

Risk Evaluation: Methodology and Practice – Advice from the Analyst Front Lines

Debra Elkins, Ph.D.

DHS Policy

Office of Strategy, Planning, Analysis and Risk (SPAR)

Debra.Elkins@hq.dhs.gov

September 18, 2012



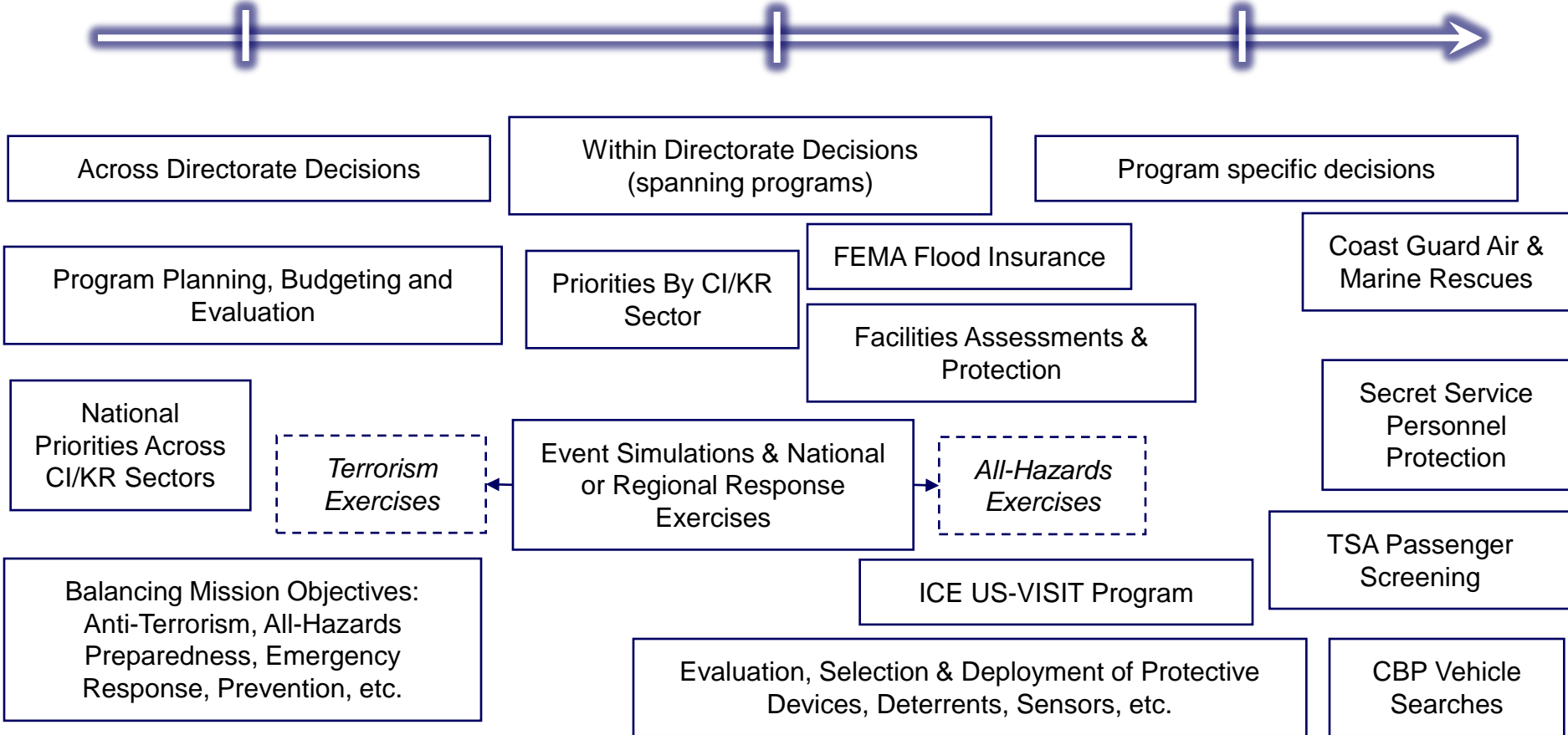
Homeland
Security

Span of Risk Informed Decisions Considered by DHS

- Minimal Data
- Qualitative or Subjective Data
- One Time or Rare Risk Events
- Longer Time Frame to Review and Revise Decisions as Future Evolves

• Some Data

- Maximum Data
- Quantitative and Objective Data
- Repeatable (Common) Risk Events
- Decisions Made With Short to Immediate Time Horizons



Homeland Security

Figure contributed by D. Elkins to the "Review of the Department of Homeland Security's Approach to Risk Analysis," p. 29, National Academies Press, 2010

Align Risk Evaluation with Department / Agency Evolving Guidance



Quadrennial Homeland Security Review Report:

A Strategic Framework for a Secure Homeland

February 2010



Risk Management Fundamentals

Homeland Security Risk Management Doctrine

April 2011



Risk Steering Committee

DHS Risk Lexicon

2010 Edition

September 2010



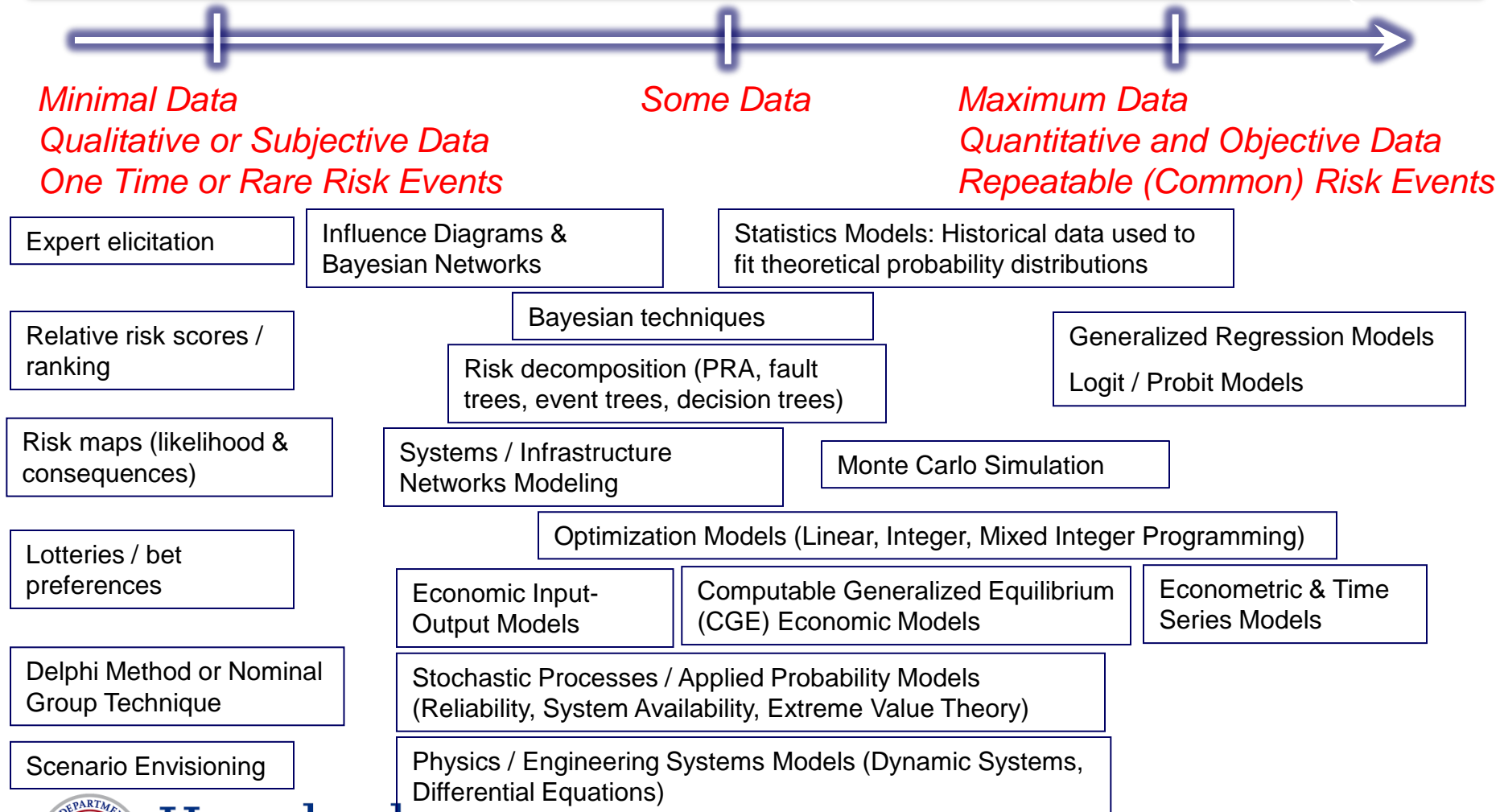
- QHSR: http://www.dhs.gov/xlibrary/assets/qhsr_report.pdf
- DHS Risk Mgmt Fundamentals: <http://www.dhs.gov/xlibrary/assets/rma-risk-management-fundamentals.pdf>
- DHS Risk Lexicon: <http://www.dhs.gov/xlibrary/assets/dhs-risk-lexicon-2010.pdf>



Homeland Security

Spectrum of Risk Analysis Methods

Choice of risk modeling & measurement methods depends on data availability & repeatability of risk events



Homeland Security

Figure contributed by D. Elkins to the "Review of the Department of Homeland Security's Approach to Risk Analysis," p. 94, National Academies Press, 2010

Question: How do I identify and select approaches from among all these tools and techniques?

Answer(s):

- A. Hire, grow, and listen to your own internal ERM talent
- B. Hire and listen to your ERM consultants
- C. Leverage a “playbook” of Risk Assessment Techniques



**Homeland
Security**

FINAL DRAFT	INTERNATIONAL STANDARD	IEC/FDIS 31010
Secretariat: TMB		
Voting begins on: 2009-08-07		
Voting terminates on: 2009-10-09		
Risk management — Risk assessment techniques		
<i>Gestion des risques — Techniques d'évaluation des risques</i>		
Please see the administrative notes on page ii		
<small>RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.</small>		
<small>IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.</small>		
		Reference number IEC/FDIS 31010:2006(E)

Example: ISO 31010 as a “Playbook” for Risk Assessment Techniques

- 30+ qualitative & quantitative techniques
- Aligned with a generic risk assessment process



- Provides guidance on each technique’s applicability and some additional tutorial overview materials (92 pages)

Table A.1 – Applicability of tools used for risk assessment

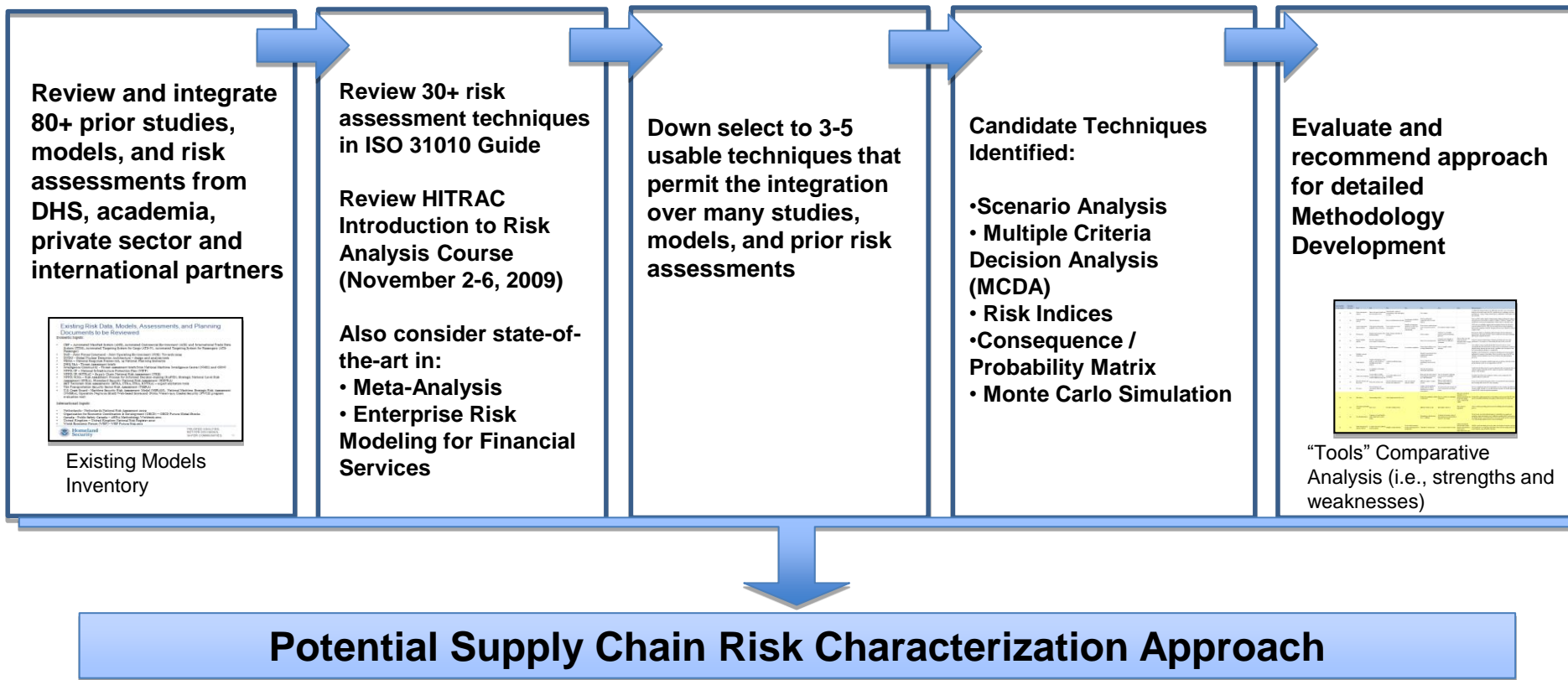
Tools and techniques	Risk assessment process					See Annex
	Risk Identification	Risk analysis			Risk evaluation	
		Consequence	Probability	Level of risk		
Brainstorming	SA ¹⁾	NA ²⁾	NA	NA	NA	B 01
Structured or semi-structured interviews	SA	NA	NA	NA	NA	B 02
Delphi	SA	NA	NA	NA	NA	B 03
Check-lists	SA	NA	NA	NA	NA	B 04
Primary hazard analysis	SA	NA	NA	NA	NA	B 05
Hazard and operability studies (HAZOP)	SA	SA	A ³⁾	A	A	B 06
Hazard Analysis and Critical Control Points (HACCP)	SA	SA	NA	NA	SA	B 07
Environmental risk assessment	SA	SA	SA	SA	SA	B 08
Structure « What if? » (SWIFT)	SA	SA	SA	SA	SA	B 09
Scenario analysis	SA	SA	A	A	A	B 10
Business impact analysis	A	SA	A	A	A	B 11
Root cause analysis	NA	SA	SA	SA	SA	B 12
Failure mode effect analysis	SA	SA	SA	SA	SA	B 13
Fault tree analysis	A	NA	SA	A	A	B 14
Event tree analysis	A	SA	A	A	NA	B 15
Cause and consequence analysis	A	SA	SA	A	A	B 16
Cause-and-effect analysis	SA	SA	NA	NA	NA	B 17
Layer protection analysis (LOPA)	A	SA	A	A	NA	B 18
Decision tree	NA	SA	SA	A	A	B 19
Human reliability analysis	SA	SA	SA	SA	A	B 20
Bow tie analysis	NA	A	SA	SA	A	B 21
Reliability centred maintenance	SA	SA	SA	SA	SA	B 22
Sneak circuit analysis	A	NA	NA	NA	NA	B 23
Markov analysis	A	SA	NA	NA	NA	B 24
Monte Carlo simulation	NA	NA	NA	NA	SA	B 25
Bayesian statistics and Bayes Nets	NA	SA	NA	NA	SA	B 26
FN curves	A	SA	SA	A	SA	B 27
Risk indices	A	SA	SA	A	SA	B 28
Consequence/probability matrix	SA	SA	SA	SA	A	B 29
Cost/benefit analysis	A	SA	A	A	A	B 30
Multi-criteria decision analysis (MCDA)	A	SA	A	SA	A	B 31

¹⁾ Strongly applicable.
²⁾ Not applicable.
³⁾ Applicable.



Homeland Security

Example: Process for Down Selecting Among Many Possible Techniques to Develop a Supply Chain Risk Characterization Methodology



**Homeland
Security**

Final Takeaways

- Pick and choose technique(s) to fit the problem at hand and what will resonate with your decision-maker(s)
 - No single “right” way to evaluate risk
- Implementing ERM is a process of building analytic capabilities (people and tools / models) to support the decision processes within your unique organization
- “Act as if what you do makes a difference. It does.”

— William James



**Homeland
Security**



Homeland Security