Making Trade Space

Value Models and Enterprise Capability Analysis for the U.S. Intelligence Community

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Introduction

- The purpose of this presentation is to show our application of decision analysis methods to improving US Intelligence Community enterprise capability analysis during the first five years of the Office of the Director of National Intelligence (ODNI)

- Analysis, Data & Standards Team

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    Analysis, Data & Standards Team Leader
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Outline

- The US Intelligence Community
- Value Models
  - Value Model Family
  - Mission Utility Studies
- Portfolio Models
  - Cut Line
  - Adds and Offsets
  - Marginal Benefit to Cost Analysis
  - Integrated Optimization
- Displays for Senior Decision Makers
- Lessons Learned

The US Intelligence Community

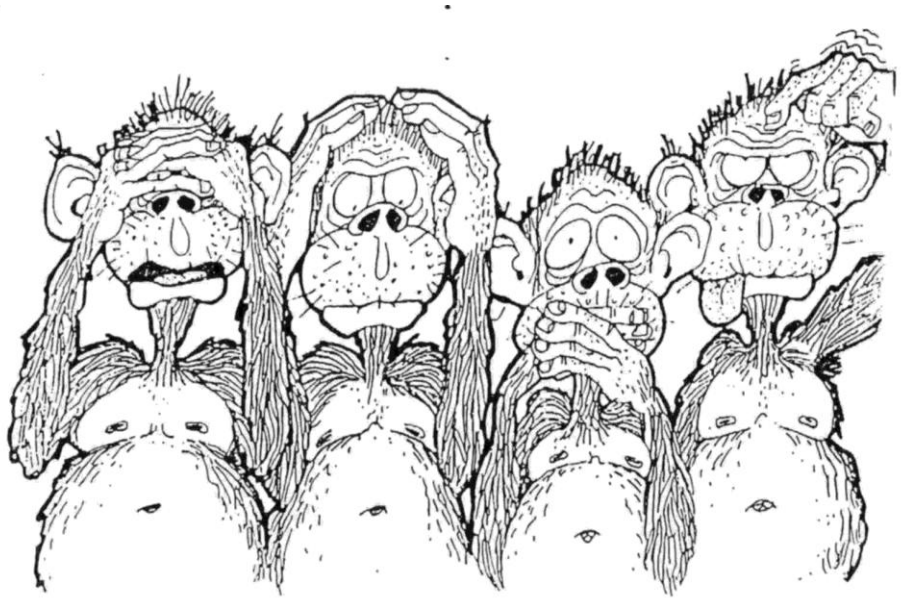
- NGA - National Geospatial-Intelligence Agency
- NRO - National Reconnaissance Office
- CIA - Central Intelligence Agency
- NSA - National Security Agency
- DIA - Defense Intelligence Agency
- US Army
- US Navy
- US Air Force
- US Marine Corps
- US Coast Guard
- Department of State
- Department of the Treasury
- DOE – Department of Energy
- FBI – Federal Bureau of Investigation
- DEA – Drug Enforcement Administration
- DHS – Department of Homeland Security

FY2009 NIP Budget = $49.8 billion

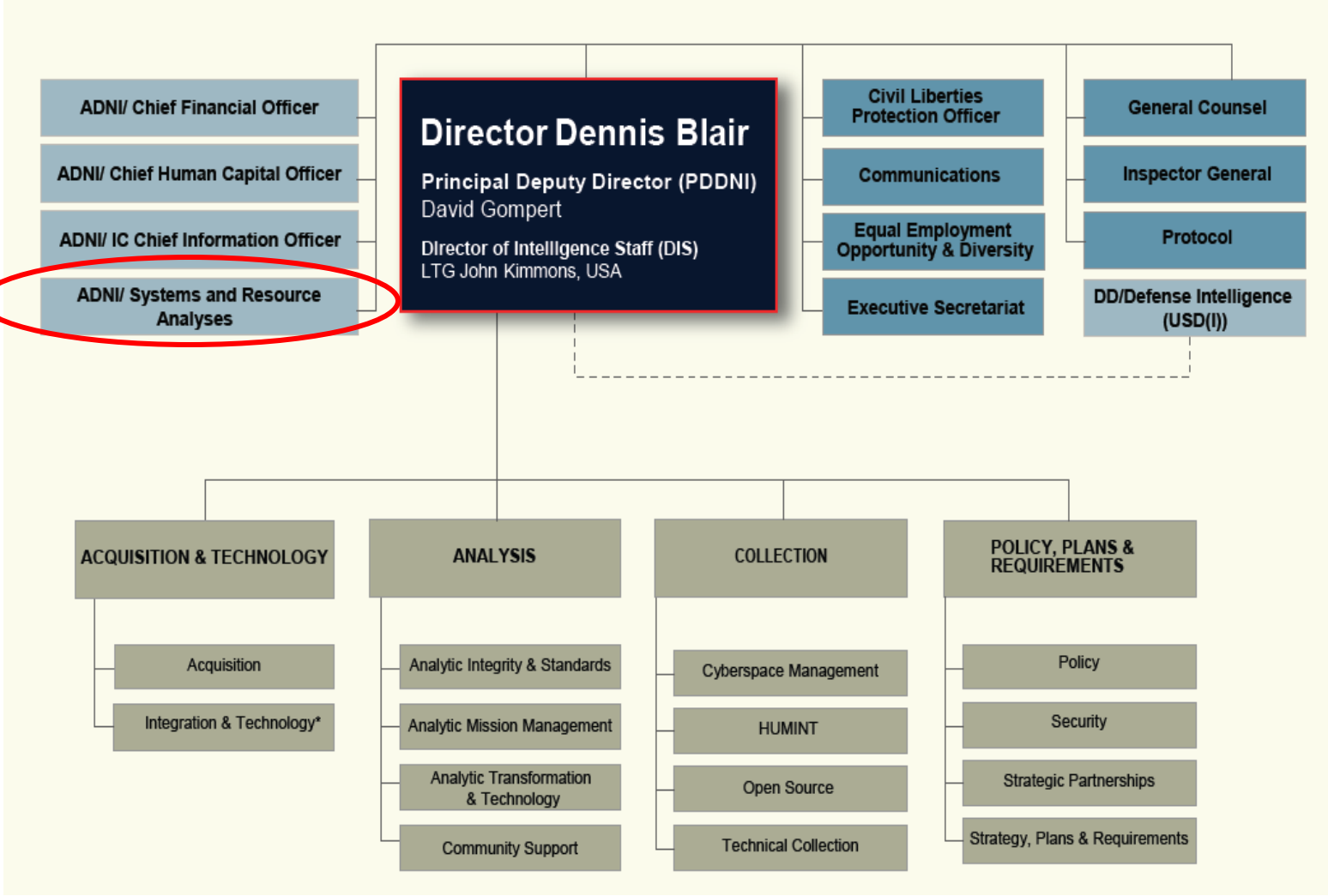
The Disciplines of Intelligence

- GEOINT
  Geospatial Intelligence
- SIGINT
  Signals Intelligence
- HUMINT
  Human Intelligence
- MASINT
  Measures and Signatures Intelligence
- Open Source
  Internet, news media, and other public sources
- Counterintelligence
- Analysis

The World's First Intelligence Staff



The Office of the Director of National Intelligence (ODNI)



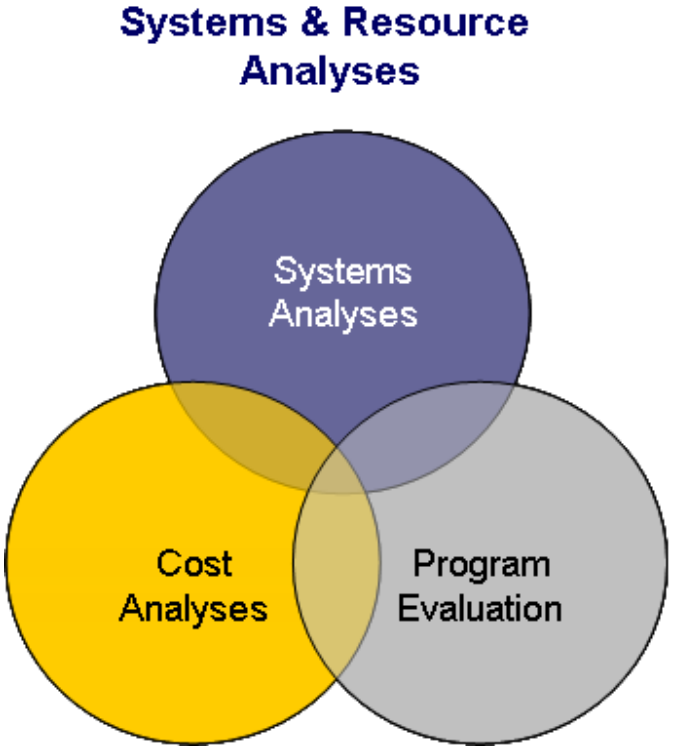
ADNI/ Systems & Resource Analyses

Mission

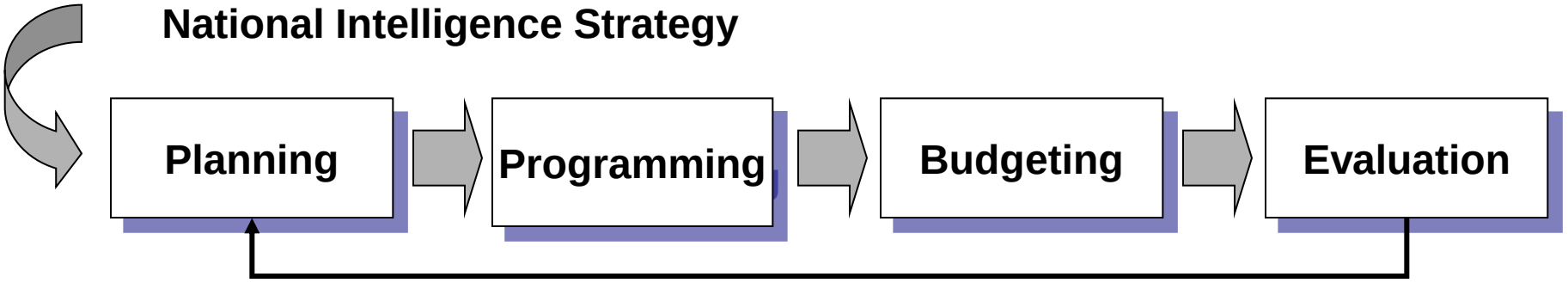
- Assist the Director of National Intelligence to shape intelligence capabilities through proactive, balanced and effective resource decisions on issues of national importance.

Key Principles

- Focus on explicit national priorities and criteria
- Present alternatives that are balanced, feasible, and comprehensive
- Maintain high degree of independence, objectivity and transparency
- Assess needs and costs simultaneously
- Consider long-term implications of current decisions



The Intelligence PPBE Process



Intelligence Planning Guidance (IPG)

Consolidated Intelligence Guidance (CIG)

The President's Budget

Strategic Evaluation Reports (SER)

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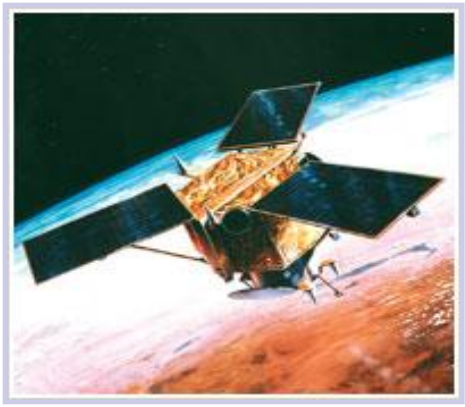
Value Model Definition

"A Value Model is a systematic qualitative and quantitative method to assess relative value to users of alternative architectures, capabilities, and systems, within and across intelligence disciplines, regimes, and functional areas."



- Gil Klinger, former Director, ODNI Architecture, Engineering and Integration Office

Intelligence Value Hierarchy

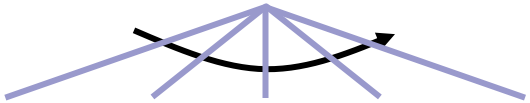
What Intelligence Problems should drive future architectures?

What are the driving information needs for each problem?

What kinds of capabilities are required in each discipline?

Example Missions/Topics

- Counterterrorism
- Counterproliferation
- Foreign Military Capabilities
- Political Stability and Regional Conflict
- Emerging Technologies
- Counterintelligence
- Diplomacy and International Relations
- Homeland Security
- Counternarcotics
- Cybersecurity
- Transnational Crime
- Economics and Resources
- Societal Issues

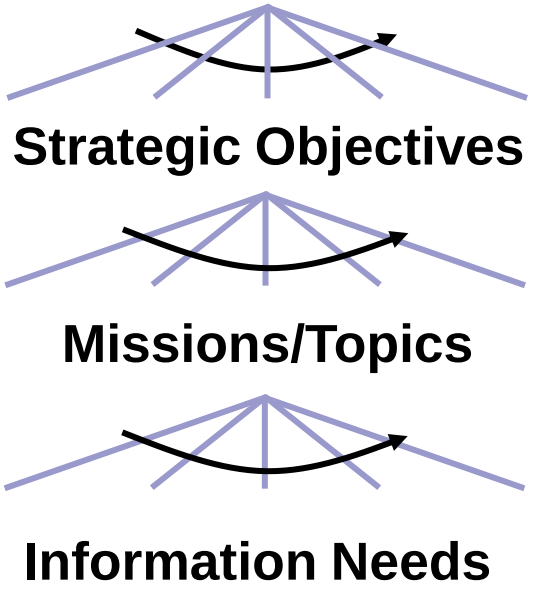


Strategic Objectives

Missions/Topics

Example Information Needs

Hannibal 218 BC	MacArthur 1945	China/Taiwan 2020?
Where are the Roman troops moving?	Where are the Japanese troops moving?	Where are the Chinese troops moving?
What equipment do they have?	What equipment do they have?	What equipment do they have?
How many Romans are there?	How many Japanese troops are there?	How many Chinese troops are there?
What are the plans of the Romans?	What are the plans of the Japanese?	What are the plans of the Chinese?
How many horses do the Romans have?	How many submarines do the Japanese have?	How many fighter planes do the Chinese have?



Example Intelligence Capabilities

GEOINT Capabilities

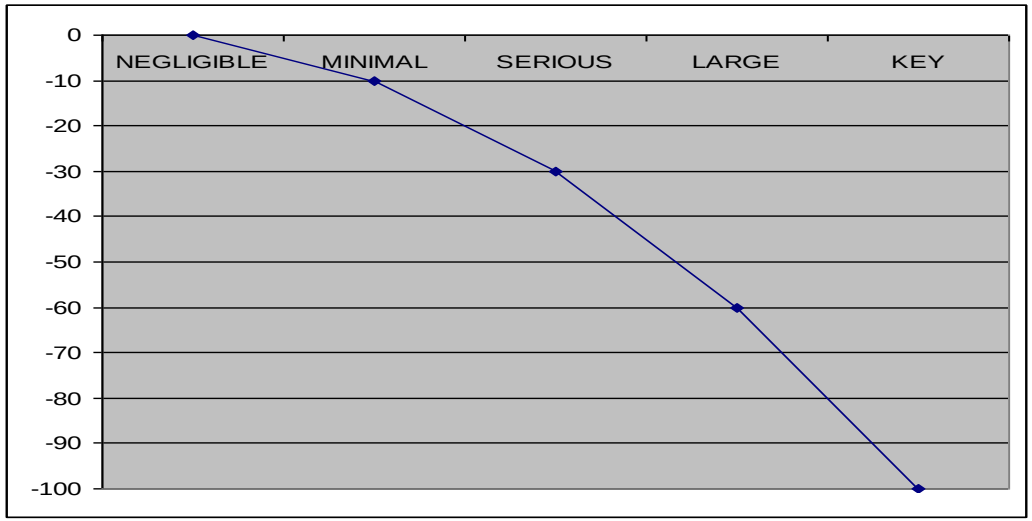
SIGINT Capabilities

HUMINT Capabilities

MASINT Capabilities

What is the impact of eliminating funding for this capability on each of the information needs?

- ☐ NEGLIGIBLE
- ☐ MINIMAL
- ☐ SERIOUS
- ☐ LARGE
- ☐ KEY



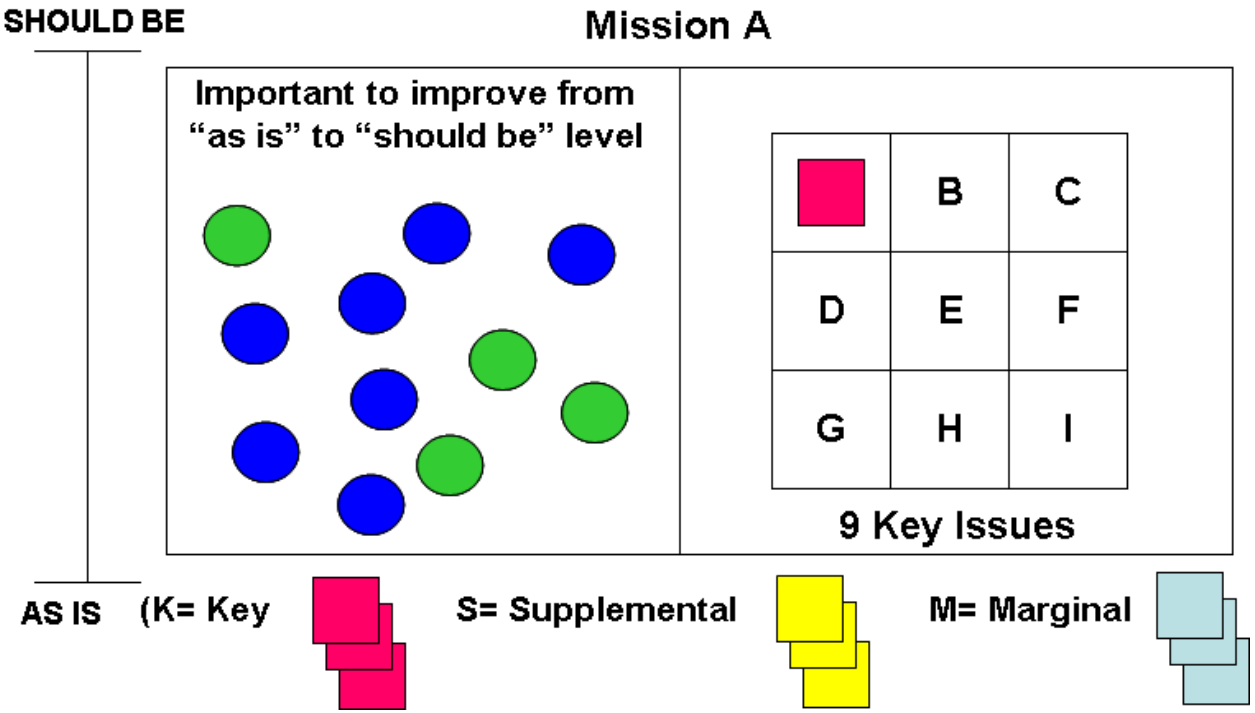
Swing Weights

- SILVER Standard
  - Workshops - Stakeholder representatives
  - Example: Value of Intelligence Workshop (2007)
- PLATINUM Standard
  - Surveys - Decision-makers and stakeholders
  - Example: Programming Committee Survey (2008)
- GOLD Standard
  - Guidance Documents - Approved documents
  - Example: Mission Priority Study (2009)

How important is it to improve intelligence collection against each mission?

Value of Intelligence Workshop

- Step 1: What are the attributes of value for intelligence?
- Step 2: What attributes are most important to improve?
- Step 3: Where will issue recommendations add value?
- Step 4: Discuss the resulting rank order of the major issues. Why does or doesn't it make sense?



Programming Committee Survey

Issue	Number of Coins/Priority	Preferred Alternative	Rationale
Issue 1	150 / 2	Alt 2	Supports national CI strategy
Issue 2	400 / 1	Alt 2	Removes single point of failure
Issue 3	150 / 3	Alt 5	Synchronizes analytic and collection capabilities
Issue 4	25 / 7	Alt 2	POR appears pretty healthy
Issue 5	25 / 8	Alt 1	Joint training may not add much to skills shortfall
Issue 6	125 / 4	Alt 2	Closely tied to info sharing
Issue 7	50 / 6	Alt 3	Important initiative but needs more specifics
Issue 8	75 / 5	Alt 2	Enables information sharing

Mission Priority Study

Data is not real

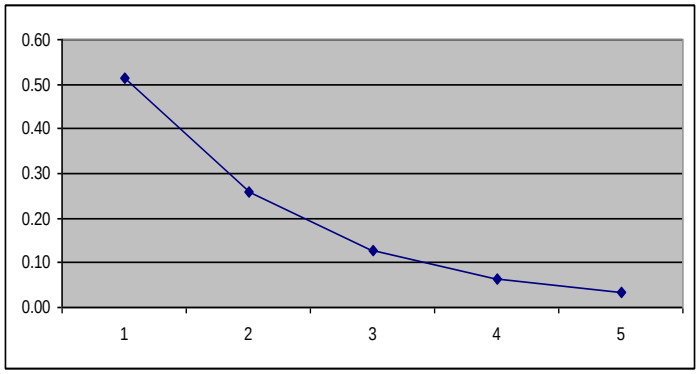
= Priority 1
= Priority 2
= Priority 3
= Priority 4
= Priority 5

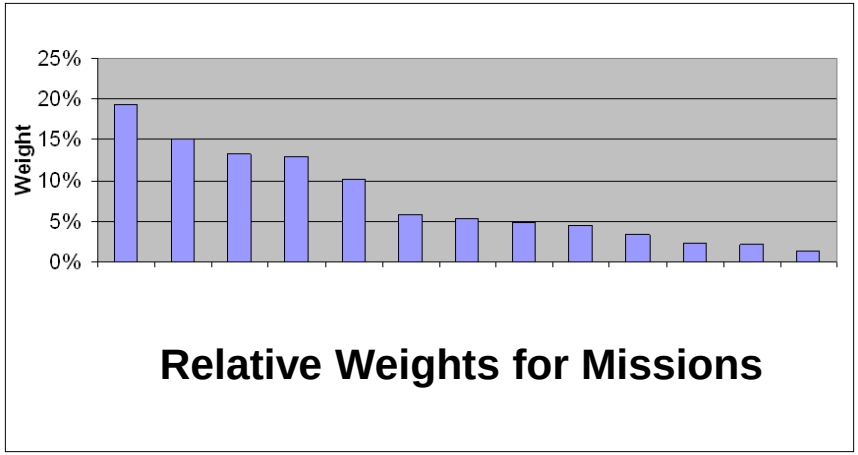
	MISSION A	MISSION B	MISSION C	MISSION D	MISSION E	MISSION F	MISSION G	MISSION H	MISSION I	MISSION J	MISSION K	MISSION L	MISSION M	MISSION N	MISSION O	MISSION P	MISSION Q	MISSION R	MISSION S	MISSION T	MISSION U	MISSION V	MISSION W	MISSION X	MISSION Y	MISSION Z
Country A	2			1		1	2		1	1	4	4						4		1	2		5	2	2	3
Country B	5		3			3			5									4		5		4		5		
Country C			4			3	3	4						5	4	4								5		
Country D																										
Country E			4	4												4										
Country F																										
Country G	5				2					4	4			3									2			3
Country H	5		5	5		5			4									4				3		5		
Country I																										
Country J																									3	
Country K	5		4	4		4			4							3	3	4						3	3	
Country L							5													4						
Country M			5	3		4			4															4	4	
Country N			3							4											4			5		5
Country O																										
Country P	4		4			3					4		4		3	4		5	4			5		4	5	
Country Q					5																					
Country R							3													5						
Country S							3				4									5						
Country T			4																	5						

Mission Priority Study

- Steps:
  - Step 1: Capture ordinal priorities from priorities matrix
  - Step 2: Convert ordinal priorities to ratio priorities using a geometric progression
  - Step 3: Sum each mission column and add across
  - Step 4: Normalize to derive relative weight for each mission

Ordinal Priorities Converted to Ratios



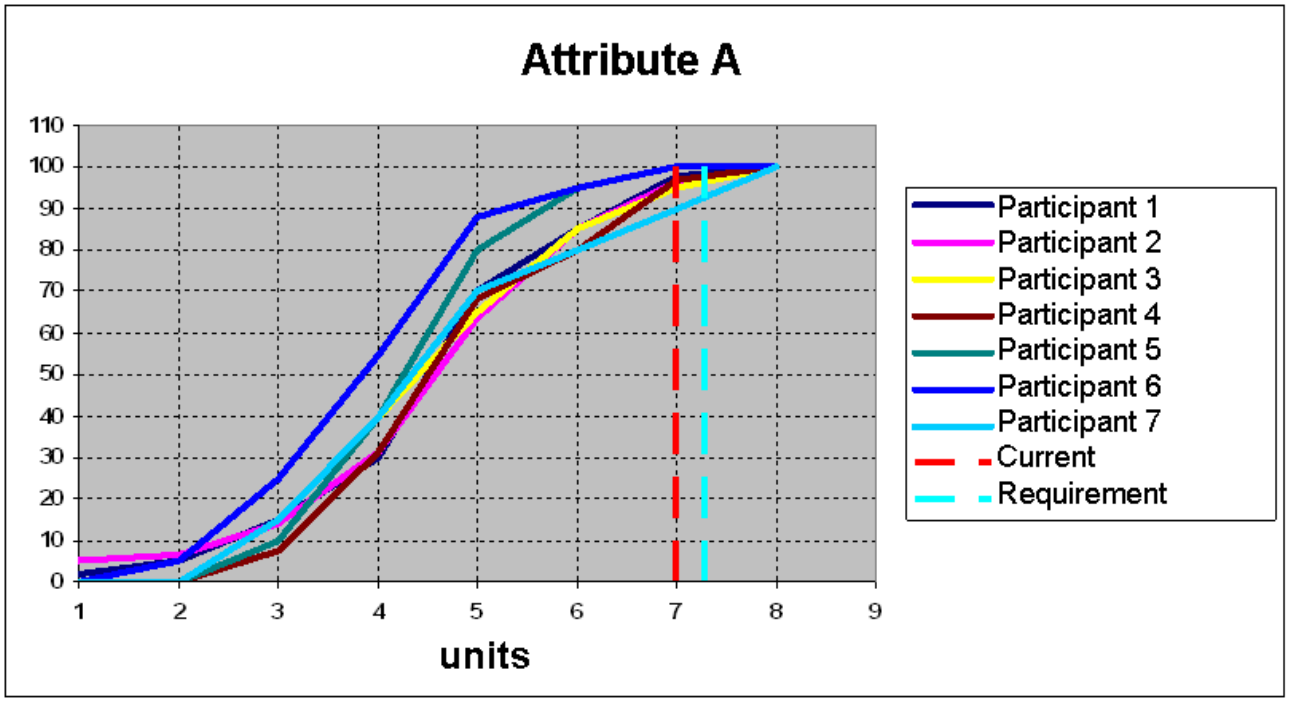


Mission Utility Studies (MUS)

- Assess mission satisfaction from capability attributes and inform difficult trades *independent of system solutions or architectures*
  - Creates a foundation for alternatives analyses, cost-effectiveness analysis, and risk assessments
  - Gathers user inputs on the utility of different levels of system performance in the context of intelligence and operational missions
  - Provides the means for making best-value decision trades based on user community inputs
  - Supports key decisions concerning capability requirements and informs the budget process

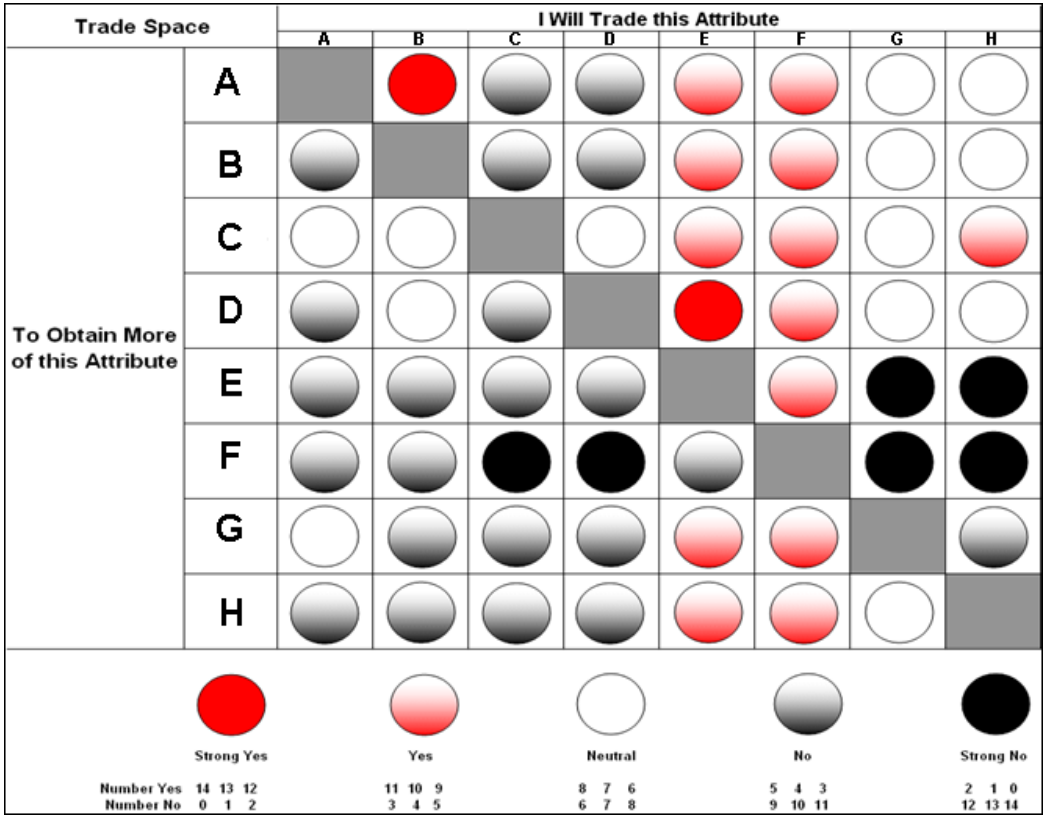
Mission Utility Curves

- For cost-driving attributes within key missions
- Look for tipping point in an attributes' contribution to mission
- Identify common community needs and unique needs
- Associated rationale is key



Attribute Trades

- Black represents attributes most in demand & IC is least willing to give up
- Red represents attributes IC is most willing to trade off



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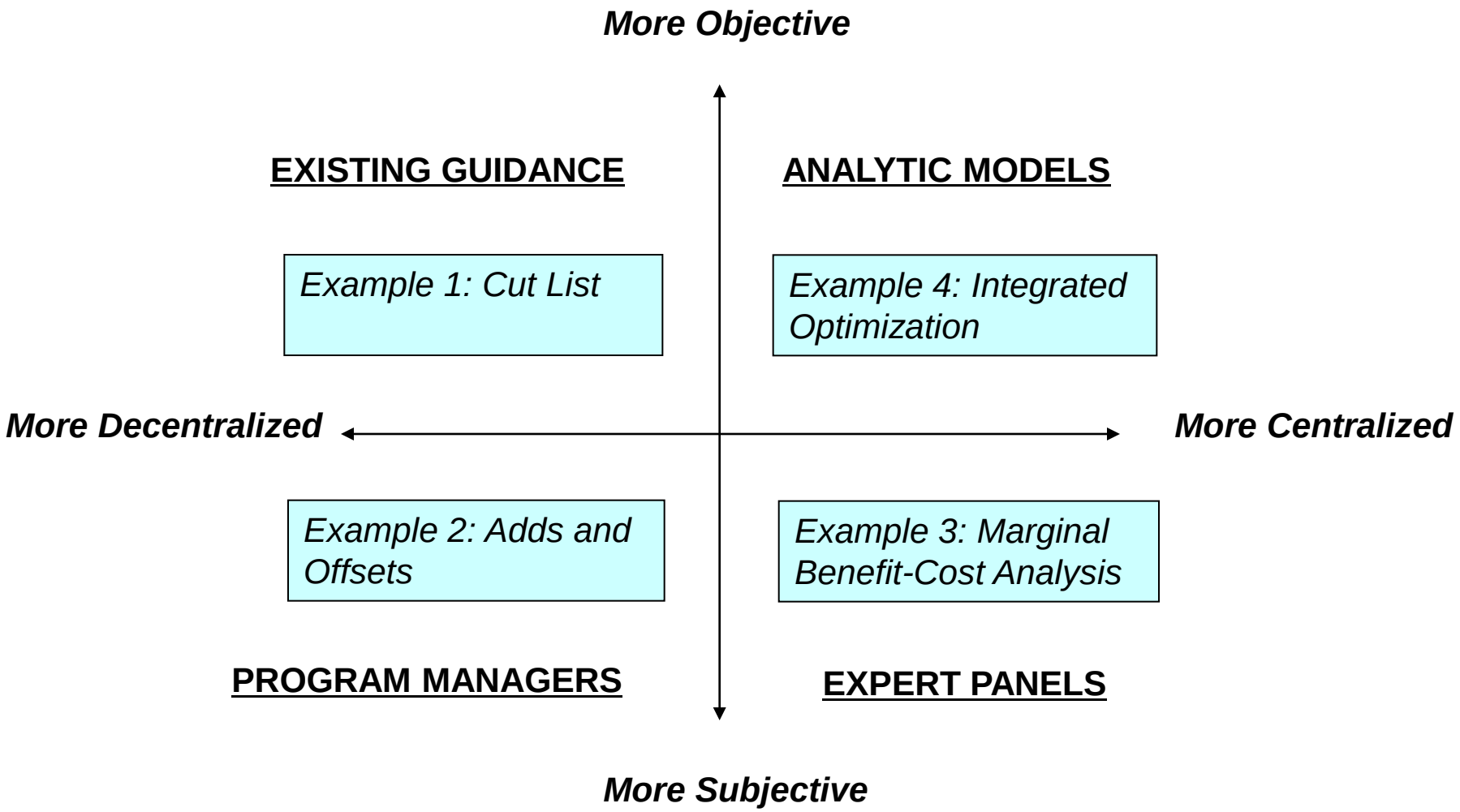
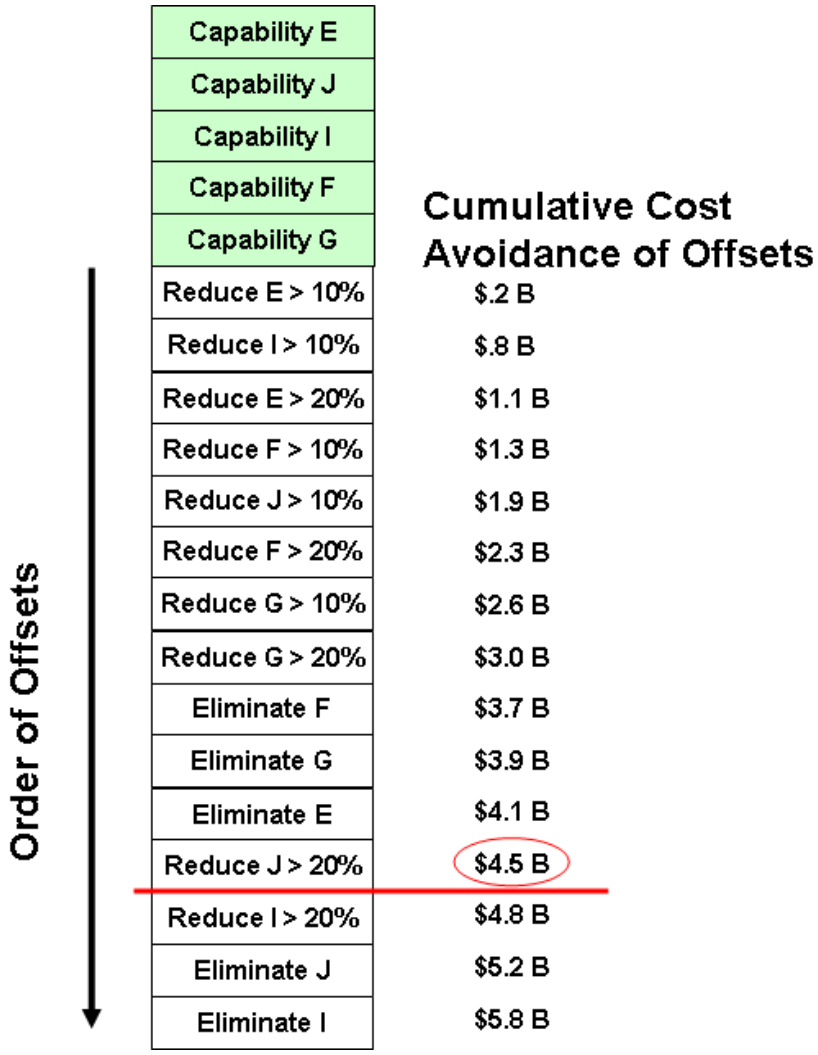
Portfolio Models

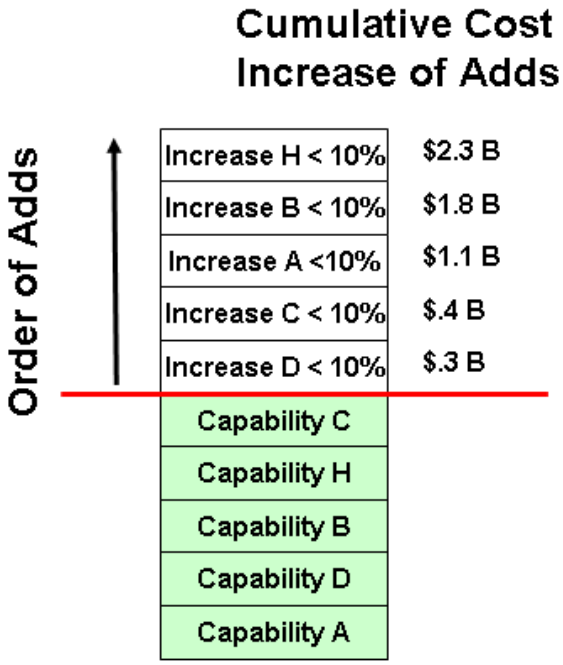


Cut List

- DNI requires the programs to submit their bottom 5 percent priorities to hold
- DEXCOM evaluates and decides on new investments, then asks the DNI for an offset amount from the 5 percent holds to pay the bill
- No comparison is made between the value gained from new investments and the value lost from the 5 percent offsets
- Vest maximum responsibility in the programs and leverages the domain expertise of the program managers
- However, lacks enterprise perspective; will tend to sub-optimize the capability portfolio

Adds and Offsets





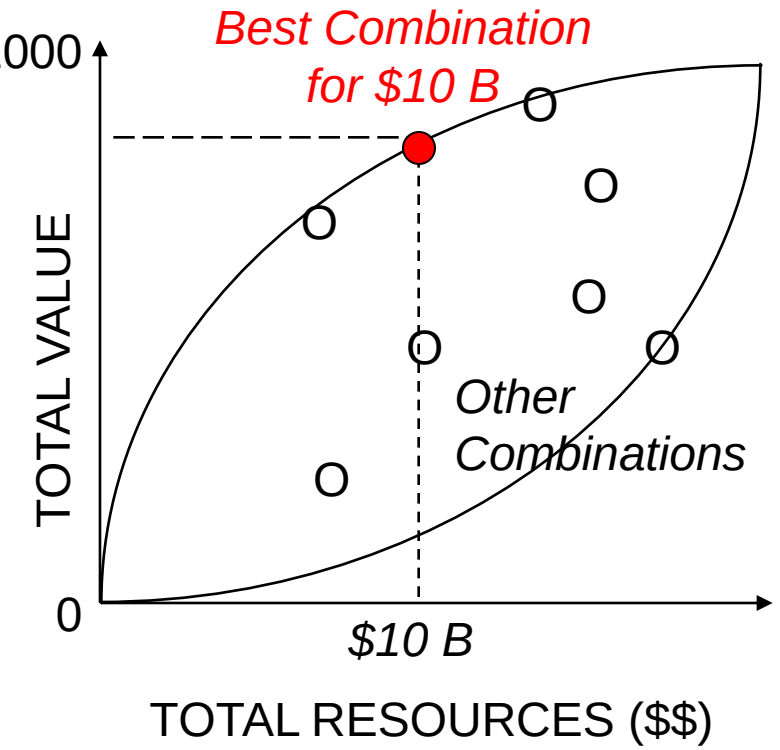
Since both lists are on the same scale, use the lists to decide how much to "rebalance" to achieve the required savings and improve use of constrained resources

Marginal Benefit-Cost Analysis

Each capability area is defined by alternatives which add increments of capability

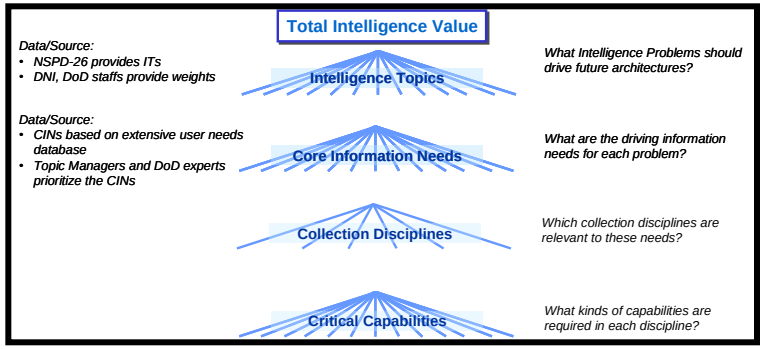
	+				
Capability Area A	**Elim**	**Deep**	**Cut**	**Base**	**Add**
Capability Area B	**Elim**	**Deep**	**Cut**	**Base**	**Add**
Capability Area C	**Elim**	**Deep**	**Cut**	**Base**	**Add**
Capability Area D	**Elim**	**Deep**	**Cut**	**Base**	**Add**
Capability Area E	**Elim**	**Deep**	**Cut**	**Base**	**Add**

The Pareto Space

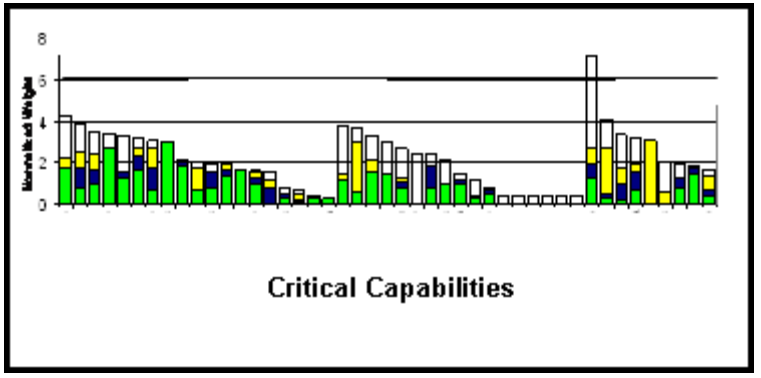


Integrated Optimization

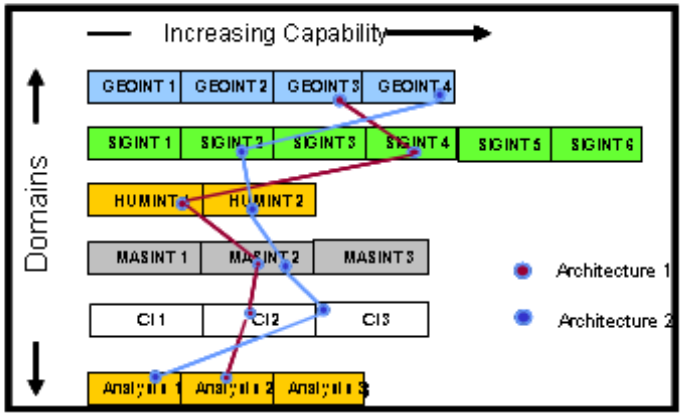
1. Identify IC Needs



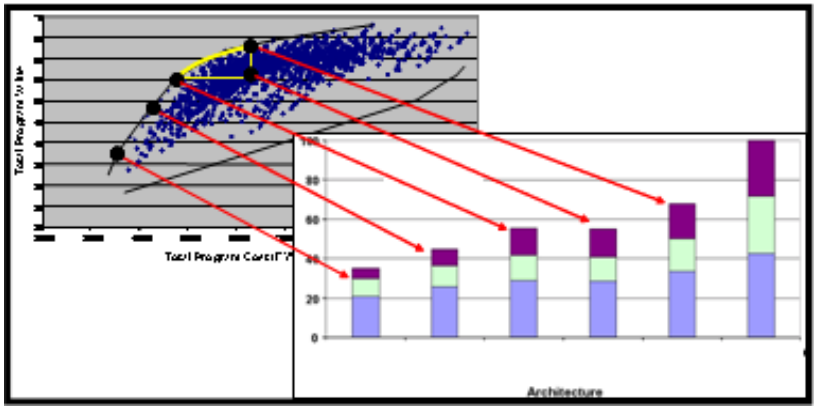
2. Prioritize Ability to Fill Gaps



3. Identify Alternative Architectures



4. Perform Cost/Benefit Analysis



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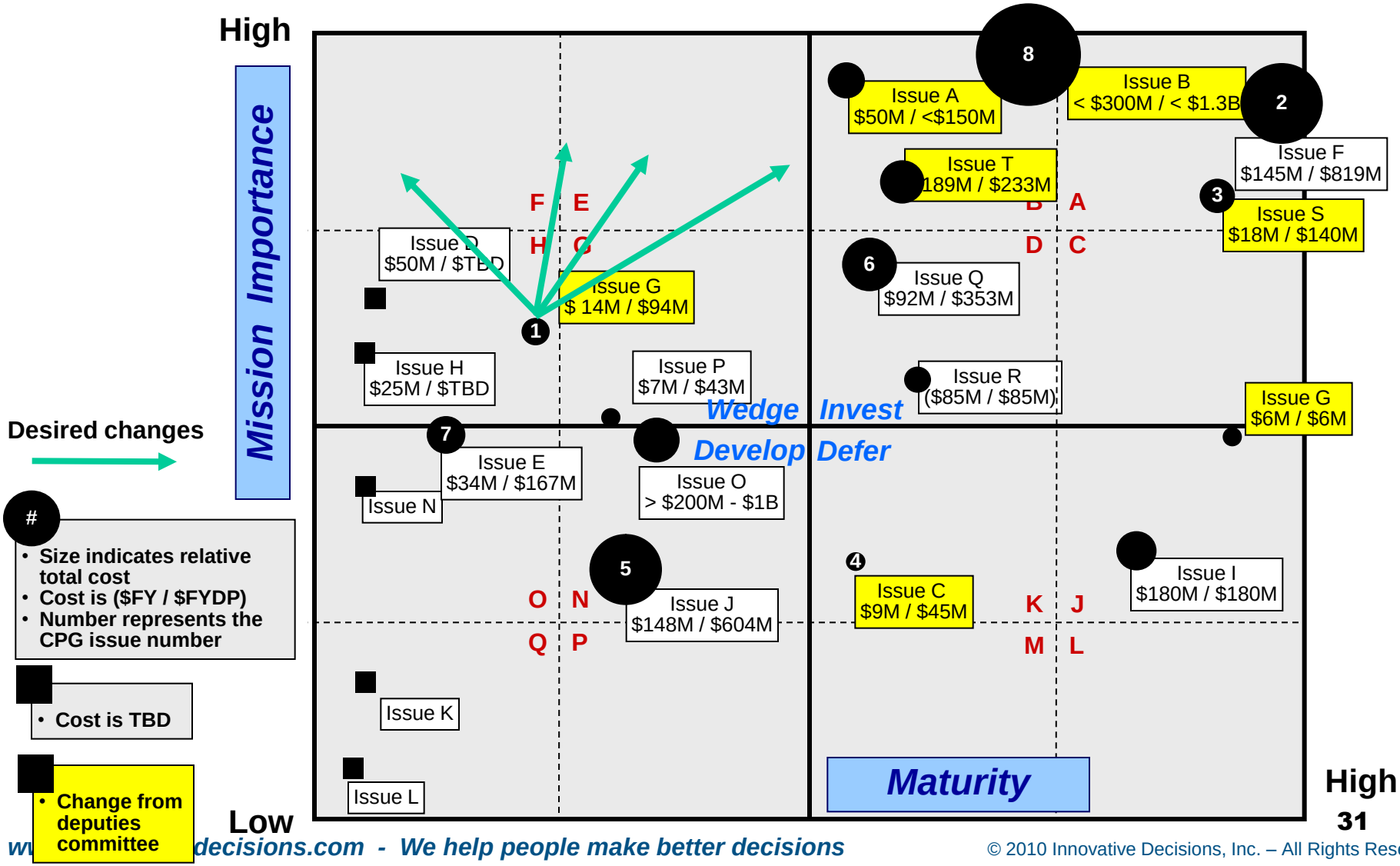
Horse Blanket

MSN A	MSN B	MSN C	MSN D	MSN E	MSN F	Overall
Capability 9	Capability 3	Capability 1	Capability 1	Capability 1	Capability 13	Capability 1
Capability 13	Capability 2	Capability 13	Capability 10	Capability 13	Capability 2	Capability 13
Capability 4	Capability 1	Capability 3	Capability 13	Capability 3	Capability 1	Capability 10
Capability 3	Capability 10	Capability 4	Capability 4	Capability 4	Capability 10	Capability 4
Capability 10	Capability 13	Capability 5	Capability 5	Capability 10	Capability 5	Capability 5
Capability 8	Capability 6	Capability 6	Capability 6	Capability 9	Capability 6	Capability 6
Capability 7	Capability 7	Capability 7	Capability 7	Capability 7	Capability 7	Capability 7
Capability 6	Capability 8	Capability 8	Capability 8	Capability 8	Capability 8	Capability 8
Capability 1	Capability 9	Capability 9	Capability 9	Capability 14	Capability 9	Capability 9
Capability 5	Capability 4	Capability 10	Capability 2	Capability 5	Capability 4	Capability 3
Capability 11	Capability 11	Capability 11	Capability 11	Capability 11	Capability 11	Capability 11
Capability 15	Capability 16	Capability 12	Capability 16	Capability 6	Capability 12	Capability 16
Capability 2	Capability 5	Capability 2	Capability 3	Capability 2	Capability 3	Capability 2
Capability 14	Capability 12	Capability 16	Capability 14	Capability 12	Capability 16	Capability 12
Capability 12	Capability 15	Capability 15	Capability 15	Capability 15	Capability 15	Capability 15
Capability 16	Capability 14	Capability 14	Capability 12	Capability 16	Capability 14	Capability 14

Decision Framework



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Lessons Learned

- Dots work! Senior decision makers like to interact with visual representations of the problem
- Senior decision makers don't think in terms of increasing benefit, but rather in terms of decreasing risk
- Enterprise value models require a major commitment by an organization, even for a relatively high level model
- Develop models at the level of detail the seniors are willing to believe
- Engage the smaller "players" who want to have an opportunity to compete for dollars
- Be patient; cultural changes take time