



## Profiling contextual factors which influence safety in heavy vehicle industries



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### ABSTRACT

A significant proportion of worker fatalities within Australia result from truck-related incidents. Truck drivers face a number of health and safety concerns. Safety culture, viewed here as the beliefs, attitudes and values shared by an organisation's workers, which interact with their surrounding context to influence behaviour, may provide a valuable lens for exploring safety-related behaviours in heavy vehicle operations. To date no major research has examined safety culture within heavy vehicle industries. As safety culture provides a means to interpret experiences and generate behaviour, safety culture research should be conducted with an awareness of the context surrounding safety. The current research sought to examine previous health and safety research regarding heavy vehicle operations to profile contextual factors which influence health and safety. A review of 104 peer-reviewed papers was conducted. Findings of these papers were then thematically analysed. A number of behaviours and scenarios linked with crashes and non-crash injuries were identified, along with a selection of health outcomes. Contextual factors which were found to influence these outcomes were explored. These factors were found to originate from government departments, transport organisations, customers and the road and work environment. The identified factors may provide points of interaction, whereby culture may influence health and safety outcomes.

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### 1. Introduction

In the 10 year period from 2003 to 2012, 30% ( $n=787$ ) of all worker fatalities in Australia resulted from truck-related incidents (Safe Work Australia, 2014). Though approximately three quarters of these fatalities occurred on public roads, 15% occurred during loading and unloading, and 7% during maintenance. During the 10 year period, a further 298 bystanders were killed, including drivers or passengers of vehicles (not including the truck driver), and pedestrians. In addition to fatalities, a high number of truck drivers are injured as a result of crashes or other workplace incidents. Injury compensation data from Queensland revealed that between 2008 and 2009 the transport and storage sector received 2718 accepted injury claims, at a rate of 21.7 per 1,000 workers (Queensland Workplace Health and Safety Board, 2010). This rate was second only to the manufacturing industry and approximately 50% higher than the all-industry average. Furthermore, the Australian heavy vehicle industry has been identified as having high rates of many other health concerns

including poor mental health, obesity, arthritis and rheumatism, lung diseases, and heart and intestinal problems (The Work Outcome Research Cost-Benefit (WORC) Project, 2008). There is a clear need to advance our understanding of health and safety within this industry and identify approaches for intervention.

Safety culture has been the focus of much research in recent years, and may provide a valuable lens with which to examine heavy vehicle operations. There are many definitions and approaches to safety culture, often reflecting, in part, the background of researchers (see reviews by Choudhry et al., 2007; Edwards et al., 2013; Guldenmund, 2000). Safety culture is often simply referred to as "the way we do things around here" (Guldenmund, 2000). Whilst this phrase was first applied to corporate cultures, as separate to safety, the phrase has gained popularity in safety culture research. This is perhaps due to the fact that the phrase shows safety culture as something that is highly abstract and implicit, yet provides members of an organisation with an intrinsic sense of what ought to be done. Given the high level of worker autonomy in heavy vehicle operations (Arboleda et al., 2003), it appears important to understand the factors which contribute to a driver's understanding of what ought to be done.

In terms of the content of safety culture, there are two main approaches in the literature, one which emphasises shared

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psychological constructs, and the other which emphasises behaviour and organisational structures and systems (Nævestad, 2009). In a recent review of the safety culture literature, Edwards et al. (2013) argued that the differing approaches to safety culture could be better viewed as multiple components of a single construct. Safety culture was then defined as “the assembly of underlying assumptions, beliefs, values, and attitudes shared by members of an organisation, which interact with an organisation’s structures and systems and the broader contextual setting to result in those external, readily-visible, practices that influence safety” (p.77). When viewed as a single construct, safety culture holds promise as a framework to understand health and safety within heavy vehicle operations. Safety culture could provide an understanding of the average psychological factors associated with heavy vehicle safety, as well as the context which interacts with this culture to influence behaviour. Research may then provide insight for the design of interventions that are congruent with the beliefs and values of the workforce (Edwards et al., 2013; Guldenmund, 2010b).

To date there has been no major research examining safety culture within heavy vehicle industries. There is, however, some research examining safety climate. Huang et al. (2013) developed a safety climate survey for lone workers, using truck drivers as an exemplar. Following testing, it was found that proactive practices, driver safety priority, and supervisory care promotion were dimensions of organisational level safety climate, while safety promotion, delivery limits, and cell phone disapproval were safety climate dimensions at a group level.

Detailing the differences between safety climate and culture are beyond the scope of the present manuscript, however, it is important to note that safety culture and climate are related, yet different concepts (Huang et al., 2013). Safety climate has been described as the aggregate perception of workers regarding the priority placed on safety by the organisation (Huang et al., 2013; Zohar, 2010). Neal and Griffin (2002) state that safety climate “refers to perceptions of policies, procedures, and practices relating to safety in the workplace” (p.67). As these perceptions may be influenced by shared beliefs, attitudes and values, safety climate can be viewed as a culturally-influenced measure of the organisational context. Further, when examining the factors used by Huang et al. (2013) it can be seen that they largely centre on the perceived attitude and actions of management, and give little attention to deeper shared beliefs, attitudes and values of the workers themselves.

Other research, which did not aim to explore safety culture or climate, has identified a number of safety-relevant beliefs, attitudes or values that were common among samples of heavy vehicle drivers. These have included a tendency to view others as less safe than oneself (Baas et al., 2000; Friswell and Williamson, 2010; Walton, 1999), prioritising road safety over other forms of safety (Friswell and Williamson, 2010; Shibuya et al., 2010), attitudes towards the effectiveness of enforcement and regulations (Douglas and Swartz, 2009; Snyder, 2012), conflict between profit and risk taking (Helmkamp et al., 2004; Summala and Pihlman, 1993), attitudes towards receiving feedback (Huang et al., 2005, 2008; Roetting et al., 2003; Zhang et al., 2006), valuing personal experience over rules (Snyder, 2012), valuing working hard and getting the job done (Snyder, 2012), and desiring to fit in with the ‘trucking image’ (Davey et al., 2007).

Prior to exploring culture, it is important to gain an insight into the context within which a culture is located. As stated by Schein (1992) behaviour is not solely the product of culture but is also the result of contextual variables. Further, it could be argued that culture only gains meaning towards behaviour when it meets with specific contextual or situational factors, serving as a stimulus for action. This is congruent with one definition of culture put forward

by Guldenmund (2010a) who stated that culture is used by a group to “interpret experience and generate behaviour that distinguishes them from other groups or categories of people” (p.1472). It is important to consider what contextual or situational factors may provide experiences to be interpreted through culture.

From the first use of the phrase safety culture, in regards to the Chernobyl disaster, it was reported that a lack of safety culture, both within the Chernobyl plant and at a national level, contributed to the incident (INSAG-1, 1986, as updated in INSAG-7, International Nuclear Safety Advisory Group, 1992). Thus, it is evident that broader contextual influences, even on a national scale, are relevant to the safety culture framework. In Edwards et al. (2013) definition of safety culture provided above, this was highlighted by indicating that both organisational structures and systems, as well as “the broader contextual setting” interact with culture. To truly understand the influence culture has on safety, it is important to gain an understanding of the context surrounding workers, an organisation and even an industry.

Within the broader safety culture literature, contextual factors have almost exclusively been investigated at an organisational level. These have included organisational management systems, policies and procedures, job design, work pressures, training, employee involvement in decision making and perceptions and attitudes regarding the work environment (Arboleda et al., 2003; Choudhry et al., 2007; Cox and Cheyne, 2000; Grote, 2008; Håvold, 2010; O’Toole, 2002; Parker et al., 2006). Though broader contextual factors are beginning to be explored in the related field of traffic safety culture (for examples, see Edwards et al., 2014; Girasek, 2011; Nævestad and Bjørnskau, 2012; Ward et al., 2010; Wiegmann et al., 2007; Williams and Haworth, 2007), little safety culture research in workplace settings has sought to examine these factors, or how they may interact with culture to influence safety.

The absence of safety culture research does not mean that there is no information on the cultural context surrounding heavy vehicle operations. A significant amount of research has sought to examine external influences on safety without using a safety culture framework. In order to lay a foundation for future exploration of safety culture within heavy vehicle industries, it is beneficial to profile external factors identified in past heavy vehicle research as relevant to health and safety outcomes (crash, injury, and illness) or safety-related behaviours. The present research consists of a review of the heavy vehicle health and safety literature seeking to profile health and safety behaviours and outcomes (as a mechanism through which contextual factors may influence safety) as well as contextual factors shown to influence these behaviours, or outcomes directly.

## 2. Method

In order to access as much of the existing literature on heavy vehicle safety as possible, a thorough search was conducted using a number of databases including EBSCOhost, Emerald, INFORMIT, Proquest and Scencedirect. The following search phrases were used (or the equivalent for a given database):

“heavy vehicle” OR “heavy goods vehicle” OR “large goods vehicle” OR “truck” OR “lorry”) AND (“health” OR “safety” OR “accident” OR “injury” OR “crash”)

A number of approaches were used to limit the number of records returned. Firstly, in order to exclude articles with only passing reference to the search terms, the terms were limited to search only the title, abstract, and keywords. Additionally, though there is a significant degree of grey literature surrounding heavy vehicle safety; the search was limited to peer-reviewed journal articles or peer-reviewed conference papers in order to maximise the quality of papers reviewed. Each article was assessed for eligibility based upon the two focuses of the current review. That

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