6th German Conference on Rail Human Factors
18th/19th February 2025

Development of Human Factors toolkit to inform behavioural research in the railway domain

Sarah A. Kusumastuti[a], Tom H.J. Kolkman[a], Julia Lo[b], Simone Borsci[a, c]

The application of automated systems in rail operations should account for its impact on train operators. The introduction of automation is expected to transform the duties and responsibilities of train operators, or more generally, the job description itself. We synthesised information from academic literature on human factors research in railway and developed a toolkit that identifies a set of human factors constructs that were commonly measured by practitioners in the railway domain, particularly in human-in-the-loop (HITL) simulations. This toolkit acts as a guide in the decision of how to assess the impact of new technology in train operations from a human factors perspective, which consists of among others the impact of operator experience with the system or impacts on their job performance. We involved 11 rail human factors experts to review and validate information from the literature and contribute to the list of tools and measurements. We found that researchers were interested in task performance, workload, communication, situation awareness, attention allocation, user experience and usability, fatigue, responsiveness, vigilance, and trust in automation. We compiled various objective and subjective measures used to measure the constructs from physiological measurements like eye tracking to ethnographic studies and behavioural scales.

Author Affiliations:

a. Faculty of Behavioural, Management and Social Sciences, Dep. Learning, Data analytics and Technology, Human Factors team of the CoDE group, University of Twente, Capitool 15, Enschede 7521 PL, The Netherlands

b. ProRail, Department of Innovation and Development, Moreelsepark 3, 3511 EP Utrecht, The Netherlands

c. Faculty of Medicine, Dep. Surgery and Cancer, NIHR UK HealthTech Research Center in In Vitro Diagnostics, Imperial college of London, St Mary's Hospital, Praed Street, London, W2 1NY, United Kingdom