# Safety intelligence: An exploration of senior managers' characteristics

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## ABSTRACT

Senior managers can have a strong influence on organisational safety. But little is known about which of their personal attributes support their impact on safety. In this paper, we introduce the concept of 'safety intelligence' as related to senior managers' ability to develop and enact safety policies and explore possible characteristics related to it in two studies. Study 1 ($N = 76$) involved direct reports to chief executive officers (CEOs) of European air traffic management (ATM) organisations, who completed a short questionnaire asking about characteristics and behaviours that are ideal for a CEO's influence on safety. Study 2 involved senior ATM managers ($N = 9$) in various positions in interviews concerning their day-to-day work on safety. Both studies indicated six attributes of senior managers as relevant for their safety intelligence, particularly, social competence and safety knowledge, followed by motivation, problem-solving, personality and interpersonal leadership skills. These results have recently been applied in guidance for safety management practices in a White Paper published by EUROCONTROL.

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## 1. Introduction

Major accident investigations show that senior managers have a particular influence on organisational safety (e.g. Baker, 2007; National Commission on the BP Deepwater Horizon oil spill, 2011). This paper presents two studies carried out in European air traffic management (ATM), which has a good safety record, but nevertheless suffered a major accident (mid-air collision) with 71 fatalities near Überlingen in Germany in 2002. The investigators describe the way senior management deals with safety issues as related to the occurrence of such accidents:

"[…], managers can change and improve existing corporate culture by establishing safety — recognisable for all staff members — as high priority. Feedback and continual reinforcement from the most senior management down will help develop dedication and accountability that is desirable." (p. 90; BFU, 2004).

Senior positions in organisations differ from lower levels (Hambrick, 1989). Senior managers can influence up to 45% of organisations' performance (Day and Lord, 1988) and have a distinct influence on organisational safety (Clarke, 1999). Reviews of the safety climate literature (Flin et al., 2000; Guldenmund, 2007) identified management's attitudes and behaviours as a predominant safety climate factor. Two more recent meta-analyses (Beus et al., 2010; Christian et al., 2009) identified perceptions of management safety commitment as one of the most influential safety climate components in relation to organisational safety performance. While these reviews and meta-analyses suggest that senior managers are central for organisational safety, studies involving senior managers are scarce (Flin, 2003). As a consequence it is unclear which personal attributes support their influence on safety.

In this paper, we examine senior managers' characteristics through the concept of 'safety intelligence'. The strategic leadership literature describes senior managers' understanding of business issues and their ability to develop policies as 'strategic intelligence' (e.g. Yukl, 2001). Accordingly, we use the term 'safety intelligence' as a concept that captures senior managers' understanding of safety issues and knowledge relevant to their policy-making in relation to safety (Kirwan, 2008). Zohar (2008) suggests that the ways in which senior managers develop and enact their policies are central to their influence on safety and their policy-making has been found to significantly contribute to employee safety climate perceptions and safety performance (Cohen, 1977; DeJoy et al., 2004).

The aim of the two studies reported in this paper is to identify the personal characteristics that support senior managers' ability to intelligently manage their organisations' safety, i.e. to make and enact policies that will have a positive effect on safety. Leadership is mostly conceptualised through interpersonal leadership

behaviours with a focus on the relationships that a manager or supervisor establishes with his or her subordinates (Zaccaro and Horn, 2003), and that is also the dominant approach in studies on leadership and safety (e.g. Clarke, 2013). However, in this study, we focus on traits and skills that can support senior managers in having a positive influence on safety, based on the following rationale. According to Zaccaro (2001), senior managers operate at a system wide level and do not have much opportunity to establish such interpersonal relations with members of their organisation. Therefore, interpersonal leadership theories are unlikely to cover all relevant aspects of senior level influence. Our approach follows the tradition of Hambrick and Mason's (1984) upper echelons theory and considers personal characteristics to be relevant for senior managers' influence on safety. Traits (personality & motivation), skills (social competence & problem-solving) and knowledge have been proposed as influencing leader performance (Mumford et al., 2000) and as particularly relevant for strategic management (e.g. Day and Lord, 1988; Hambrick and Mason, 1984). Studies concerned with senior managers' influence on organisational attributes have focussed on their personal characteristics. For example, Huffman and Hegarty (1993) found senior managers' externally oriented expertise and their planning and control abilities to largely influence innovations in organisations. Berson et al. (2008) found CEO values, such as benevolence, security and self-direction, to influence attributes of organisational culture, such as bureaucratic, innovative and supportive culture. Other studies report CEOs' personality (particularly need for achievement) as impacting organisational culture, strategy and structure via the rationality in their strategy making (Miller and Dröge, 1986; Miller et al., 1988; Miller and Toulouse, 1986).

The investigation of senior managers' influence on organisational safety presented in this paper represents an aspect of macroergonomics, i.e. the analysis and design of work systems, which also include organisations. Hendrick (2002) describes this ergonomics discipline as overlapping with organisational psychology and this is also the case for this paper. Consequently, our study sits on the overlapping fringes of ergonomics and organisational psychology in that it addresses a group that crucially shapes macro-level work systems (i.e. organisations) and investigates this issue via psychological characteristics of senior managers.

We investigate this issue in air traffic management (ATM), an industry that majorly contributes to airspace safety (EUROCONTROL, 2005). ATM organizes traffic flow and helps to prevent the collision of aircraft (Federal Aviation Administration, Air Traffic Organization Policy; February, 2010). ATM's services involve balancing safety against other pressures such as traffic throughput, providing short cuts in the airspace, safety benefits and economic costs of a new technological investment (e.g. radar system), or flight level request from pilots in order to reduce the airlines' fuel costs. Findings obtained in this highly reliable industry might be transferable to others and can promote cross-industry learning. The following section introduces the five characteristics (traits, skills and knowledge) we suggest as relevant for senior managers' safety intelligence.

### 1.1. Traits: personality and motivation

We propose the Big Five personality factors (Costa and McCrae, 1992) to support senior managers' ability to develop effective strategic safety policies and to enact them. For example, a senior manager who is highly extraverted may communicate his or her safety policies more forcefully. A more agreeable senior manager may be able to create a greater sense of trust, which can be positively related to safety (Clarke and Robertson, 2005) and can help them to enact the safety policies convincingly. According to

Peterson et al. (2003), conscientious senior managers are more likely to be task focused, and thus may develop safety related policies more cautiously. A senior manager who is low on emotional stability may be less effective in actively and safely controlling stressful situations (Clarke and Robertson, 2005) and this might affect his or her capability to develop effective safety policies. Senior managers' openness to experience may support them in being more receptive to learning (Clarke and Robertson, 2005), helping them to develop a broader range of safety knowledge and consequently devise better safety policies.

In addition, a motivational trait conceptualised as regulatory focus (Crowe and Higgins, 1997) that has previously been applied to safety (Wallace and Chen, 2006), might influence senior managers' safety policy-making. Motivational traits have been found to relate to senior managers' impact on other organisational outcomes (e.g. structure; Miller and Dröge, 1986). Regulatory focus describes individuals to be motivated towards a goal via a pronounced promotion and prevention focus. Promotion focus leads individuals to follow an eagerness strategy and a desire to complete tasks quickly. A pronounced prevention focus leads individuals to follow a vigilance strategy and avoid negative outcomes (Wallace et al., 2008), thus avoiding risks when developing and communicating safety policies. Accordingly, a prominent prevention focus may support senior managers' safety intelligence. This can arise through two mechanisms: first, more prevention focussed managers might pay more attention to detail and spend more time on safety issues. Time is usually a limited resource for senior managers and the amount of time they spend on safety issues has been described as conveying their personal value for safety (Flin, 2003). Secondly, a more pronounced prevention focus might support managers to prioritise safety issues in their policies and communication with the workforce.

### 1.2. Skills: problem-solving and social competence

Management's approach towards safety related problems can function as a frame of reference for the workforce and can reflect senior managers' commitment to safety (Zohar and Luria, 2005). We suggest that creative problem-solving (Isaksen and Treffinger, 2004; i.e. investigation of problems, idea generation, planning ability) supports senior managers' safety intelligence as it ultimately contributes to the ways in which managers devise safety policies. Because the way senior managers solve problems shapes organisations and work conditions (e.g. equipment, staffing level), this can also have an immediate effect on the perceived status of safety in organisations.

Personable communication of senior managers with the workforce is frequently emphasised as relevant to conveying their safety messages (e.g. Harper et al., 1996; Hopkins, 2011). A recent study involving senior managers has investigated their language as a leadership tool through which they might influence organisational safety culture (Fruhen et al., 2013a). Accordingly, social competence (Baron and Markman, 2000; i.e. their ability to interact with others effectively through for example perception of others intentions, persuasion) can contribute to senior managers' ability to communicate about safety with subordinates and support the ways in which they enact safety policies.

### 1.3. Knowledge

Finally, safety knowledge may also contribute to senior managers' safety intelligence. Knowledge has been described as one of the main tenets of senior managerial power (Finkelstein, 1992) and has been reported to relate to safety performance at other levels of the organisation (e.g. Griffin and Neal, 2000). Safety knowledge can enable senior managers to understand safety related information