



Operational Application of Targeted Data Analysis

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Agenda

- Who is NTELX?
- Applying Intelligence Multi Source and Multi Indicator Knowledge Based Decision Making to Medicaid/Medicare Data Analysis
- Defining Actionable Analytics
- Policy and Governance

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What we do?

Experts in designing, implementing and operating complex analytical and Knowledge Discovery and Decision Making (KDDM) solutions for US Government Regulatory and Intelligence Agencies.

- Mission-critical systems to several U.S. Government agencies for food safety, financial, and risk-based decision making solutions
- Solve problems that require software solutions which collect, fuse, normalize and analyze disparate, heterogeneous, complex and voluminous data
- Employ a methodological approach that allows for rapid deployment, situational awareness and knowledge based decision making
- Provide clients advanced, proven FDFolio Suite web-based software technologies which keep costs down, saves time and supports rapid scalability from pilot to operational systems

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Alignment of Terms NTEL X
Insight to Action

Medicare	Intelligence	Behavior
Fraud	Nefarious Actors	Criminal Activity
Abuse	Gamers	Consciously Exploiting the System
Waste	Process Improvement Candidate	Lazy, Stupid or Both

The key word is the Medicaid/Medicare conversation is "intent"

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Challenges facing the Intelligence Communities NTEL X
Insight to Action

- Lots of data
- Lots of data gaps
- Data is not harmonized
- The lack of automated analysis
- Technology is turning analysts into tool jockeys
- Complex and often conflicting indicators
- Brain Drain Problem
- Musical Chairs

"We learned of the pervasive problems of managing and sharing information across a larger and unwieldy government that had been built in a different era to confront different dangers."
- 911 Commission Final Report

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The Solution - Actionable Analytics NTEL X
Insight to Action

Situational Awareness - Holistic view of disparate data sets across multiple domains. Provides stakeholders a common operating picture (COP) and richer understanding of the problem domain

Predictive Analytics - Statistic/mathematical methods and data mining techniques that uncover (interesting) patterns and relationships within data for predicting behavior and events

Rule Based Decision Making - Combines multiple analytical approaches (expert rules, link/network analysis, statistical data mining, predictive analytics, spatial analysis, etc.) to develop insight using business rules to synthesize these insights into "actionable" decision making

Actionable Analytics → Analyst/Researchers
 → Field Operations
 → System Work Flow

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Three Legs of the Stool

We use the analogy that an effective knowledge based analytics system is like a three-legged stool.

- Leg 1** - Data model; this is the leg most people associate with the word "collect".
- Leg 2** - Aligning or "fusing" the disparate "dirty" transactions into a ontology based information model.
- Leg 3** - Automated actionable analytics to improve decision making and optimize scarce resources



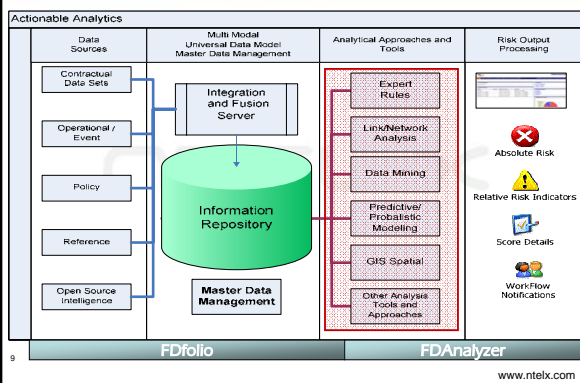
If any of the legs are too short on a three-legged stool, it will be out of balance and fall.


CFAD Framework

NTEL-X provides the (CFAD) framework and technology to:


- Identify, **Collect**, and monitor large volumes of data related to Operational, Clinical, Translational, and Research with the objective to connect the information dots across the healthcare Continuum.
- Organize and Semantically **Fuse** the disparate data sets and structured/unstructured semantic data to prepare it for analysis based on multiple ontologies.
- Provide Integrated **Analysis** and automated anomaly detection, analysis, and assessment based on a smart aggregate risk scoring model against a unified view of the data in a dynamic, time-appropriate fashion..
- Enable secure Interoperable Sharing, Visualization, and **Dissemination** of analytical products across current communications channels and to potential future stakeholders.

Collect, Fuse, Analyze, Disseminate (CFAD)



Federal Agency Data Mining Reporting Act 2007 

**Civil Liberties
and
Privacy**



**Stopping
Nefarious
Activity**


Excluded from the definition are:

- activities that "start with a known or suspected terrorist or other subject of foreign intelligence interest"
- "match known patterns of deception as provided by subject matter experts"

Definition of "data mining" - "a program involving pattern-based queries, searches or other analyses of 1 or more electronic databases" in order to "discovery or locate a predictive pattern or anomaly indicative of terrorist or criminal activity...."

Office of the Director of National Intelligence Data Mining Report
15 February 2008 - UNCLASSIFIED

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NTELX Knowledge Discovery and Decision Solution 

Data Sources (Inputs)

Medicaid Claims

Clinical Data

Crime Data

Ownership Data

Demographic

Open Source

Information Fusion (Ontology)

NTELX Ontology Based Data Model

Knowledge Discovery Models (Indicators)

Data Mining Models

Link Analysis

Text Mining

Software Agents

OTHERS

Knowledge Profiles

Policy Rules

Scenario Analysis

Spatial Analysis

Statistical Models

Spatial Analysis

Knowledge Based Decision Making

Investigation Models

Expert Rules

Aggregate Scoring Models

Validation Models


Actionable Analytics

Entities Of Interest

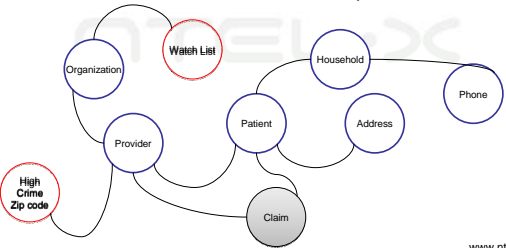
Transactions Of Interest

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Connect the Data Dots 

Formal ontologies are used to **semantically** fuse information across multiple data sources. An ontology provides upper- and domain-level category systems for decomposing Analytical and Referential Data, relating objects, object attributes/properties, temporal events, and relations of interest to the analyst



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graph TD
    Org[Organization] --- Watch[Watch List]
    Org --- Provider[Provider]
    Provider --- Patient[Patient]
    Patient --- Claim[Claim]
    Patient --- Household[Household]
    Household --- Address[Address]
    Household --- Phone[Phone]
    High[High Crime Zip code] --- Provider
  
```

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Knowledge Discovery Models (Indicators)



- Data Mining Models
 - Classification, predictive models, clusters, outliers, associations
- Link Analysis
 - Visual analysis technique that complements aggregate scoring models
- Text Mining
 - Process of deriving high-quality information from text (concept/entity extraction, entity relationship models)
- Software Agents
 - Information retrieval, filtering, and monitoring
- Statistical Models
 - Function approximation, or regression analysis, including time series prediction and modeling.
- Policy Rules
 - Expert Rules tied to policy and compliance
- Scenario Analysis
 - Automatic assessment of patterns in the context of likely and/or realistic scenarios
- Spatial Analysis
 - Find interesting, potentially useful, non-trivial patterns from spatial data for location prediction, spatial outliers detection, co-location mining

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Knowledge Based Decision Making



NTEL-X's actionable analytics utilize a rules based reasoning approach and aggregate scoring models to:

- Interpret Multiple Indicators
 - Account for gaps in time and data inaccuracies
 - Is their supporting third party or referential data?
 - What to do to the indicator/patterns show?
- Establish Probability and Confidence Factors
 - Is the indicator/pattern reliable?
 - Which indicator/pattern is more valuable ?
- Determine if the indicator/pattern is Actionable
 - Prioritize the indicator/pattern by mission model

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NTEL-X's Aggregate Scoring Models



- NTEL-X's actionable analytics are based on aggregate scoring models are a powerful method that can combine the best knowledge of experienced human experts and the power of predictive modeling algorithms.
- The core concept for developing our aggregate scoring model to minimize the effects of bias in specific model choices in outcome prediction. It has been our experience that different analytic models using identical data often have differing results.
- Our aggregate scoring model creates analytics/outcomes with higher confidence by:
 - ✓ Incorporating multiple classifying analytical techniques with multiple confidence/weighting algorithms
 - ✓ Scoring across multi data domains and data sets to reduces false-positive and false-negative rates
 - ✓ Providing the end-user with details on how the score was derived and the ability to provide feedback to improve confidence

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