



**Applied Risk Management Specialty Group  
Relevant Scientific Literature  
April 2019**

1. Aven, T. (2017) "Improving risk characterisations in practical situations by highlighting knowledge aspects, with applications to risk matrices", *Reliability Engineering and System Safety* 167 (2017) 42–48. DOI: 10.1016/j.ress.2017.05.006 ..... 3
2. Aven, T. and L. Cox Jr (2016) "National and Global Risk Studies: How Can the Field of Risk Analysis Contribute?" *Risk Analysis*, Vol. 36, No. 2, 2016 DOI: 10.1111/risa.12584 ..... 3
3. Blodgett, J. (2015) "Struggling with the Ethical Limits of Expected Value Utilitarianism as Applied to Positive and Negative Singularities", *Existential Risk/Opportunity Singularity Management*, October 2015..... 4
4. Chawla, J., D. Singh, B. Sundaram and A. Kumar (2017) "Identifying Challenges in Assessing Risks of Exposures of Silver Nanoparticles", *Exposure and Health*, 1-15..... 4
5. Haimes, Y., S. Kaplan and J. Lambert (2002) "Risk Filtering, Ranking, and Management Framework Using Hierarchical Holographic Modeling", *Risk Analysis*, Volume 22, Issue 2, pp 383-397. DOI: 10.1111/0272-4332.00020..... 4
6. Khan, K. (2017) "Post-disaster Policy Decision Making and the Prospects of Human Rights-The Case of Fukushima Daiichi Nuclear Power Plant Accident", *Sociology and Anthropology* 6(1): 116-134, 2018. DOI: 10.13189/sa.2018.060111 ..... 5
7. Lathrop, J. and B. Ezell (2016) "Validation in the Absence of Observed Events", *Risk Analysis* 36(4) April 2016, pp 653-665. DOI:10.1111/risa.12442, Special Issue on Adversary Behavior: Validating the Models ..... 5
8. Lathrop, J. and B. Ezell (2017) "A systems approach to risk analysis validation for risk management", *Safety Science* 99(B) November 2017, pp. 187-15. DOI: 10.1016/j.ssci.2017.04.006, Special Issue on Risk Analysis Validation and Trust in Risk Management..... 6
9. Lathrop, J. and B. Ezell (2017) "Validating Terrorism Risk Assessment Models – Lessons Learned from 11 Models", Chapter 4, *Improving Homeland Security Decisions*, Cambridge University Press, September 2017., pp. 54-84. DOI: 10.1017/9781316676714. .... 6
10. Lathrop, J. and J. Linnerooth (1983) "The Role of Risk Assessment in a Political Decision Process", *Advances in Psychology* 14, 1983, pp. 39-68. DOI:10.1016/S0166-4115(08)62225-6 7

11. Lathrop, J. and J. Post (2012) “The Modeler Meets the SME: The Challenge of Integrating Quantitative and Qualitative Models of Terrorist Decision Making”, *Democracy and Security* 8 2012, pp. 266–276. DOI:10.1080/17419166.2012.710152 ..... 7
12. Peace, C., V. Mabin and C. Cordery (2017) “Due diligence: a panacea for health and safety risk governance?”, *Policy and Practice in Health and Safety*, 15(1), 19-37. DOI: 10.1080/14773996.2016.1275497 ..... 8
13. Yellman, T. (draft) “Interpreting Aleatory Uncertainty and Epistemic Uncertainty” ..... 8

## Submission with Abstract

1. Aven, T. (2017) “Improving risk characterisations in practical situations by highlighting knowledge aspects, with applications to risk matrices”, *Reliability Engineering and System Safety* 167 (2017) 42–48. DOI: 10.1016/j.ress.2017.05.006  
<https://www.sciencedirect.com/science/article/pii/S0951832016306950>

Abstract: Current practice for risk characterisations is based on methods reflecting threats, their consequences and probability, as well as concepts like risk factors and sources. The risk matrix is an example of such a method. The risk analysis field has demonstrated that there are many challenges related to this practice and there is a substantial potential for improvements in how the characterisations can be conducted. The key is to better reflect the knowledge aspect of risk. The purpose of the present paper is to present a set of practical methods that can be used for characterising risk in this setting in line with these findings of the risk analysis field. Extended risk matrix approaches are highlighted. These approaches include strength of knowledge judgements and rankings of risk factors and assumptions supporting the analysis. Special attention is given to potential surprises relative to the current knowledge. Simple examples are presented to illustrate the use of these methods and approaches.

2. Aven, T. and L. Cox Jr (2016) “National and Global Risk Studies: How Can the Field of Risk Analysis Contribute?” *Risk Analysis*, Vol. 36, No. 2, 2016 DOI: 10.1111/risa.12584

Abstract: Recent years have seen several studies and reports that seek to improve understanding, communication and treatment of national and global risks.(1–9) The Global Risk Report by the World Economic Forum(1) is one of the most comprehensive, and its message is in the news worldwide. A “risk landscape” is presented using the dimensions of likelihood and impact, developed from a survey of almost 900 members of the World Economic Forum’s global multi stakeholder community. Although the scope differs for global compared to national risk assessments, they all seek to inform relevant decisionmakers. The increasing number of such studies and reports indicates that they are perceived to meet a need and are actually used to inform risk management and governance.

Surveys also support this thesis; see for example the Global Risk Report,(1) which states that many stakeholders use the report in relation to crisis management preparation and exercises, and the training of decisionmakers. These studies and reports are the point of departure for this current topic article. We question: how can the field/science of risk analysis contribute to improving these studies and reports? Risk analysis is here understood, following long practice within the Society for Risk Analysis (SRA) community, to include risk assessment, risk characterization, risk communication, risk management, and policy relating to risk, in the context of risks of concern to individuals, to public and private sector organizations, and to society at a local, regional, national, or global level.(10) The importance of these studies and reports makes it essential that they should build on the best knowledge available within risk analysis. We argue that current practice can be significantly improved by paying closer attention to:

- (1) the risk concept;
- (2) how risk is described;
- (3) the use of surveys to describe risk;

(4) the practical use of the studies and reports.

Can the studies and reports be a tool for prioritizing risks? We refer mainly to the Global Risk Report, but most of the discussion applies to all works of this type.

3. Blodgett, J. (2015) "Struggling with the Ethical Limits of Expected Value Utilitarianism as Applied to Positive and Negative Singularities", Existential Risk/Opportunity Singularity Management, October 2015.  
Available at <http://www.global-risk-sig.org/pub.htm>

Opening Paragraph: How do we choose where to steer potential singularities? How do we address negative singularities, i.e. existential risks? Before we steer anywhere we need a direction, and we need a compass to point that direction. The greatest good for the greatest number, the goal of utilitarianism, sounds like it might be that compass. But we need to look deeper.

4. Chawla, J., D. Singh, B. Sundaram and A. Kumar (2017) "Identifying Challenges in Assessing Risks of Exposures of Silver Nanoparticles", Exposure and Health, 1-15.  
Research Gate:  
[https://www.researchgate.net/profile/Arun\\_Kumar360/publication/314080855\\_Identifying\\_Challenges\\_in\\_Assessing\\_Risks\\_of\\_Exposures\\_of\\_Silver\\_Nanoparticles/links/5a880d6caca272017e5c85df/Identifying-Challenges-in-Assessing-Risks-of-Exposures-of-Silver-Nanoparticles.pdf](https://www.researchgate.net/profile/Arun_Kumar360/publication/314080855_Identifying_Challenges_in_Assessing_Risks_of_Exposures_of_Silver_Nanoparticles/links/5a880d6caca272017e5c85df/Identifying-Challenges-in-Assessing-Risks-of-Exposures-of-Silver-Nanoparticles.pdf)

Abstract: Silver nanoparticles (AgNPs) find applications in many consumer products due to their unique properties. It is imperative to contend with the safety issues in respect of AgNPs during manufacturing, usage, and after disposal, as manufacturers as well as consumers are likely to be exposed to these particles. This review seeks to scrutinize the current challenges in obtaining input parameters for conducting risk assessment of exposure to Ag NPs and specifically focuses on exposures of humans to Ag NPs through oral ingestion of Ag NPs via edible parts of plants, water, soil ingestion, and fish, and through dermal uptake exposure pathways. The present status of toxicological studies of silver nanoparticles and challenges in assessing risks of exposure to silver nanoparticles has been discussed in detail. The limited and contradictory existing data imply that prudence must be exercised when potential exposures to silver nanoparticle emerge from different routes.

5. Haimes, Y., S. Kaplan and J. Lambert (2002) "Risk Filtering, Ranking, and Management Framework Using Hierarchical Holographic Modeling", Risk Analysis, Volume 22, Issue 2, pp 383-397. DOI: 10.1111/0272-4332.00020  
<https://onlinelibrary.wiley.com/doi/full/10.1111/0272-4332.00020>

Abstract: This paper contributes a methodological framework to identify, prioritize, assess, and manage risk scenarios of a large-scale system. Qualitative screening of scenarios and classes of scenarios is appropriate initially, while quantitative assessments may be applied once the set of all scenarios (hundreds) has been prioritized in several phases. The eight-phase methodology is described in detail and is applied to operations other than war. The eight phases are as follows:

Phase I, Scenario Identification—A hierarchical holographic model (HHM) is developed to describe the system's "as planned" or "success" scenario. Phase II, Scenario Filtering—The risk scenarios identified in Phase I are filtered according to the responsibilities and interests of the current system user. Phase III, Bi-Criteria Filtering and Ranking. Phase IV, Multi-Criteria Evaluation. Phase V, Quantitative Ranking—We continue to filter and rank scenarios based on quantitative and qualitative matrix scales of likelihood and consequence; and ordinal response to system resiliency, robustness, redundancy. Phase VI, Risk Management is performed, involving identification of management options for dealing with the filtered scenarios, and estimating the cost, performance benefits, and risk reduction of each. Phase VII, Safeguarding Against Missing Critical Items—We examine the performance of the options selected in Phase VI against the scenarios previously filtered out during Phases II to V. Phase VIII, Operational Feedback—We use the experience and information gained during application to refine the scenario filtering and decision processes in earlier phases. These eight phases reflect a philosophical approach rather than a mechanical methodology. In this philosophy, the filtering and ranking of discrete scenarios is viewed as a precursor to, rather than a substitute for, consideration of the totality of all risk scenarios.

6. Khan, K. (2017) "Post-disaster Policy Decision Making and the Prospects of Human Rights-The Case of Fukushima Daiichi Nuclear Power Plant Accident", *Sociology and Anthropology* 6(1): 116-134, 2018. DOI: 10.13189/sa.2018.060111  
Google Scholar: <http://www.hrpub.org/download/20171230/SA11-19610791.pdf>

Abstract: The day of 11 March 2011 will be sadly remembered in the history of the rise and rise of nuclear power since its discovery a couple of centuries ago due to Fukushima Daiichi Power Plant accident, the third in the series of colossal nuclear accidents after 'Three Mile Island' (USA) and 'Chernobyl' (Ukraine, former Soviet Union). Each of these accidents reminded the international community of the risk inherent in nuclear technology, however, the demand for the so called clean energy and assertive approach of nuclear industry continued to push forward proliferation of technology in power generation. Five years down the line and despite government efforts to normalize the situation, the apprehensions about Fukushima evacuees' resettlement, economic uplift, political stability, governance and fulfillment of human rights including health consequences of radiation from Fukushima fall out on the affected population and workers, still linger on. This paper provides an account of post-disaster multi-faceted issues and challenges that came in the wake of disaster during the period 2011-2016 as seen through the lens of media and assessed in the prospects of human rights. The policy analysis is framed within the scope of the UN 'Bill of Rights' in four thematic areas: natural/fundamental rights and liberties, political and socioeconomic perspective, development, technological and environmental perspective, and governance and legal perspective.

7. Lathrop, J. and B. Ezell (2016) "Validation in the Absence of Observed Events", *Risk Analysis* 36(4) April 2016, pp 653-665. DOI:10.1111/risa.12442, Special Issue on Adversary Behavior: Validating the Models  
<https://e-reports-ext.llnl.gov/pdf/791562.pdf>

Abstract: This article addresses the problem of validating models in the absence of observed events, in the area of weapons of mass destruction terrorism risk assessment. We address that

problem with a broadened definition of “validation,” based on stepping “up” a level to considering the *reason why* decisionmakers seek validation, and from that basis *redefine* validation as testing how well the model can advise decisionmakers in terrorism risk management decisions. We develop that into two conditions: validation must be based on cues available in the observable world; and it must focus on what can be done to affect that observable world, i.e., risk management. That leads to two foci: (1) the real-world risk generating process, and (2) best use of available data. Based on our experience with nine WMD terrorism risk assessment models, we then describe three best use of available data pitfalls: SME confidence bias, lack of SME cross-referencing, and problematic initiation rates. Those two foci and three pitfalls provide a basis from which we define validation in this context in terms of four tests—Does the model: . . . capture initiation? . . . capture the sequence of events by which attack scenarios unfold? . . . consider unanticipated scenarios? . . . consider alternative causal chains? Finally, we corroborate our approach against three validation tests from the DOD literature: Is the model a correct representation of the process to be simulated? To what degree are the model results comparable to the real world? Over what range of inputs are the model results useful?

8. Lathrop, J. and B. Ezell (2017) “A systems approach to risk analysis validation for risk management”, *Safety Science* 99(B) November 2017, pp. 187-15. DOI: 10.1016/j.ssci.2017.04.006, Special Issue on Risk Analysis Validation and Trust in Risk Management  
<http://iranarze.ir/wp-content/uploads/2018/07/E8500-IranArze.pdf>

Abstract: This paper presents a logical structure to address the topic of this special issue: Risk Analysis Validation and Trust in Risk Management. We do that by presenting a systems approach that links all four of those concepts. The underlying logic: Validation should test how effectively a risk analysis supports actual, real-world implemented risk management. Our approach is based on a flowchart linking all of the elements from inputs through risk analysis, risk reporting and transparency, then how that reporting-transparency support the risk management decision making process and associated third party and stakeholder reviews (formal or informal), which in turn determine the trust and acceptance necessary for the real-world implementation of risk management actions. We take that flowchart and identify within it sixteen critical elements, then specify a validation test for each of those elements. Validation, then, consists of subjecting the risk analysis to those sixteen tests. Those tests, together, test the risk analysis for how effectively it supports implemented risk management. Another key feature: We divide the flowchart into Analysts’ Domain, Users’ Domain, and Analysis Community Domain. The Analysts’ Domain is where the risk analysts work, then the Users’ Domain stands between their work and implementation. The Analysis Community Domain is comprised of the communities of risk analysts and commissioners of risk analyses. Those two communities are where we would, as part of building our systems approach to risk analysis validation, build a “Culture of Analysis Quality,” where the sixteen validation tests would be enforced by both of those communities.

9. Lathrop, J. and B. Ezell (2017) “Validating Terrorism Risk Assessment Models – Lessons Learned from 11 Models”, Chapter 4, *Improving Homeland Security Decisions*, Cambridge University Press, September 2017., pp. 54-84. DOI: 10.1017/9781316676714.



Opening Paragraphs: A defining risk of our time is the possibly growing capability of terrorist groups to fabricate and deliver weapons of mass destruction, WMDs. That risk is characterized by extreme possible consequences, including tens of thousands of fatalities and initiation of global conflict. Yet by some definitions of WMDs, we have not, as of this writing, observed even a single full-scenario event. There are three other interrelated aspects of that risk: 1) The essential terrorist-defender game aspect of the risk, where the terrorist may be intelligent and adaptive to defensive actions, and may make decisions based on poorly understood processes of radicalization and poorly understood foreign and domestic subcultures; 2) terrorist incentives to develop and launch WMD attacks may be changing due to “The Great Unraveling” of international processes;<sup>(1,2)</sup> 3) Terrorist capabilities can include step function increases due to Internet information, random meetings of individuals and random opportunities.

These considerations combine to create an almost overwhelming risk management challenge and an almost overwhelming risk assessment challenge for risk analysts. We pose that latter challenge as: How, in this context, do analysts apply all available data and analysis tools to generate the most effective risk management advice?

10. Lathrop, J. and J. Linnerooth (1983) “The Role of Risk Assessment in a Political Decision Process”, *Advances in Psychology* 14, 1983, pp. 39-68. DOI:10.1016/S0166-4115(08)62225-6

Abstract: In this paper, we examine the role risk assessments played in a political decision process: the siting of an LNG facility on the California coast. We find that the political process, where the decisions are made sequentially, bears little resemblance to the analyst's perspective, where objectives are traded off under conditions of uncertainty. A detailed comparison of three risk assessments used in this sequential process reveals that there are many degrees of freedom left to the analyst's judgment, and the results of an assessment may be determined as much by this judgment as by the site and technology considered. In addition, the effectiveness of a risk assessment is shown to depend not only on its analytic rigor, but on the persuasiveness of its presentation. In order to improve the use of risk assessments in setting public policies, we suggest that *rules of evidence*, or standards to which risk assessments must adhere in order to be admissible evidence, be considered.

11. Lathrop, J. and J. Post (2012) “The Modeler Meets the SME: The Challenge of Integrating Quantitative and Qualitative Models of Terrorist Decision Making”, *Democracy and Security* 8 2012, pp. 266–276. DOI:10.1080/17419166.2012.710152

Abstract: Terrorism risk assessment and management involves a unique set of modeling challenges. A special problem is that the expertise required to address those challenges lies divided between two communities: risk assessment modelers working in the probabilistic risk assessment paradigm, and subject matter experts (“SMEs”) working in terrorist psychology. SMEs don’t fully understand what Modelers bring to the table, and Modelers don’t fully understand what SMEs bring to the table. The two cultures sit at different tables, unable to

communicate effectively, and the nation comes out behind. This article takes the form of a dialogue between a Modeler and a SME, describing the different perspectives of modelers and SMEs. We discover critical modeling shortfalls arising from the differing world views of those two cultures. Out of our dialogue, we develop a solution in the form of a new modeling paradigm, based on combining the relative strengths of the two communities.

12. Peace, C., V. Mabin and C. Cordery (2017) "Due diligence: a panacea for health and safety risk governance?", *Policy and Practice in Health and Safety*, 15(1), 19-37. DOI: 10.1080/14773996.2016.1275497

Abstract: The failure of boards and individual directors to engage with and accept accountability for work health and safety (WH&S) has frequently been commented on as a contributory cause of high injury and fatality rates. New Zealand has been no exception to this record, having poor fatal accident rates when compared with other OECD countries. One mining accident in New Zealand in 2010 triggered the introduction of new legislation in New Zealand, requiring 'due diligence' of 'officers' of workplace health and safety. This paper reviews the background to the law change, highlights its focus on due diligence, and explores the meaning of 'officer'. A decision tree is presented to help show the relationship of the due diligence requirement to companies' legislation and other requirements. The wider duties of directors are briefly analysed before presenting a range of 'reasonable steps' that might enable an officer to claim they had exercised due diligence to ensure compliance with the WH&S responsibilities of a business or undertaking. The relationship of these options to knowledge management and potential for application of management by objectives is described before discussing compliance problems arising for officers in smaller businesses.

13. Yellman, T. (draft) "Interpreting Aleatory Uncertainty and Epistemic Uncertainty"  
Available from tedwyellman [at] gmail.com

Abstract: *Aleatory uncertainty* and *epistemic uncertainty* appear often in risk-related literature along with dozens of different explanations of their meanings. The author of this article suggests that a good definition of aleatory uncertainty is "a perception that certain events in the real world may be unpredictable," and that a good definition of epistemic uncertainty is "a perception that a mental model of the real world might not satisfactorily represent it." The authors further suggest that at least as memory aids *unpredictability* and *model uncertainty* respectively capture the essence of those definitions.