

# The structure of contributing factors of human error in safety-critical industries

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## Abstract

This paper presents the development of a human factors assessment tool for safety-critical industries. The assessment tool is a questionnaire about human factors issues that can cause human error and accidents in consequence. It is based on the 'Dirty Dozen' human error concept of Dupont (1997, as cited in Safety Regulation Group, 2002). The advantage of this concept is the adaptable nature in the applied field. Moreover, it was intended to search for a latent structure behind the dirty dozen concept. Hence, a questionnaire with 240 items was tested and optimised in two large metal manufacturing companies. In order to find a hidden structure behind the dirty dozen, a factor analysis of all twelve scales was performed. The factor analysis yielded three factors: *Organizational Interaction & Resources*, *Mental Workload* and *Social Dominance*. Results are discussed in terms of their utility for human error research.

## Introduction

Human error can play a significant role in the contribution to incidents and accidents. In most industries more than 70 to 90 percent of factors that cause an accident refer to human error (Hollnagel, 1993). There exist various academic models of human error (Reason, 1990; Rasmussen, 1986). On the contrary, there is only a small number of more practice-oriented concepts. Most of academic models have good explanatory power concerning the cognitive structures and processes underlying human error. However, they often lack their adaptability in the field context. One human error concept which was found very adaptable is the 'Dirty Dozen' concept of Dupont (1997, as cited in Safety Regulation Group, 2002). The dirty dozen have been found to be the 12 most common causes of human error in aviation maintenance. Today, many airlines use this concept in their incident and accident analyses and also for their maintenance human factors training programs (Safety Regulation Group, 2002). The dirty dozen encompass different categories of human factors that contribute to accidents. These categories are individual factors like *lack of awareness*, *complacency*, *lack of knowledge*, *lack of assertiveness*, *distraction*, *fatigue*, *stress*, social factors like *lack of teamwork*, *lack of communication*, *social norms*, and contextual conditions like *pressure* and *lack of resources*. Nevertheless,

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