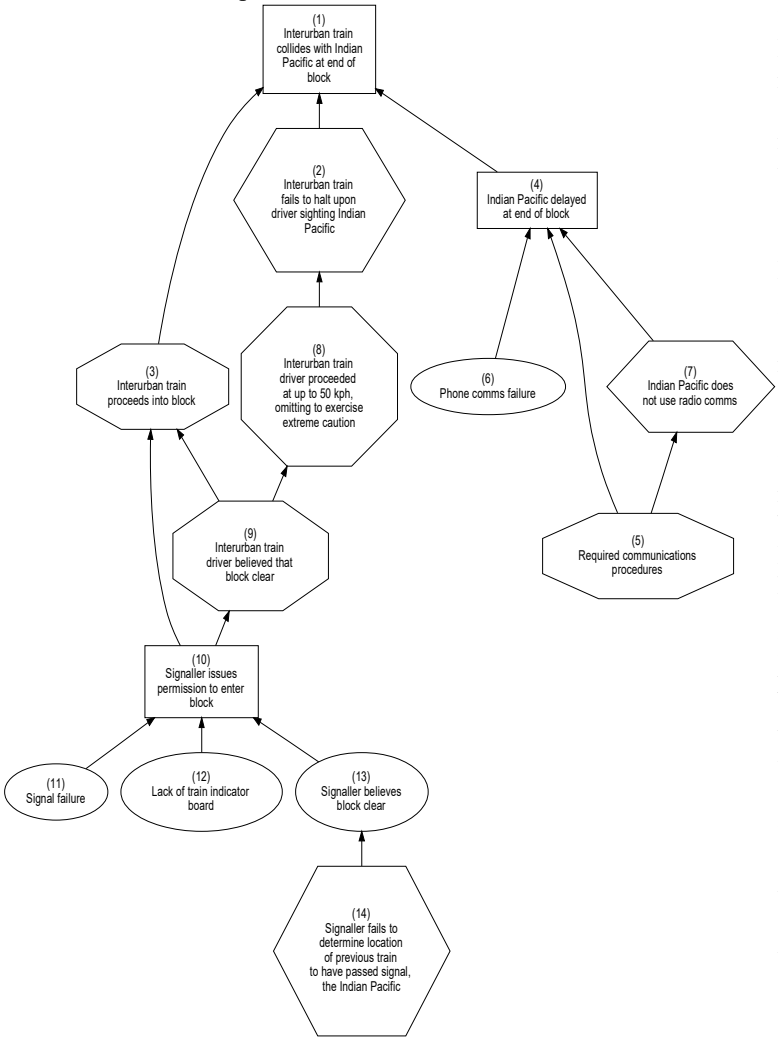
WHY-BECAUSE ANALYSIS

Why-Because Analysis (WBA) is a rigorous method for investigating unwanted system behavior and failures (incidents and accidents). WBA examines and derives the causal relationships between the factors and can be used as an informal, semi-formal or formal method.
WBA makes no assumptions about the nature and structure of the technical or socio-technical systems under investigation and is therefore not limited to specific application domains. To date, WBA has been successfully used in the investigation of incidents in aviation, on the railway, in shipping, in computer security and in industrial-plant engineering, both for industrial purposes and for criminal and civil legal purposes.

The formalism in WBA enables relative-completeness, objectivity, falsifiability and reproducibility of the analysis results to be as far as possible assured.



The result of a WBA is available as a Why-Because Graph (WBG), which is the visual representation of the causal relationships of an incident and which can easily be interpreted by non-experts. A timeline, a diagram showing the timing of events and their participants, accompanies the WBG.

Mathematically, a WBG is a directed, acyclic graph. The nodes of the WBG represent causal factors of an incident.The directed edges represent cause-effect relationships between the factors.

To check the correctness of a cause-and-effect relationship, the Counterfactual Test (CT), based on work of David Lewis and David Hume, is used. "If the (potential) causal factor had not occured, could the effect have occurred?"
If this test is answered with "no", then the potential causal factor is a "necessary causal factor" (abbr. NCF).
Use of the CT ensures that all nodes in the WBG are correctly linked.

To test the relative completeness of a WBG, the Causal Sufficiency Test (CST) is used. "Does the effect necessarily occur, if all listed causes are present?" If this question is answered "yes" then the group of factors tested is relatively complete and the CST is passed.

Both tests work on small sections of the WBG. The mathematical properties of the tests make sure that if all subgraphs of the WBG pass the CT and the CST, then the entire graph passes the test. Complex analyses can thus be reduced to manageable sub-analyses.

Contact: Workgroup RVS, Faculty of Technology, Bielefeld University
Tim Schürmann
Mail: tschuerm@techfak.uni-bielefeld.de

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Universitätsstrasse 25 , 33615 Bielefeld , Germany