



National Interest Security Corporation
An IBM Company

An Introduction to Edge Methods

Business Analytics and Optimization for Intelligence

Analytics Solution Center, DC

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Managing large volumes of data can be overwhelming, deriving insights from your data is invaluable – our approach



- Our goal today is to provide you with a better appreciation of how we tackle today's seminar topic within the Defense and Intelligence community
- At the root of our client engagements lie:
 - Large volumes of structured and unstructured data
 - Existing and future capability needs
 - Urgency to make large-scale decisions
- We orient our practitioners and projects around an empirically-based analytical framework called **Edge Methods**
- We will provide you real-life case studies where we have employed these methods to create value for our clients



Our BAO-Intelligence team provides domain knowledge and expertise in integrating business and technology services




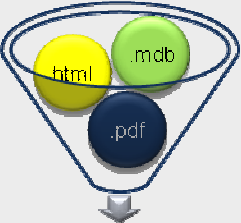
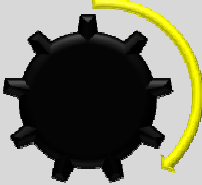
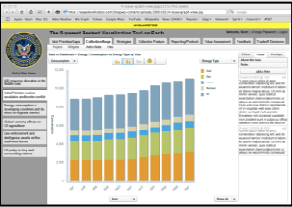
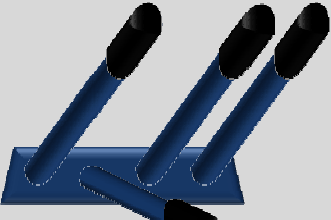
- Empirically-based performance analysis and deep client domain expertise are at the heart of our consulting engagements
- **Edge Methods** (our consulting model) – integrates commercial consulting methods with tacit knowledge of the mission, delivering work products and advice that improve operations and creates new capabilities
- Our empirical methods enhance rather than replace subject matter expert input into strategic planning and budgeting decision processes
- Our strategy methods assess multiple levers of organizational change and use value as a key discriminator
- ▶ We are a *learning* organization – constantly improving our methods

Mission Focused – Performance Driven



Edge Methods provide a quantitative approach to strategy and performance improvement



	<h2>Hypothesize</h2> <ul style="list-style-type: none">•Inductive approach to problem solving, focuses data collection on key information•Goes beyond understanding a situation, identifies solutions from the beginning•Establishes clarity early, often in the midst of complexity and ambiguity
	<h2>Gather and Clean Data</h2> <ul style="list-style-type: none">•Data is at the heart of our analysis and decision support process•Custom scripts and web crawling tools are used to collect, assemble and clean large volumes of data from databases, reports, spreadsheets and open sources.
	<h2>Analyze</h2> <ul style="list-style-type: none">•Execute calculations relevant to hypotheses being tested•Statistical and geospatial analysis and modeling are performed using both off the shelf and custom built IT tools
	<h2>Visualize</h2> <ul style="list-style-type: none">•Provide tailored interactive visualization tools to understand performance data•Custom designed AdvantEdge web application that integrates into client mission processes
	<h2>Synthesize and Identify</h2> <ul style="list-style-type: none">•Hypothesis driven analysis yields synthesizes the data to provide actionable recommendations or support informed collaborative decision making•Improvement levers are identified and supported by quantitative analysis



We deliver high-quality, high-impact results across the community – mission focused, performance driven



Client	Focus Areas	Edge Methods	Description
OSD/JCS	<ul style="list-style-type: none"> • Plans/Budgeting • Mission Analysis • Program Strategy • Modeling/Simulation 	<p>SPIN</p> <p>Hypotheses-Driven Approach</p> <p>Quantitative Assessments</p> <p>Deck Writing</p> <p>Performance Improvements</p>	Delivering data-driven strategy solutions to aid current counterterrorism (CT) and counterinsurgency (COIN) efforts as well as to inform the posture of U.S. forces for the long-term
CT	<ul style="list-style-type: none"> • Mission Analysis • Quantitative Analysis • Capability Development 		Assessing the performance of the intelligence community in ongoing counter-terrorism (CT) efforts
ISR TF (AFG)	<ul style="list-style-type: none"> • ISR PED Process Imprv. • CONOP Development • Mission Analysis 		Providing direct analytical and “wrenching” support to the ISR Task Force in support of the AFG Campaign
NGA	<ul style="list-style-type: none"> • Mission Analysis • Capability Development • Decision Support 		<p><i>Analysis & Production directorate:</i> Combining performance-based assessments of GEOINT production, data visualizations, and executive decision support</p>

A sample of our current engagements



For the SECDEF, our assessments informed multi-billion dollar investments by the Secretary in major change



Client: Secretary of Defense and Vice Chairman of the Joint Chiefs of Staff

Challenge: Optimize a multi-billion dollar investment portfolio against the intelligence needs of Operation Iraqi Freedom

Approach

Assemble Ops and Intell Data

- Narrative reporting from human and signals intelligence
- Systemic data from airborne collection platforms
- Operational results

Develop Mission Context

- Three separate multi-week trips to Iraq theatre
- Gathered over 1TB of additional data stored in theatre

Analyze Dataset Against Operations

- Conducted series of empirical and logical tests to identify frequencies, relationships, and limiting factors

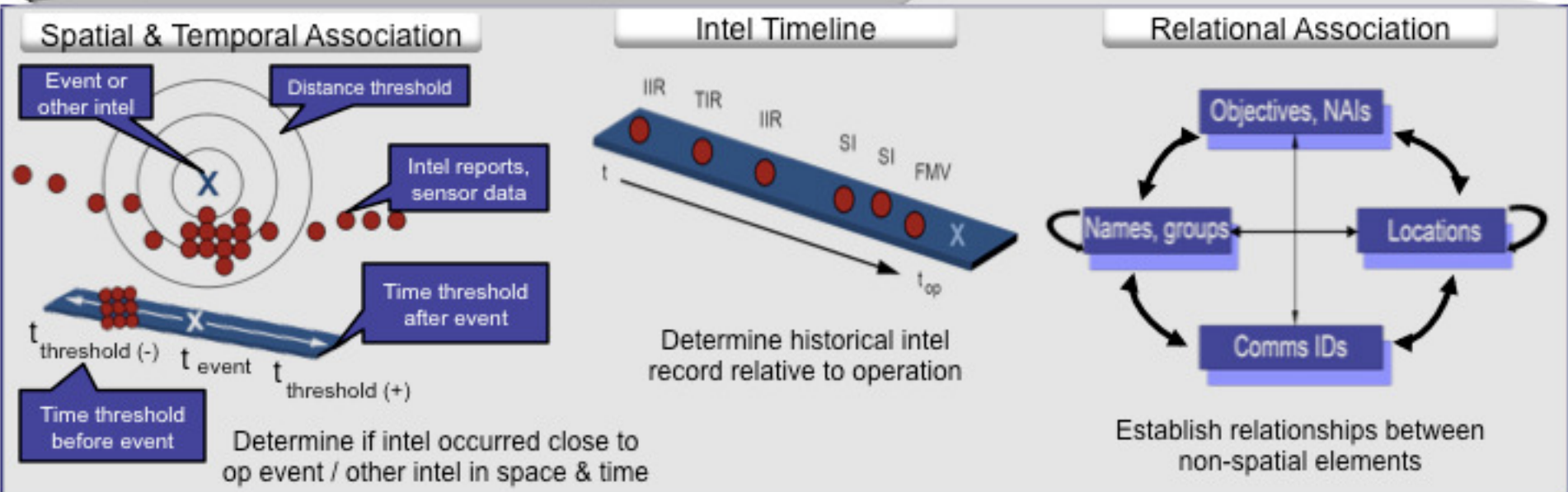
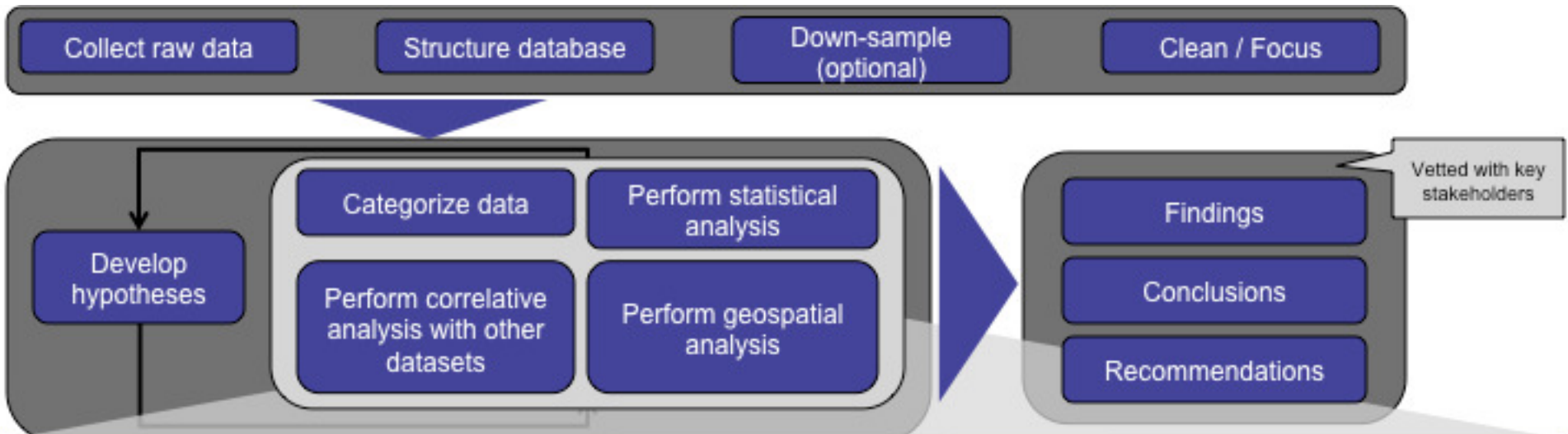
Synthesize Operations

- Quickly vetted and established preliminary insights
- Refined findings and developed implications for programmatic budget decisions

- Established performance baseline; identified capabilities most critical to mission performance and those with little contribution, including several surprises to conventional assertions of value
- Empirical insight into force sizing for intelligence systems in Iraq drove significant programmatic changes to the FY09 and FY10 budgets



The applied method in the OSD/JCS case quantified ISR value across 4,000 SOF operations in Iraq



We further enable Edge Methods through technology, allowing enterprise value to be assessed and visualized for decisions



- Diverse categories of financial and mission performance data
- Stored in numerous locations and repositories
- Data exists in multiple file format types (databases, spreadsheets, documents)
- Gather quantitative data from multiple datasets
- Extract metadata from within files and clean (spelling, typos, errors)
- Apply pre-established rule sets and algorithms to calculate enterprise value
- Lightweight application for visualizing interactive views of aggregated data - "Pivot table on steroids"
- Control axes and filters to customize the view
- Save views in a dashboard format for executive review
- Provide decision framework to shape analysis
- Enable collaboration around decisions
- Execute mission processes to develop decisional products



In support of the national CT mission, we have helped analyze performance as well as create desktop performance analysis tools

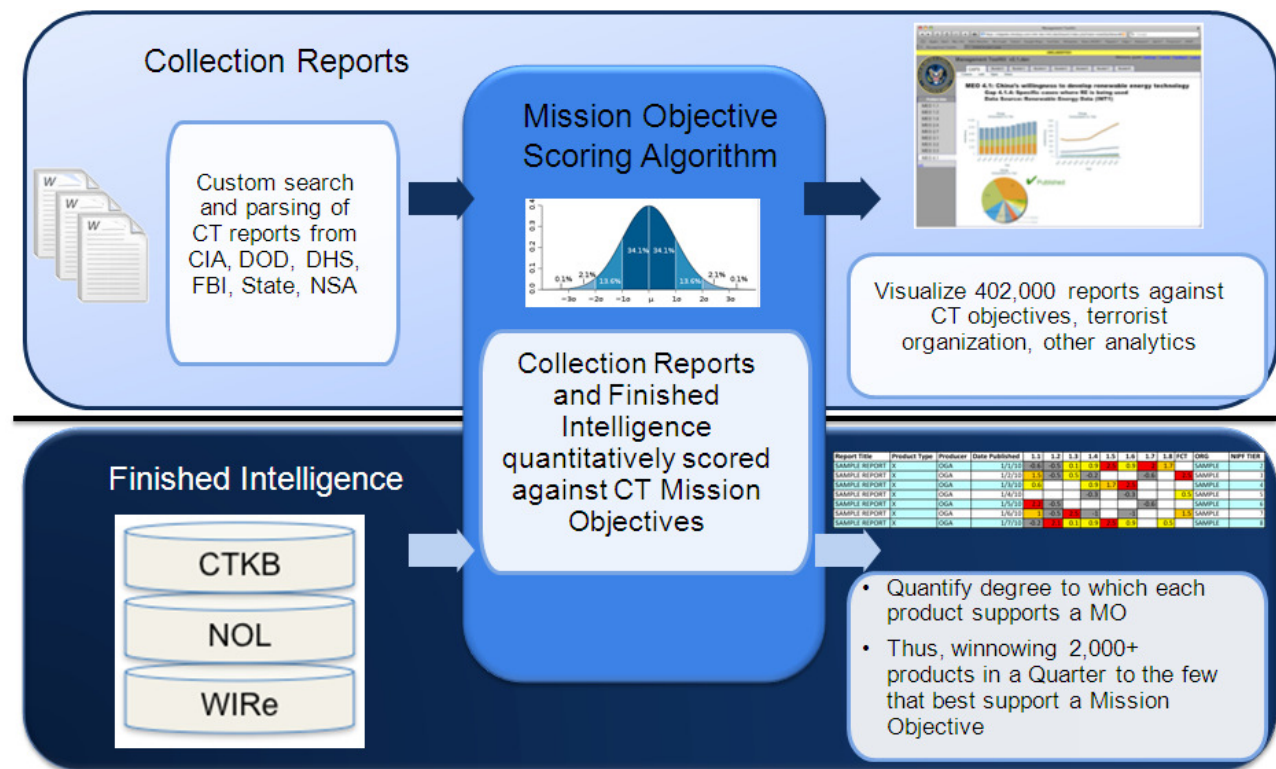


Challenge: Assessing the performance of the intelligence community in ongoing counter-terrorism (CT) efforts

Approach

Collection – analyzing collection reports through customized scripts and algorithms to score relevance through large volumes of reporting, displaying over 400,000 reports to Mission Managers via visualization capability

Analysis – assessing finished intelligence, leveraging scoring algorithms to correlate approx. 750 key words/phrases against over 2,000 products per quarter, gaining efficiencies on the NCTC floor



We are helping to drive informed decision-making within NCTC's Mission Management office by delivering empirically-based results on critical mission objectives affecting our nation's security



Delivering mission impact – at NGA/P we are blending empirically-driven analysis with technology enablement



Client: National Geospatial-Intelligence Agency (NGA) Analysis & Production Directorate (NGA/P). Over 2,000 analysts delivering timely and relevant GEOINT services to meet the needs of the Warfighter and Policy makers

Challenge: How to assess and manage the analytical enterprise to ensure optimal performance is being achieved

Approach

Efficiency
<ul style="list-style-type: none"> Is NGA/P effectively measuring, tracking, and reporting its performance?
Focus
<ul style="list-style-type: none"> Is NGA/P appropriately arrayed against key priorities (country/topic), and postured to answer intelligence gaps?
Impact
<ul style="list-style-type: none"> Are NGA/P products, services, and analyses meaningful to its partners?

- ▶ Capabilities provide the greatest mission impact when the development takes place alongside the mission
- ▶ Through our analysis we are able to harvest 10+ years of mission data, identifying trends and outliers – informing decision-makers, delivering impact
- ▶ Now providing data-to-the-desktop for over 125 managers within NGA/P



- 2 Gather Data**
 - Methods for automating data collection, structuring, and cleansing can be applied to shared datasets and made available to the dashboard for quick visual reference
- 3 Analyze, Visualize**
 - The dashboard can provide analysts, managers, and executives a quick means to visualize collected data
 - Data and visuals presented by the dashboard can be used to support or supplement more detailed correlative analysis of problem indicators



For the ONCIX, we are employing a risk assessment approach that evaluates IC supply-chain vulnerabilities



Client: Office of National Counter-Intelligence Executive (ONCIX)

Challenge: Creating an approach and capabilities to assess and manage the increased risk to national security due to the global reliance on global supply-chain

Approach

Assemble Probabilistic Data and Feedback

- Elicit feedback and harvest operational data to identify relationships between threats and supply chain

Formulate Evidence-based Models

- Generated models of the environment that predict risk
- Established probabilistic metrics framework

Conduct Analysis and Simulation Models

- Simulated the varying factors affecting supply chain risk
- Enable “what if” experimentation and trends

Synthesize Operations and Develop Tools

- Create interactive visualization of risk to facilitate better understanding*

Instituted analytical rigor providing a simple, but powerful approach – rooted in mathematical algorithms that are framed by operational data and provide analytically defensible decisions

The screenshot shows a software interface for configuring a risk assessment model. It is divided into three main sections:

- 1. Select an Indicator:** A table with columns for Indicator, Weight, and Source Count. The total weight is 17%.
- 2. Select a Question:** A list of questions with radio buttons for selection. The total weight for the selected question is 75%.
- 3. Sources [Question: Is the majority of stockholders citizens or entities of Lower Tier Countries of Concern or Non-State Groups?]:** A table for defining data sources, with columns for Source Label, Source Selection, Confidence, and Date/Time Modified.

Indicator	Weight	Source Count
**** *	4%	0
**** *	6%	0
**** *	10%	1
**** *	4%	0
**** *	2%	0
**** **	25%	2
**** **	6%	0
**** **	9%	0
**** **	3%	0
**** **	10%	0
**** **	7%	0
**** **	11%	0
**** **	3%	0

<input checked="" type="radio"/> Is [this company] a foreign or domestic company?
<input type="radio"/> Is [this company] public or private?
<input type="radio"/> Is the majority of stockholders citizens or entities of Upper Tier Countries of Concern or Non-State Groups?
<input type="radio"/> Is the majority of stockholders citizens or entities of Lower Tier Countries of Concern or Non-State Groups?
<input type="radio"/> Is the majority of stockholders citizens or entities of Neutral Countries?
<input type="radio"/> Is the majority of stockholders citizens or entities of Allied Countries?
<input type="radio"/> Is the majority of stockholders U.S. Citizens?
<input type="radio"/> Is the majority of stockholders Unknown?
<input type="radio"/> Is the majority of stockholders citizens or entities of Upper Tier Countries of Concern or Non-State Groups?
<input type="radio"/> Is the minority of stockholders citizens or entities of Lower Tier Countries of Concern or Non-State Groups?
<input type="radio"/> Is the minority of stockholders citizens or entities of Neutral Countries?
<input type="radio"/> Is the minority of stockholders citizens or entities of Allied Countries?
<input type="radio"/> Is the minority of stockholders U.S. Citizens?

Source Label	Source Selection	Confidence	Date/Time Modified



In summary, Edge Methods helps clients define strategies, measure and improve performance, and drive impact



Capabilities	Impacts
Performance Assessment	<ul style="list-style-type: none"> Quantitative assessment of intelligence value to 4,000 special operations led to historic \$1B DoD reprogramming for intelligence Differentiators: Identified major shift in intelligence production by quantifying performance of 1,000 analysts over a seven year period
Strategic Management	<ul style="list-style-type: none"> Providing technical, analytical, and program management support to critical homeland segments – cyber and infrastructure protection Differentiators: Helping the Dept. of Energy manage large programs including the Administration’s new \$30B investment in energy technologies
Operational Improvement	<ul style="list-style-type: none"> Identifying intelligence improvements in Iraq and Afghanistan for ISR Task Force, JCS, and US CENTCOM Differentiators: Defining changes in counterintelligence tasking and production for the National Counterintelligence Executive
Capability Design and Prototyping	<ul style="list-style-type: none"> Drove requirements for redesign of Army’s intelligence force structure Differentiators: Prototyped and piloted automated mission management capability, enabling NCTC to assess performance from half million records

