



Value Focused Thinking for Counterterrorism Risk Analysis

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17 March, 2009

Why Study Terrorists Objectives and Values?

- Current methods for terrorism risk assessment focus on:
 - Target Vulnerability
 - Terrorist Capabilities and Resources
 - Possible Attack Consequences
- Too many potential threats to defend against all possible attacks
- Potential waste of national resources to defend unlikely targets
- Leads to “over defense” of some targets and “under defense” of other targets



Why important to think about values

- Values are what we care about and should be the driving force behind decision making
- Decision problems may be framed around the evaluation of alternatives, BUT are not the basis of how decisions are made
- Values are used to improve decision making
 - Focuses early on values ideally to produce more desirable consequences
 - Allows for the examination of other's values as well as their own

Folkways of Threat Assessment

- Human behavior is unpredictable
 - Mitigate against worst possible attack
 - Maxi-min strategy
- Zero-Sum game assumption
 - Value to opponent is inverse of loss to us
 - Mitigation depends mostly on potential cost to us, weighted by opponent capability



Perspective Taking

- Perspective taking not the same as empathy
- Opponent motivations are unique
- Egocentric bias to assume opponents values are inverse of our own
- Drives us to ruminate over darkest fears
- Value focused thinking *for* opponent



Value Focused Thinking

Value focused thinking essentially consists of two activities...

- (1) Deciding what the problem context is/what you want, and
- (2) Then figuring out how to get it.

Attack Alternatives Considered

No attack (baseline)

IED engine room of naval vessel(s)

Explosion resulting in dam failure(s)

MANPAD attack on airplane (s)

Portable nuclear bomb in major city(s)

Explosions on mass transport(s)

Release of anthrax in populated area(s)

Detonation of dirty bomb in major city(s)

Smallpox release in major city(s)



Value Focused Thinking

- (1) Identifying fundamental objectives
- (2) Identifying attributes for the fundamental objectives

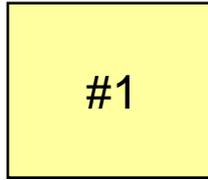
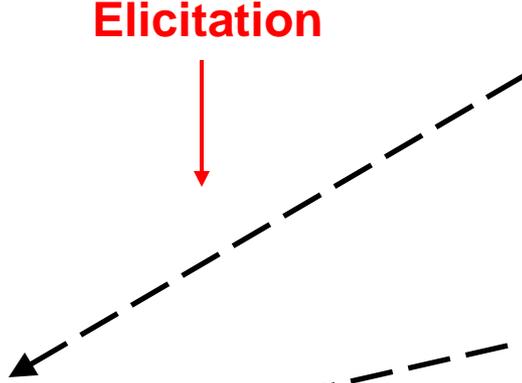
Terrorist Leader - General Approach

- Studying beliefs and motivations of terrorist leaders
 - Beliefs: What do terrorist leaders believe about the likely outcomes of specific attacks?
 - Motivations: What are the values and objectives of terrorist leaders?
- Interviewing those who understand terrorist leaders
 - Intelligence experts
 - People who understand and/or empathize with terrorist leaders
- Using published writings by and about terrorist leaders to infer beliefs and motivations

Intelligence
Experts



Elicitation



Values

Options

Beliefs



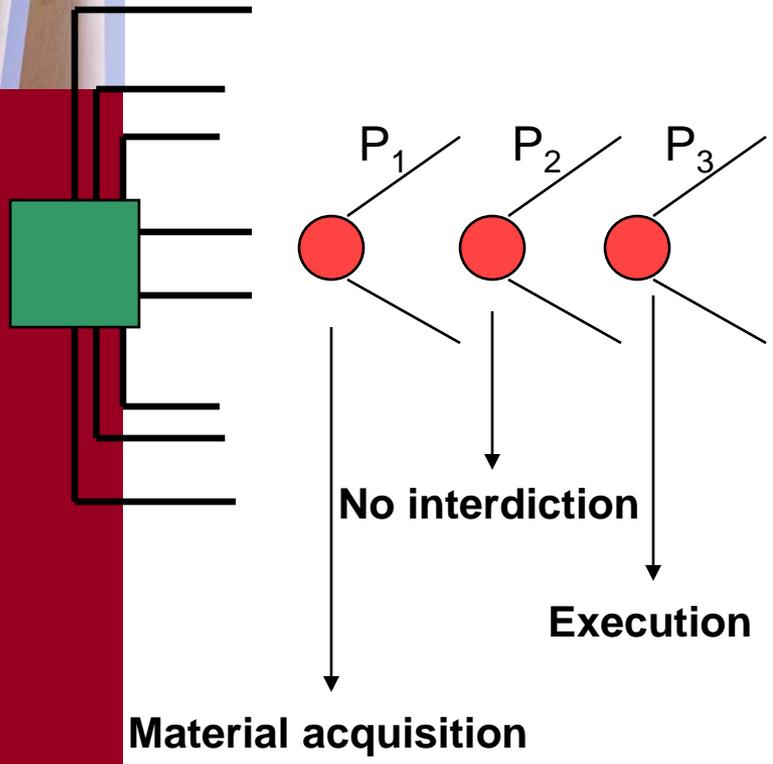
Choice about what attack to
develop, attack capability,
and whether to strike.

Decision analysis for the terrorist by proxy

(1) Attack Alternatives

(2) Decision Tree

(3) Value Elicitation



- NINE attack alternatives:
 - No attack (baseline)
 - IED attack
 - Dam failure
 - MANPADS attack
 - Port Nuc attack
 - Explosion on mass transport
 - Anthrax release
 - Dirty bomb attack
 - Smallpox attack

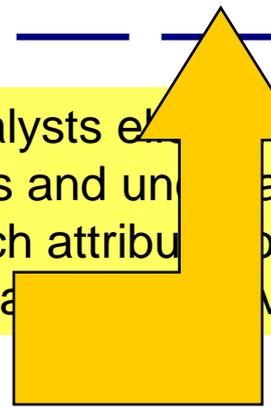
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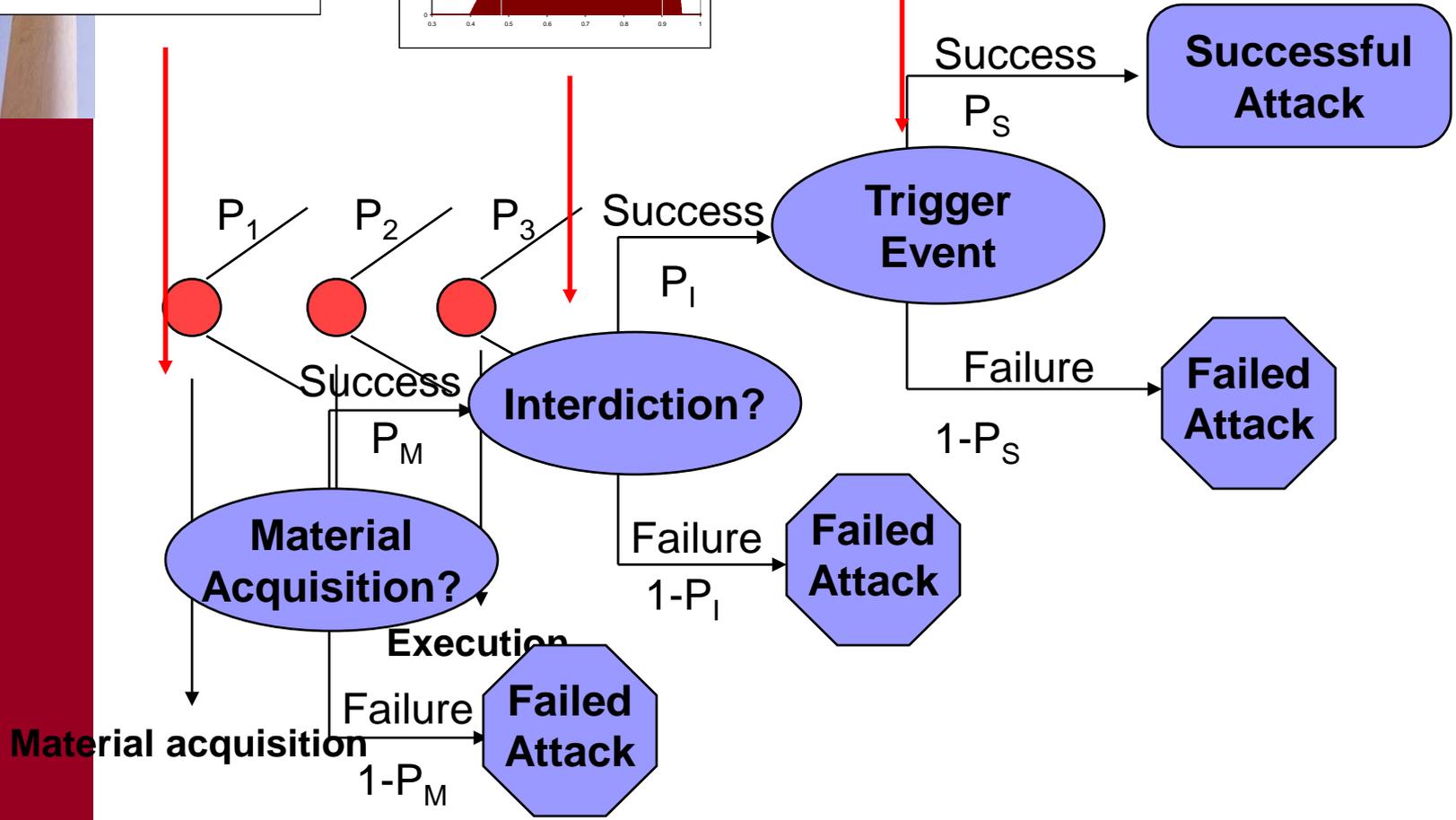
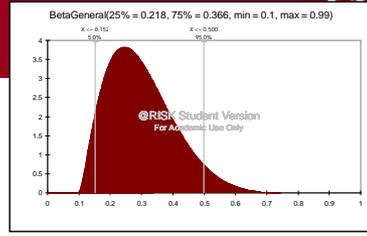
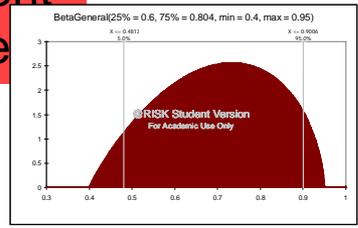
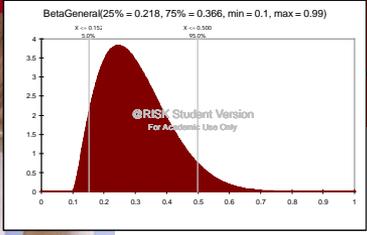
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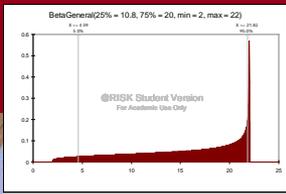
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Analysts elicit the values and uncertainties for each attribute for each attack alternative.

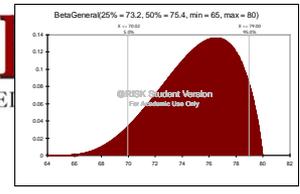
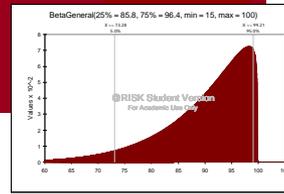
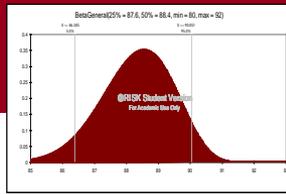


Event Tree





Value
ation



Preferred Terrorist Attack

Scales for each attribute

Al Qaeda
Organizational
Strength

Operational
Expenditures

Impact on the
United States

Maximize
recruitment

Maximize
funding

Minimize
cost

Minimize
resources

Economic
impact

Instill
fear

Human
causalities

Maximize
pop. support
(sympathizers)

Minimize
"backlash"
To Al Qaeda

ST immediate
damage

LT ripple
effects

Analysts elicited the
constraints
for each
attack alternative.

= Prob Estimates

Expert 1: Mean .63

#1



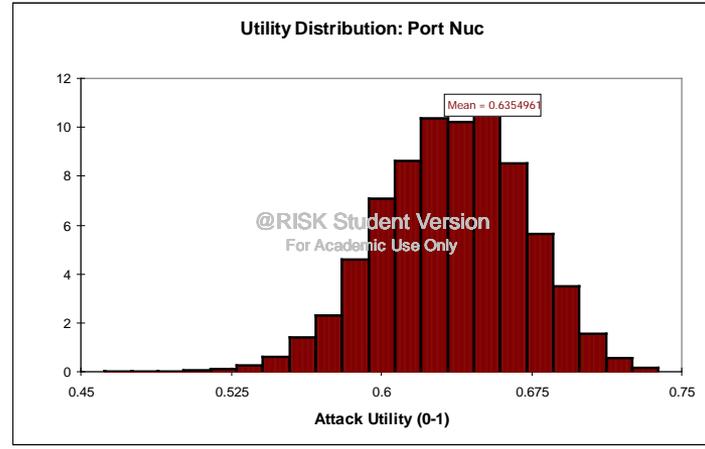
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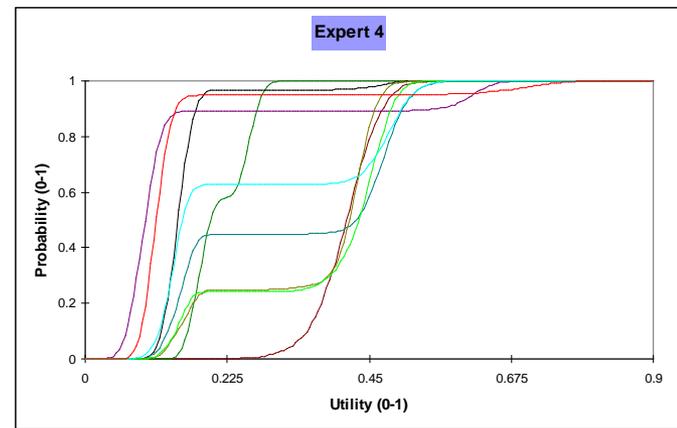
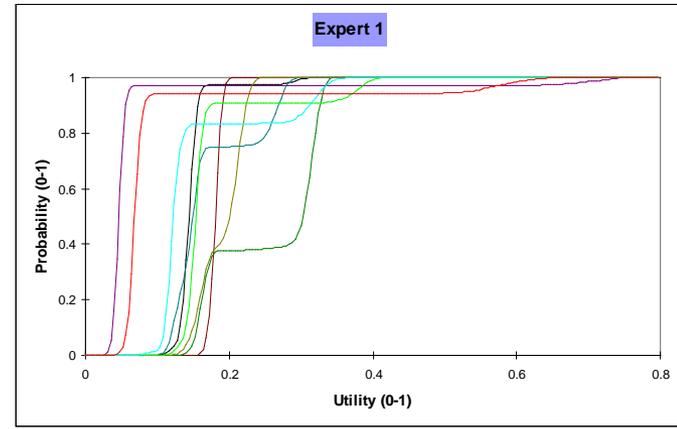
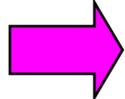
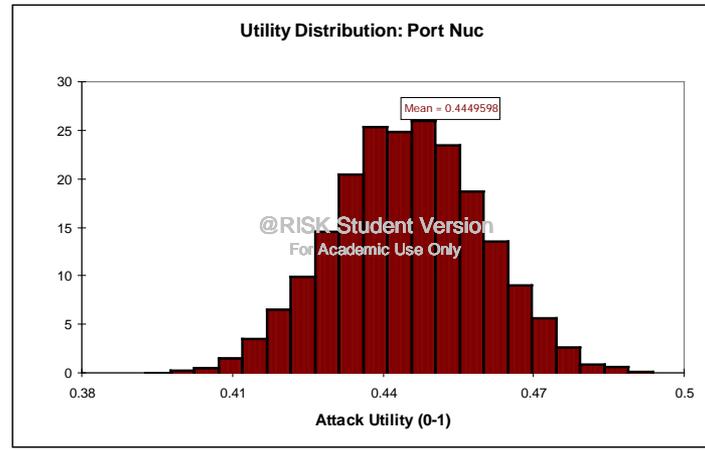
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Expert 3: Mean .44



= Prob Estimates

Expert 1: Mean .63

#1



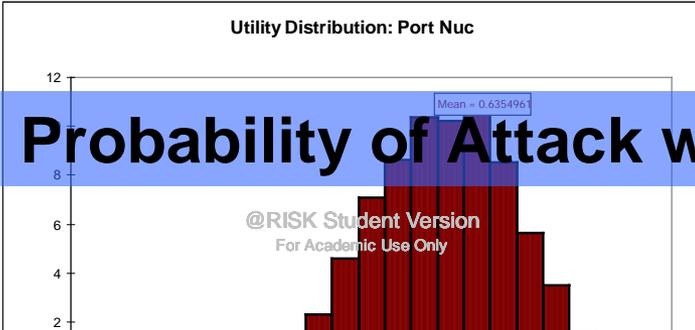
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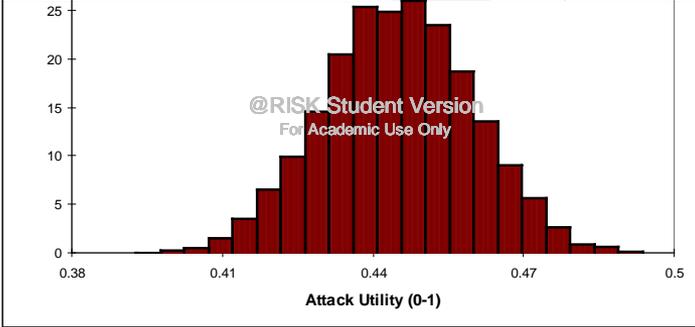
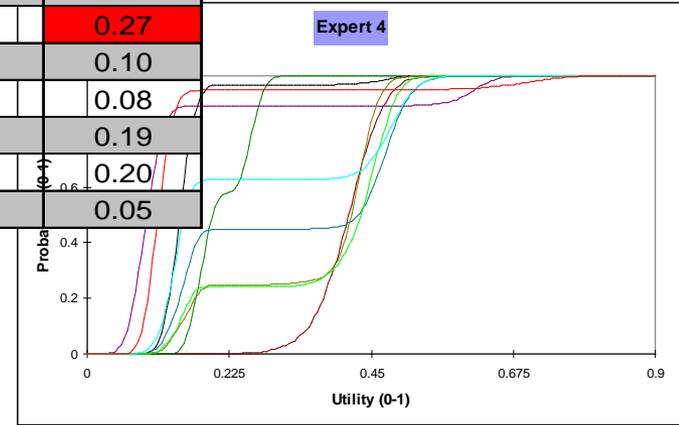
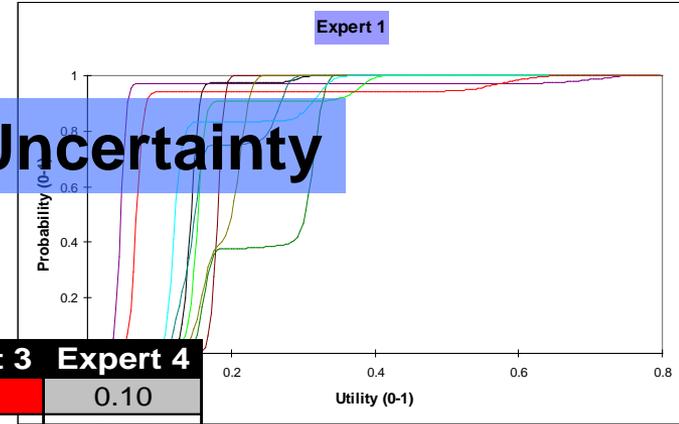


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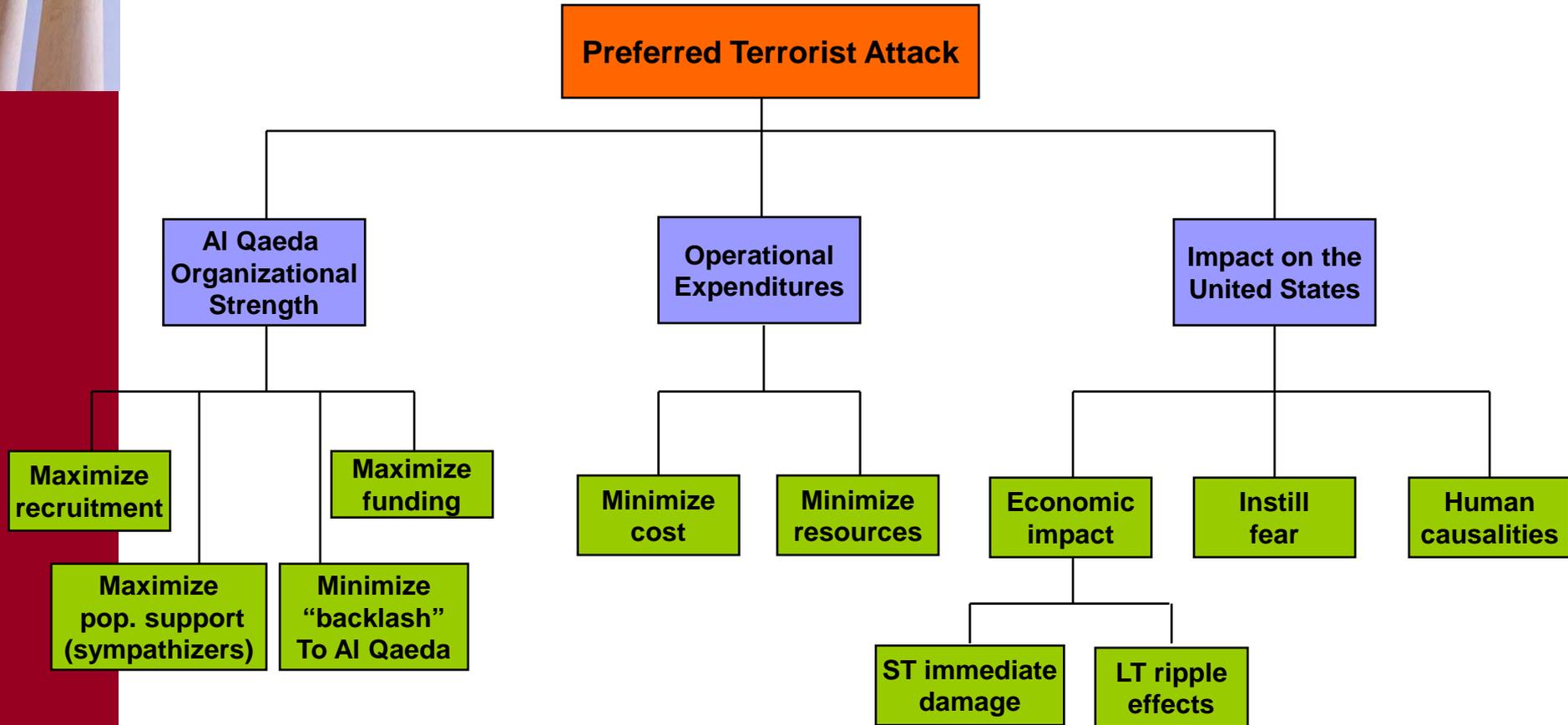


Probability of Attack with Uncertainty

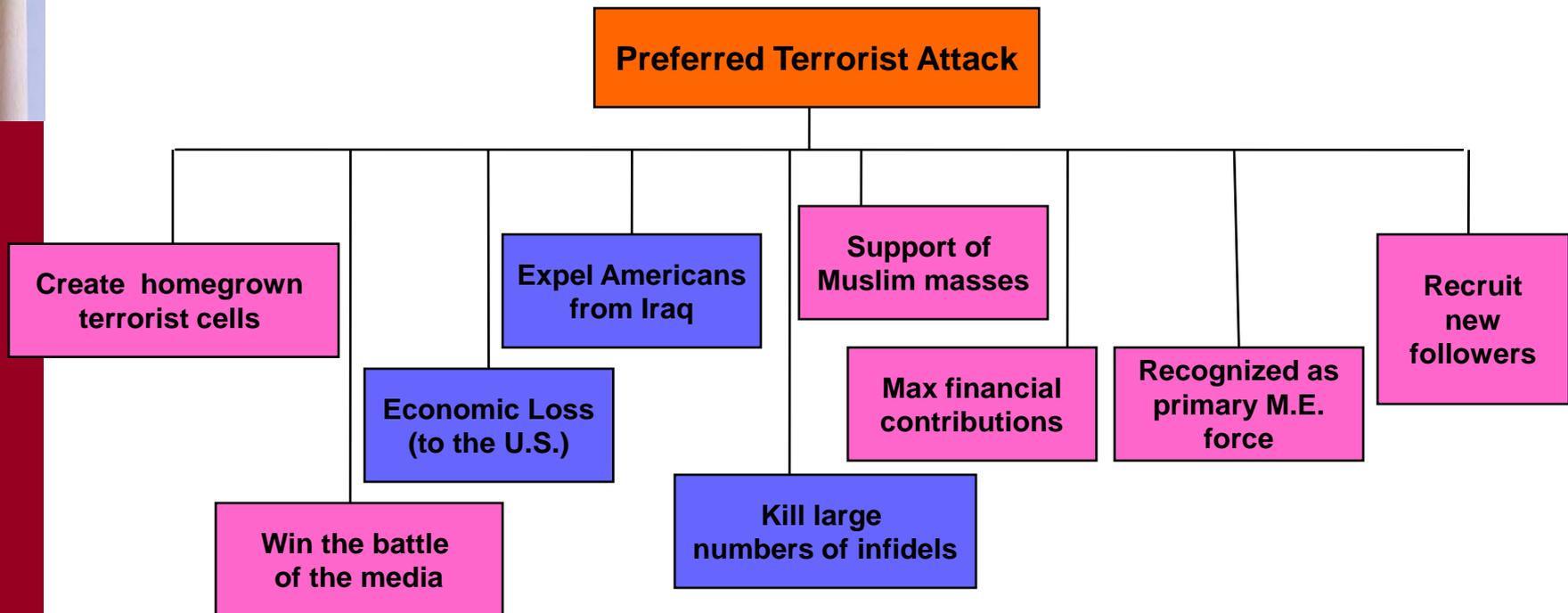
Attack Type	Expert 1	Expert 2	Expert 3	Expert 4
No Attack (baseline)	0.07	0.12	0.94	0.10
IED	0.46	0.01	0.05	0.00
Dam Explosion	0.01	0.04	0.00	0.01
MANPAD	0.06	0.09	0.00	0.27
Portable Nuclear Device	0.03	0.10	0.01	0.10
Transport. Systems	0.12	0.16	0.00	0.08
Anthrax	0.09	0.06	0.00	0.19
Dirty Bomb	0.10	0.07	0.00	0.20
Smallpox	0.06	0.35	0.00	0.05



Terrorist Leader Fundamental Objectives Hierarchy



Terrorist Leader (2) Fundamental Objectives Hierarchy

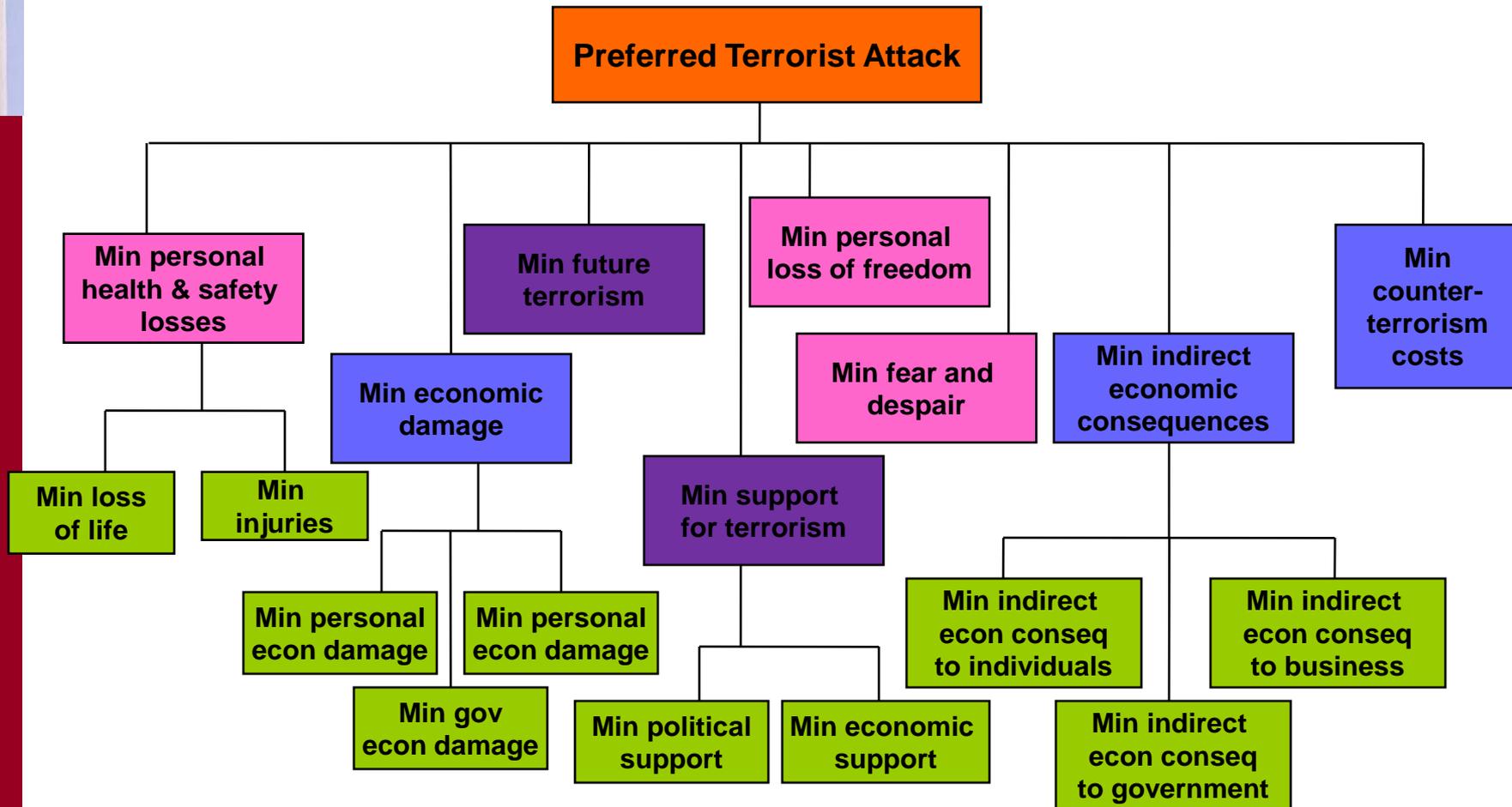


From Keeney, G. (2008). *Research on Identifying Al-Qaeda Objectives*. CREATE Research Report.

Government (DHS) - General Approach

- Studying beliefs and motivations of the Department of Homeland Security (DHS)
 - Beliefs: What does DHS believe to be the likely outcomes of specific attacks given their department’s capabilities?
 - Motivations: How do the values and objectives of DHS influence the department’s perception of a terrorist leaders selection of attack type?
- Using published writings about DHS to infer beliefs and motivations
 - *Keeney, R.L. (2005). “Thoughts on HSI Portfolio Management Methodology”*
 - *Pruitt et al. (2004). “Modeling homeland security.”*

DHS Fundamental Objectives Hierarchy



Attributes for Objectives



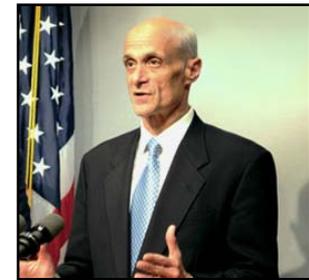
OBJECTIVE

Terrorist Attribute

DHS Attribute

Al Qaeda recruitment	Max recruitment	Min political support
Al Qaeda funding	Max funding	Min economic support
Attack economic impact	- Min cost of attack - Max LT and ST damage	- Min economic damage - Min indirect econ costs
Attack casualties	Max casualties	Min casualties

Measures for Attributes



ATTRIBUTE

Terrorist Measure

DHS Measure

Al Qaeda funding

% of 2 billion (0-100%)

% of 1 million (0-100%)



ATTRIBUTE

Terrorist Measure

Terrorist Measure

ST Economic Impact

% of 400 billion (0-100%)

% of 9/11 (0-400%)

Cost of attack

Dollars (0-\$200,000)

Dollars (0-800,000)



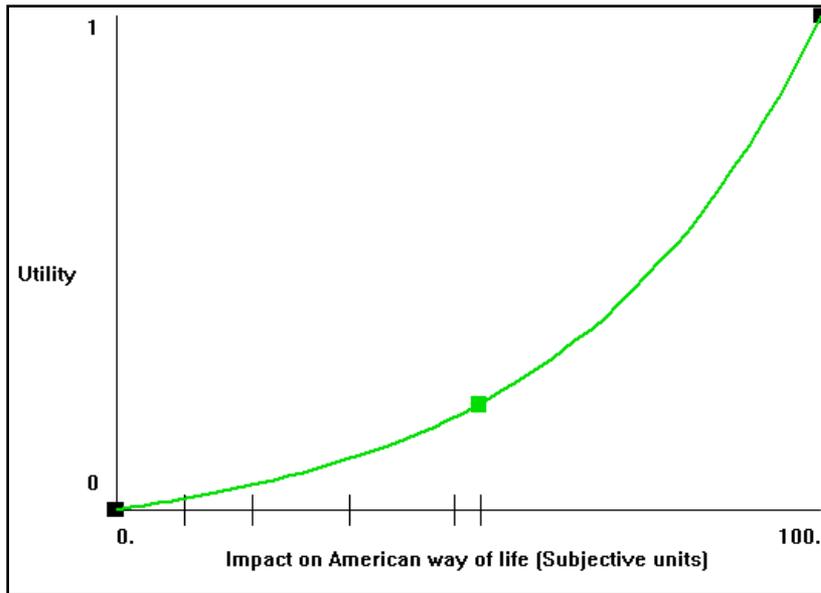
Value Focused Thinking

- (3) Specifying relative preferences for different levels of the single attributes



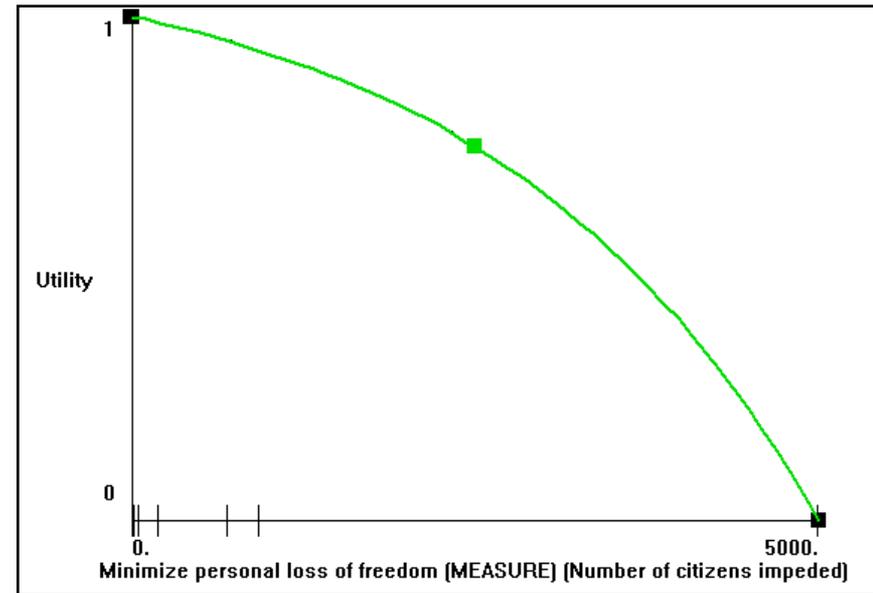
Attitude Toward Risk

TERRORIST LEADER



Risk seeking

HOMELAND SECURITY



Risk averse

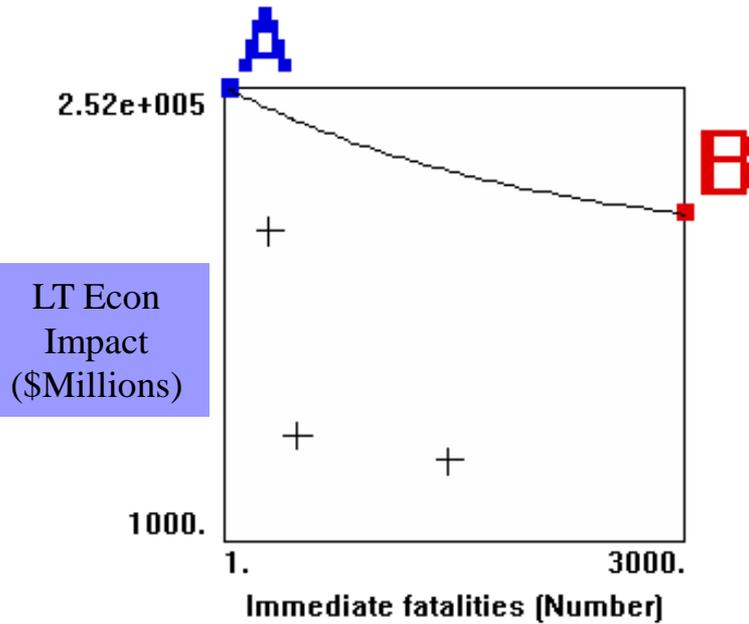


Value Focused Thinking

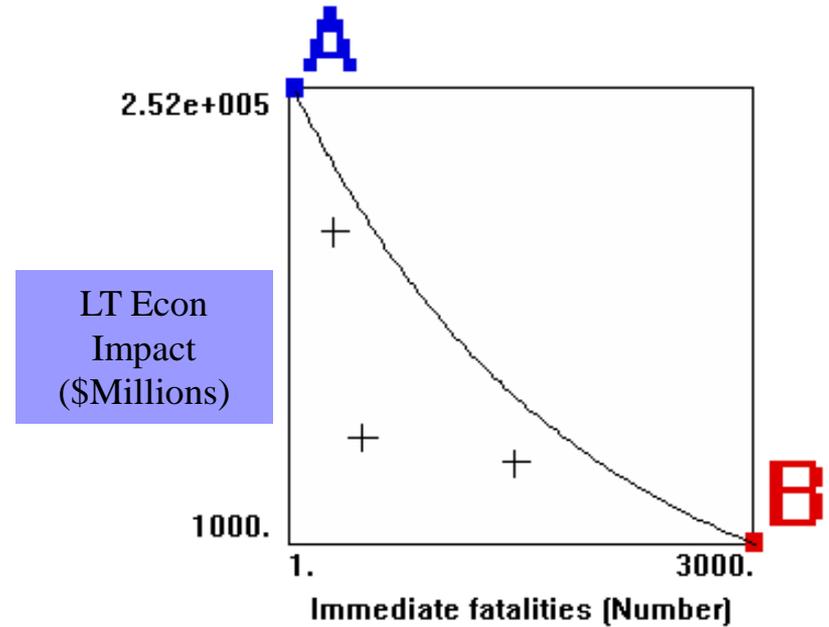
- (4) Defining the value tradeoffs that prioritize the different objectives

Value Tradeoffs

TERRORIST LEADER



HOMELAND SECURITY



Value Model Results

Proxy Terrorist #1

1. No attack
2. IED
3. MANPAD
4. Smallpox

Proxy Terrorist #2

1. Smallpox
2. Transport system
3. Portable Nuc.
4. MANPAD

Proxy Terrorist #3

1. Dirty Bomb
2. MANPAD
3. Transport system

Homeland Security #1

1. IED
2. No attack
3. Dam failure
4. Transport system
5. Anthrax

Homeland Security #2

1. IED
2. Transport system
3. No attack
4. MANPAD

Two Types of Dependency

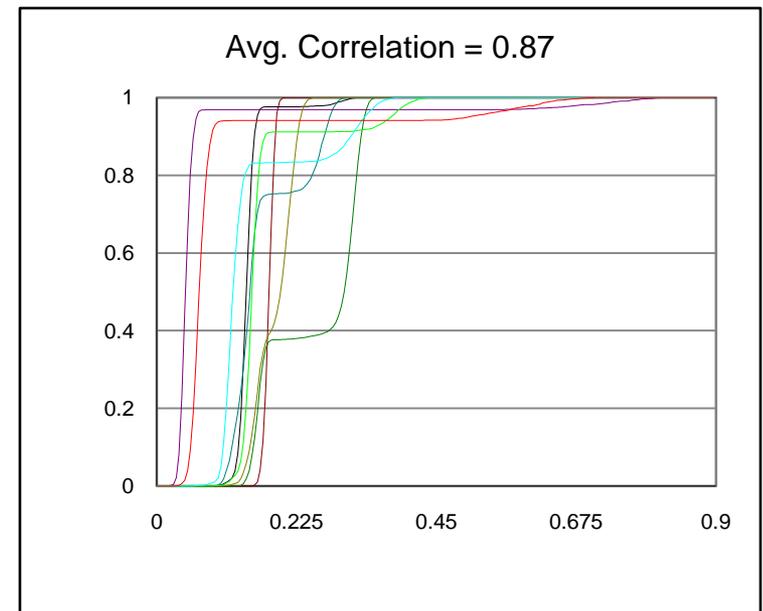
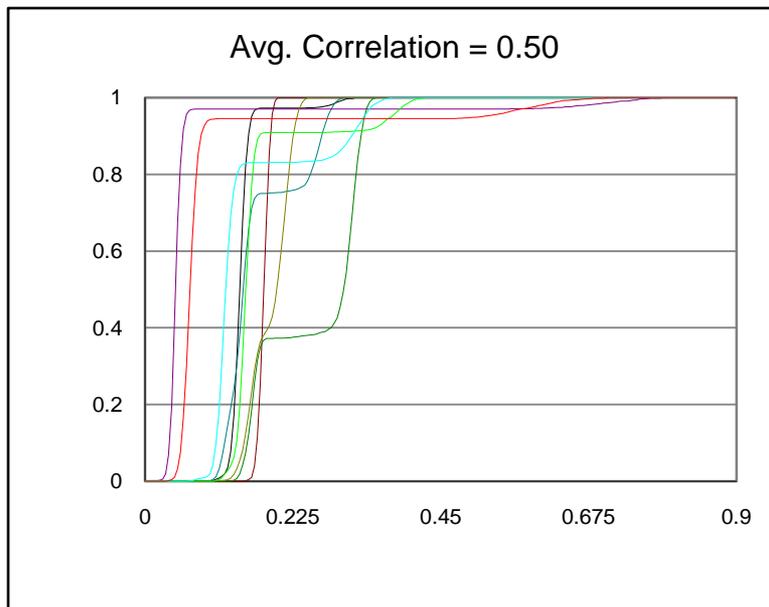
Environmental Dependencies:

- Common causes create positive correlations among attributes
- Related to Environmental Context of the Problem

Value Dependencies:

- Preferences for gambles (outcomes) on one attribute **DEPEND**
On levels of other attributes
- Related to Decision Maker (Terrorist CEO) Values

Common Cause Dependencies: Effects of Positive Correlations Among Attribute Outcomes



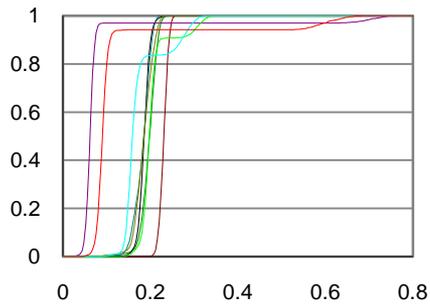
Multiplicative Models & Attribute Interaction Effects: Complements and Substitutes

Complements: k -parameters sum to less than 1, then multiplicative term (K) is positive, attributes complement each other---both need to be high in order to have high overall utility. Ex: Job Applicants

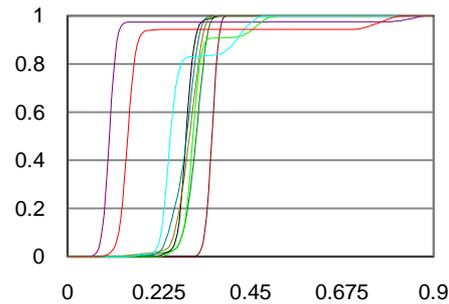
Substitutes: k -parameters sum to greater than 1, then multiplicative term (K) is negative, attributes substitute for each other---a desirable level on either attribute leads to high overall utility. Ex: Investments

Multi-Attribute Risk Attitude: Supplementing vs. Complementing

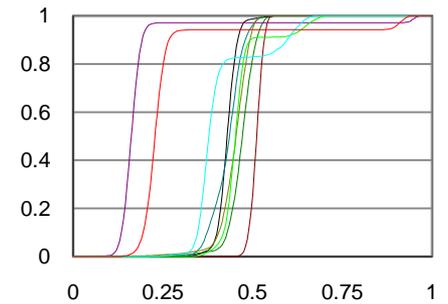
Mild Complementing, $K=-0.5$



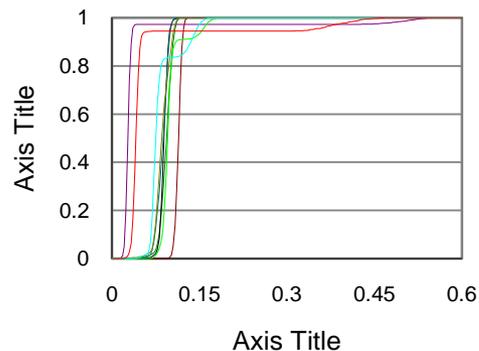
Mod Complementing $K=-.9$



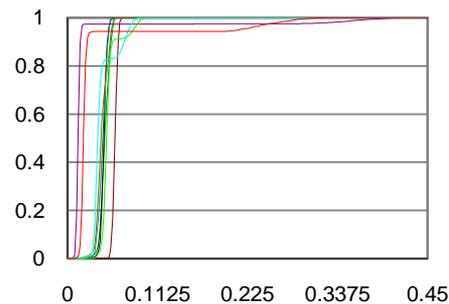
High Substitution, $K=-0.99$



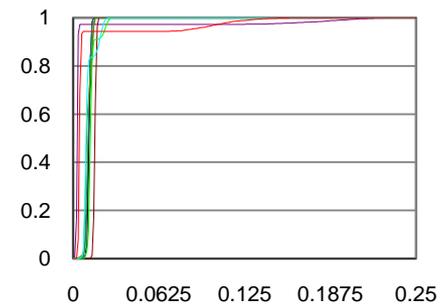
Mild Substitution, $K=2$



Mod Substitution, $K=10$



High Substitution, $K=100$



Challenges and Difficulties

- Terrorist leaders not unified
 - Different terrorist stakeholder groups, separated geographically
 - Values and beliefs of terrorist groups may conflict with one another
- Terrorist leadership may change
 - Leadership evolves; some are killed or captured
 - Beliefs and motivations may change over time
- Terrorist beliefs may change
 - Success probabilities and consequence expectations may change due to counterterrorism efforts
- Attack alternatives may change
 - Alternative set is growing due to terrorist advances
- Terrorist values and objectives may change



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