

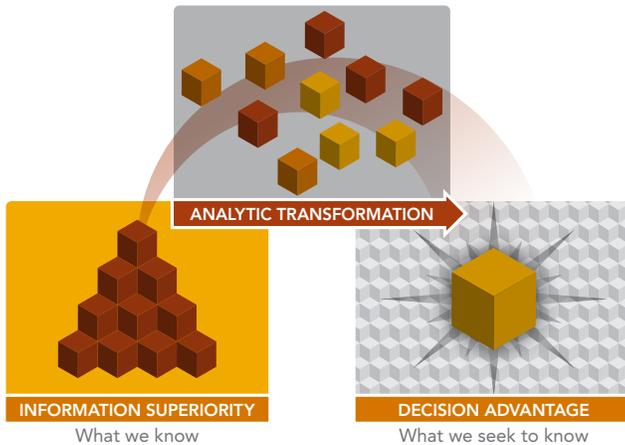
# Technosocial Predictive Analytics Initiative

Fall 2008

<http://predictiveanalytics.pnl.gov/>



QUARTERLY NEWSLETTER



## ANALYTIC TRANSFORMATION

The creation of Decision Advantage is central to the vision for a globally networked and integrated intelligence enterprise in the 21<sup>st</sup> century recently released by the Intelligence Community through the Office of the Director of National Intelligence (see Vision 2015 at <http://www.dni.gov>). Decision Advantage is achieved through a process of Analytic Transformation which enables the transition from what we know to what we seek to know.

*...continued on p.2*



### Antonio's Notes

This has been a tremendous year for the Technosocial Predictive Analytics Initiative team, with outstanding results in all areas. Many thanks to you all for the support and interest you have shown in our work during this first year. As we move further into our second year of operations, we will increasingly bring our combined R&D

efforts to fruition with integrated demonstrations that will harness capabilities from the three focus areas within the initiative: Technosocial Modeling, Knowledge Inputs and Knowledge Enhancement. The acquisition and dissemination of knowledge and evidence and the enablement of collaboration play a central role in promoting this advancement. Be sure to check out how our Knowledge Encapsulation Framework project is achieving these objectives in this issue's highlight.

## FOURTH QUARTER PROJECT STATUS

### Knowledge Encapsulation Framework: A Framework for Knowledge Inputs for Technosocial Predictive Analytics

The KEF team spent the fourth quarter focusing on alternative approaches to view the documents within the repository. Methods were developed to view documents aligned on a map and a timeline. Changes were also made to add geo-coding capability and improve the quality of the named-entity identification. Finally, progress was made on constructing a three team end-to-end demonstration of capability.

### Development of Serious Gaming Technology for Cognitive Enhancement in Predictive Analytics

The basic components of our gaming framework have been implemented and tested with a proof-of-concept "Econ 101" game interface to demonstrate feasibility. We ended the 4th quarter of FY2008 with a draft definition of a "Biofuels" game developed in collaboration with Area 1, which we will be prototyping in the first quarter of FY2009.

### Vulnerability of Food Security and Energy Infrastructures to Climate Change and Terrorism

The project team developed a working prototype of integrated agricultural, economic, health and governance factors involved in producing biofuels in India. The prototype was developed in Stella™. Two social science theory descriptions, for Rational Actor Theory and Cultural Theory, were developed for the initiative wiki site.

### Predicting the Impact of Climate Change on U.S. Power Grids and Its Wider Implications on National Security

Progress includes the preliminary implementation of a visual analytics prototype system, which integrates four major model components (i.e., climate, power grid, social, and security) into one working platform. Our work in the study of modeling technology, demographic changes, and infrastructure protection continues.

### Dynamic Scenarios for Organizations in Infrastructures

The proposed effort to NA-22 for utilizing intent in support of nonproliferation in the context of nuclear material diversion was awarded funding. We began developing dynamic models to represent general threat scenarios and detailed process models for IED scenarios. Using a Bayesian net representation of the process we show how direct observations connect with the IED process model.

### Leadership Team

Antonio Sanfilippo, Initiative Lead and Knowledge Inputs Area Lead  
Jim Thomas, Cognitive Enhancement Area Lead  
Steve Unwin, Technosocial Modeling Lead

### Operational Team

Janine Anderson, Communications  
Amanda Cowell, Administrator  
Gary Morgan, Strategy Advisor  
Fran Stanley, Finance  
Tim Strycker, Operations



**Pacific Northwest**  
NATIONAL LABORATORY

# KNOWLEDGE ENCAPSULATION FRAMEWORK

## Project Lead: Andrew Cowell

The Knowledge Encapsulation Framework (KEF) is a suite of tools to enable knowledge inputs to modeling and simulation projects, as well as other domains that require collaborative workspaces for knowledge-work. The framework has multiple applications and can be used to:

1. Capture and investigate evidence (trusted material such as journal articles, government reports)
2. Discover new evidence automatically (harvested from web sources, covering both traditional and social media)
3. Enable collaboration and discussions
4. Automatically generate semantic annotations and relationships.

From within a wiki environment, the current KEF implementation provides a simple but powerful collaborative space for

team members to review, annotate, discuss and align evidence with their modeling frameworks. This novel approach allows for the combination of automatically tagged and user-vetted resources, increasing user trust in the environment, and ultimately leading to ease of adoption for the collaborative environment.

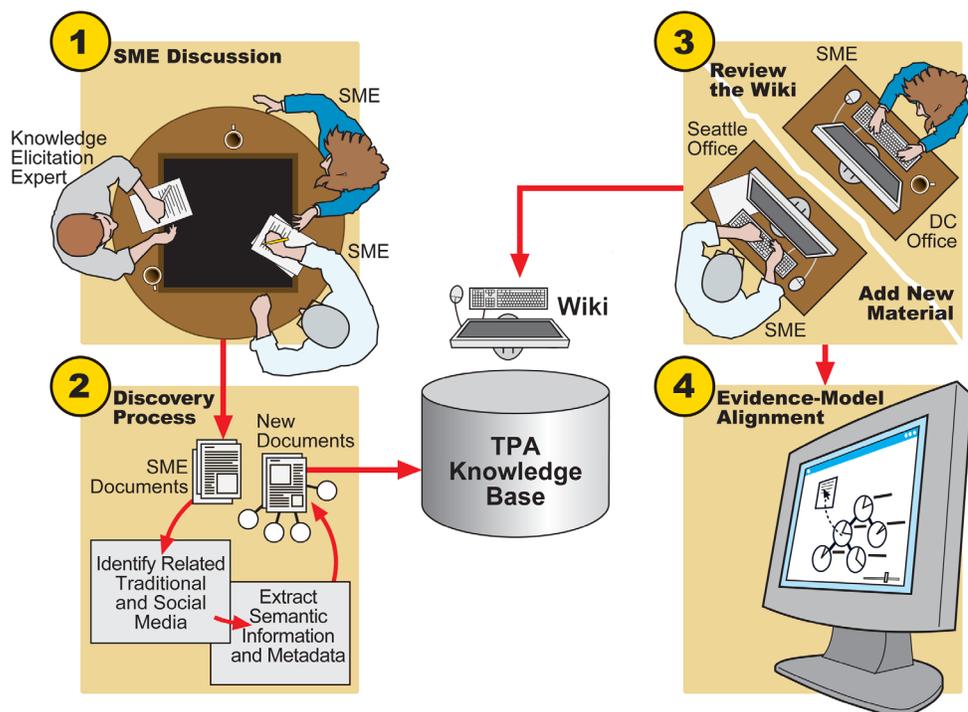
As the data repository is populated with relevant vetted material, users can interact with the data on a variety of levels depending on their goals. All data in the repository is automatically tagged with basic document metadata (source, author, date, etc.) as well as semantic information extracted from the text.

Using information extraction tools, all entities (people, locations, events, etc.) in the text are marked, as well as topics and terms regarding sentiment and rhetoric. User identified key terms also are

automatically tagged, providing a means of search and organization for ease of recall for all users in the system.

Users can correct existing annotations, or create their own to match their individual needs. Users can replace manual margin mark-ups with notes or annotations that can be searched on later or used by other collaborators. Finally, each document has a "talk page" where users can discuss the document.

The KEF collaborative workspace allows researchers to gather, annotate and store large quantities of relevant information, combining automatically harvested materials with user-vetted content. Through a semantic wiki, multiple users can add, vet and discuss source material, enabling a true and effective collaborative environment. For more information, visit our website at [www.predictiveanalytics.pnl.gov](http://www.predictiveanalytics.pnl.gov).



## Analytic Transformation

...continued from p.1

Analytic Transformation relies on creative judgment and collaboration to build more integrated analytic operations across the Intelligence Community that help adapt and respond to new situations quickly. The Technosocial Predictive Analytics approach addresses the creation of Decision Advantage through a primary focus on anticipatory creative thinking which is enabled by the

- Estimation and management of plausible futures
- Integration of human and physical models
- Encapsulation, vetting and dissemination of expert knowledge and evidence leveraging semi-automated content extraction and analysis methods
- Attention to collaborative work
- Enhancement of a user's cognitive access to the predictive analytical process
- Commitment to standards.