indicators upon which they were focusing, specifically, the lagging historical indicators of incident and accident reporting. Yet, as organizations become more reliable, and even achieve ultra-safe levels of performance (Amalberti, 2001), nothing to measure (Weick, 1987), at least not through using traditional metrics, leaves organizational leaders with no proactive indicators upon which to evaluate the true state of an evolving safe system. This is particularly true during periods of deliberate organizational change where strong organizational safety cultures might mask, and even partially compensate for deteriorating safe processes. Many techniques focus on studying organizational culture, and leveraging safety climate as a proactive measure (Zohar, 1980). Safety climate, as a proactive indicator, has been studied for over 35 years, but there is still little agreement as to the best mix of cultural dimensions to be included in a safety climate model (Williamson et al., 1997). However, it has been argued that safety climate questionnaires have not been particularly successful in exposing the core of an organizational culture (Guldenmund, 2007), and have also been criticized for lacking a normative framework (Grote and Kunzler, 2000). By normative, Grote and Künzler explain that "cultural analyses allow a description of norms and assumptions more or less shared by the members of the social system and more or less supportive of achieving the system's expressed goals, but no implications about whether the culture is 'good' or 'bad' can be derived" (p. 135). Others, however, have found that there is evidence that a strong safety climate contributes to better safety performance over time (Powell et al., 1971; Zohar, 1980; Glendon and McKenna, 1995; Diaz and Cabrera, 1997), which supports the view that safety climate data, as a snapshot in time, is a potentially important contribution for evaluating evolving safety states within high-risk industries. This is particularly true during periods of organizational change where lagging indicators often miss the signs of latent risk in safe systems prior to failure. This is especially relevant for High Reliability Organizations undergoing strategic change processes where safety climate indicators will react more quickly than the underlying organizational culture itself.

There is growing interest in understanding the influence of organizational change on safety outcomes due to factors such as: the leadership's commitment to safety, safety culture and safety climate (Ciavarelli and Crowson, 2004). However, there is currently little research focusing upon the direct impact of strategic change on organizational safety. The purpose of this article is to increase our knowledge about the effects of change on safety in "ultra safe" industries by presenting and evaluating "other types of indicators," and to show how safety processes are, in fact, adversely affected in a live case, and which organizational factors are most influential in affecting safety levels.

2. Model and hypotheses

2.1. The role of employee attitudes and perceptions in safety behavior

It is clear from the safety literature that employee attitudes and perceptions have a positive relationship to safety behavior (Schneider, 1975; Zohar, 1980; Schneider and Gunnarson, 1991; Cox and Flin, 1998). However, capturing these changes in attitudes and perceptions during periods of change are often missed in ultra safe systems were failure is often avoided due to large safety margins, and other compensating mechanisms (Lofquist, 2010). The purpose of this study was to design a measurement model that would capture the relationships between different safety concepts within a live change context before an actual failure occurred.

The conceptual safety measurement model used in this study, depicted in Fig. 1, consists of two (exogenous) latent independent variables—perception of the Leadership's Commitment to safety (LC) and perception of Safety Climate (SC), one (endogenous) mediating variable—Attitude towards Change (AC), and one (endogenous) dependent variable—Perception of Safety (PS).

The conceptual safety measurement model in Fig. 1 depicts the four latent constructs of interest in this study, and the five hypothesized causal relationships having direct and indirect causal relationships to the main dependent variable – perception of safety.

2.2. Perception of safety (PS)

There is little agreement in the literature for a universal definition of safety. For this study, we have used a variation of the definition provided by Hollnagel (2008) by focusing on safety as a process that produces outcomes that are safe. But, since these processes are embedded within complex socio-technical systems, as represented by High Reliability Organizations, they cannot be measured directly but only indirectly through other indicators. Though there is no agreement on a definition of safety, there is agreement in the literature that individual perceptions of safety guide cognitive processes, and have a direct influence on behavior (Rasmussen, 1986, 1990; Hollnagel, 1998, Mearns et al., 2003; Flin et al., 2000). We argue that these changes in behavior have a direct effect on safety performance. All of the hypotheses below imply either direct or indirect positive causal influences between the

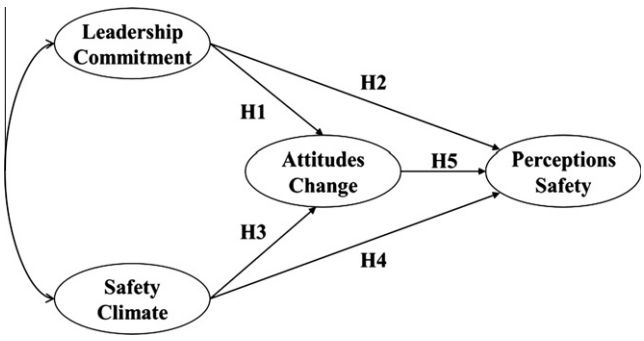

Fig. 1. Safety management model.