



Associations between task, training and social environmental factors and error types involved in rail incidents and accidents

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ABSTRACT

Rail accidents can be understood in terms of the systemic and individual contributions to their causation. The current study was undertaken to determine whether errors and violations are more often associated with different local and organisational factors that contribute to rail accidents. The Contributing Factors Framework (CFF), a tool developed for the collection and codification of data regarding rail accidents and incidents, was applied to a sample of investigation reports. In addition, a more detailed categorisation of errors was undertaken. Ninety-six investigation reports into Australian accidents and incidents occurring between 1999 and 2008 were analysed. Each report was coded independently by two experienced coders. Task demand factors were significantly more often associated with skill-based errors, knowledge and training deficiencies significantly associated with mistakes, and violations significantly linked to social environmental factors.

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1. Introduction

From January 2001 to December 2010, 392 fatalities have occurred in Australia from rail accidents (Australian Transport Safety Bureau, 2011). In the year 2009, railway accidents in European Union countries lead to 1391 deaths, although a relatively small number of these fatalities were passengers (European Railway Agency, 2011). Rail may not experience the high numbers of fatalities seen in other industries such as road transport (see Bureau of Infrastructure Transport and Regional Economics, 2010), however, as a complex safety critical industry with a considerable passenger transport component, there is an ever-present risk of a catastrophic event occurring. This risk has been realised in numerous accidents overseas and locally and motivates the need to better understand why these accidents occur, and how they can be prevented.

Applying systems theory to understanding accidents facilitates a broad and holistic perspective of problems: from the actions of the individuals involved, to the organisational processes and management decisions that affected the outcome, as well as the wider social and environmental context such as community expectations and government influences. A systems approach has been

demonstrated to provide a valuable basis for the analysis of accident data (see for example, Hobbs and Williamson, 2003; Li and Harris, 2006).

Reason's model of accident development in organisations (the 'Reason model', 1990, 1995, 1997, 2008) is a systemic model that is widely accepted in the accident prevention field and has been highly influential since it was first published (Hauer, 2010; Hayward et al., 2008). The model acknowledges the role of human error at all levels of the organisational system, and the futility of focusing accident investigations only on errors by front line personnel. The Reason model has informed the development of many tools and methods utilised in system safety analyses such as the Incident Cause Analysis Method (ICAM, De Landre et al., 2007), the Human Factors Analysis and Classification System (HFACS, Wiegmann and Shappell, 2003) and the Contributing Factors Framework (CFF, Rail Safety Regulators' Panel, 2009). These approaches typically involve identifying errors or deficiencies at different levels of the system such as the individual level, the local workplace level, the organisational level and the external environment.

2. Previous research exploring contributing factors and their associations

Previous studies that have aimed to identify contributing factors to rail accidents have been limited to reporting only frequencies of contributing factors based on investigation of incidents and analysis of the factors identified (Reinach and Viale, 2006)

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