

Case Study Analysis of 2017 European Railway Traffic Management Incident: The Application of System for Investigation of Railway Interfaces Methodology

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Abstract : This paper presents the results of the modelling and analysis of the European Railway Traffic Management (ERTMS) safety-critical incident to raise awareness of biases in the systems engineering process on the Cambrian Railway in the UK using the RAIB 17/2019 as a primary input. The RAIB, the UK independent accident investigator, published the Report-RAIB 17/2019 giving the details of their investigation of the focal event in the form of immediate cause, causal factors, and underlying factors and recommendations to prevent a repeat of the safety-critical incident on the Cambrian Line. The Systems for Investigation of Railway Interfaces (SIRI) is the methodology used to model and analyze the safety-critical incident. The SIRI methodology uses the Swiss Cheese Model to model the incident and identify latent failure conditions (potentially less than adequate conditions) by means of the management oversight and risk tree technique. The benefits of the systems for investigation of railway interfaces methodology (SIRI) are threefold: first is that it incorporates the “Heuristics and Biases” approach advanced by 2002 Nobel laureate in Economic Sciences, Prof Daniel Kahneman, in the management oversight and risk tree technique to identify systematic errors. Civil engineering and programme management railway professionals are aware of the role “optimism bias” plays in programme cost overruns and are aware of bow tie (fault and event tree) model-based safety risk modelling techniques. However, the role of systematic errors due to “Heuristics and Biases” is not appreciated as yet. This overcomes the problems of omission of human and organizational factors from accident analysis. Second, the scope of the investigation includes all levels of the socio-technical system, including government, regulatory, railway safety bodies, duty holders, signaling firms and transport planners, and front-line staff such that lessons are learned at the decision making and implementation level as well. Third, the author’s past accident case studies are supplemented with research pieces of evidence drawn from the practitioner’s and academic researchers’ publications as well. This is to discuss the role of system thinking to improve the decision-making and risk management processes and practices in the IEC 15288 systems engineering standard and in the industrial context such as the GB railways and artificial intelligence (AI) contexts as well.

Keywords : accident analysis, AI algorithm internal audit, bounded rationality, Byzantine failures, heuristics and biases approach

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