



# **FRAM: The Functional Resonance Analysis Method: Modelling Complex Socio-technical Systems**

*Erik Hollnagel*

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Since the first book was published in 2006, resilience engineering has consistently argued that safety is more than the absence of failures. Several book chapters and papers have illustrated the advantage in going behind 'human error' and beyond the failure concept, and various complicated accidents have accentuated the need for it. But there has not yet been a comprehensive method for doing so; the Functional Resonance Analysis Method (FRAM) fulfils that need. Whereas commonly used methods explain events by interpreting them in terms of an already existing model, the FRAM is used to produce a model of what is needed for everyday performance to go right. This can then be applied to explain specific events, by showing how functions can be coupled and how the variability of everyday performance sometimes may produce unexpected and out-of-scale outcomes - either good or bad. The FRAM is based on four principles: equivalence of failures and successes, approximate adjustments, emergence, and functional resonance. Since the FRAM is a method rather than a model, it makes no assumptions about how the system under investigation is structured or organised, nor about possible causes and cause-effect relations. Instead of looking for specific failures and malfunctions, the FRAM explains outcomes in terms of functional coupling and resonance. This book presents a detailed and tested method that can be used to model how complex and dynamic socio-technical systems work, and understand both why things sometimes go wrong but also why they normally succeed.



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