Sociocultural Behavior Analysis and Modeling Technologies for a Phase 0 World

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Bottom Line

- **It's a Phase 0 world**
  - *We must shape perceptions and influence adversaries' and allies' behavior*

- **High payoff from six year investment in Human, Social, Cultural and Behavior (HSCB) modeling research, but just starting…**
  - *A five year investment in Radar would have ended research in 1939*

- **Domain is still nascent, needs have changed**
  - *Adapt research agenda to address these new requirements*

- **DoD has greatly benefited from a robustly funded, OSD-led, 6.1 - 6.4 sociocultural modeling research program**

Beginnings: Demand for Sociocultural Behavior Capability

> *"We must develop the ability to understand the complex human factors and must incorporate them into all facets of operations."*
>
> MG Freakley, CG, 10th Mountain Div
> Source: Operational Needs Statement, 1 Feb 2006

- **In 2006, widespread agreement from all communities (Planners, Intelligence, Trainers, Experimenters) on lack of available and mature HSCB data, models and tools.**

- **Emphasis on counter-insurgency, Irregular Warfare (OPLAN 7500, NSPD-44, DoDD3000.05, FM3-7, FM3-24).**

Spark: The 2008-2013 Strategic Planning Guidance Study

Documented Deficiencies

- *Lack of a military technical sociocultural behavior core capability*

- Absence of data and collection methods to support understanding, models, and tool development

- Models limited in scope and scale

- Limited 'reuse' of data and software and no life-cycle management plan for products

- No integration of modeling for strategic/operational/tactical planning and operations

- Capability gap at individual soldier level
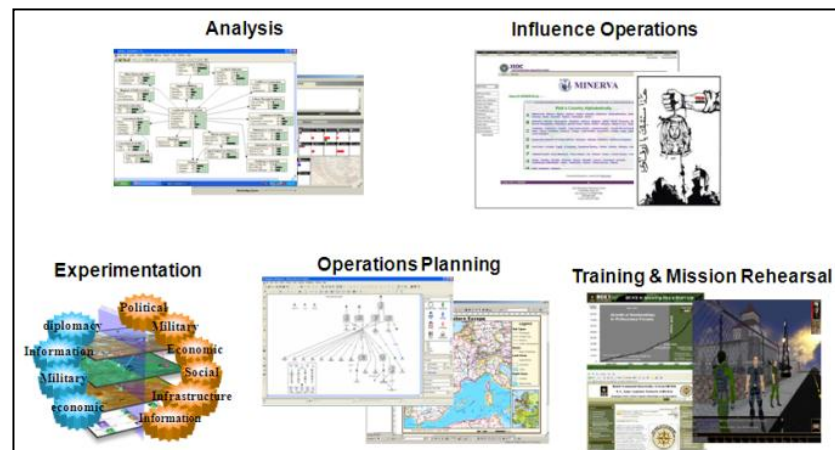
> **"Current DoD investment in R&D to develop and deliver HSCB capabilities is inadequate. Multiple sources have highlighted this deficiency; the current focus is on creating a balanced investment that will support long-term military objectives."**

2006 Initial Recommendations

- **Boost R&E investment 2008-2013**
  - **Create three new D-line Program elements for BA1-3, and one new D-line PE for BA4.**
  - **Total of $519 million—baseline plus recommended new:**
    - **BA1 = $78 million**
    - **BA2-3= $342 million**
    - **BA4= $99 million**

- **Establish HSCB R&E as a "portfolio"**
  - **HSCB science should be generalizable across many & diverse application and customer domains**

- **Establish a Program Office and Program Executive Council:**
  - **PM office will guide execution of BA1-BA4 lines**
  - **Distributed execution with Services and Agencies**
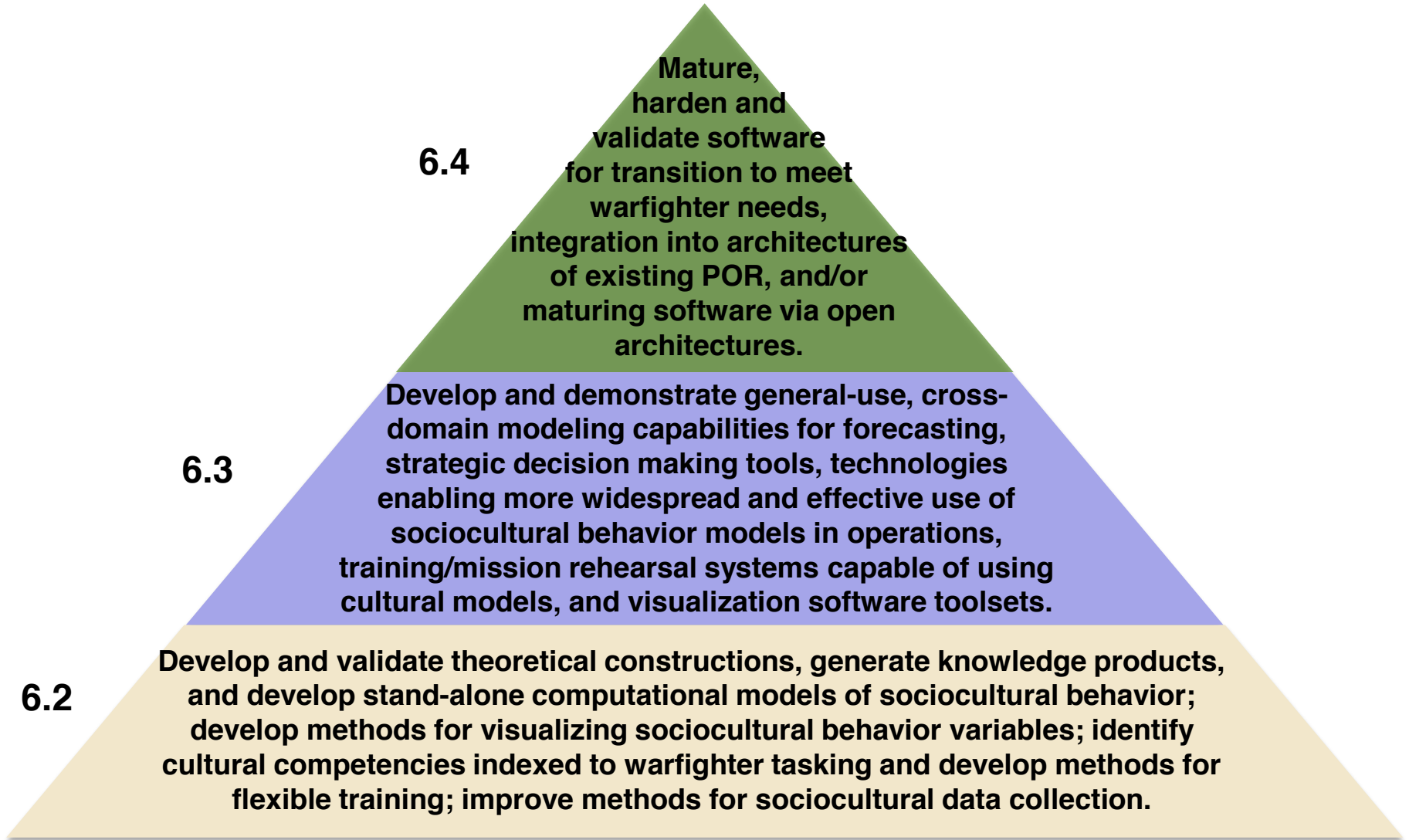
Response: HSCB Modeling Program

- **Grow an applied science base for general-use, cross-domain capabilities/tools**

- **Develop computational models that will support forecasting at the strategic, operational, and tactical levels**

- **Integrate models into software tools that assist in considering human terrain factors**

- **Support transition, whether through architectures of existing programs of record, or open architectures that would allow broad systems integration**

The HSCB program vertically integrates applied research, advanced technology development, and prototyping, and is coordinated with basic research programs to help ensure coherence across the defense research and development community.

Vertical Integration

6.4 Mature, harden and validate software for transition to meet warfighter needs, integration into architectures of existing POR, and/or maturing software via open architectures.

6.3 Develop and demonstrate general-use, cross-domain modeling capabilities for forecasting, strategic decision making tools, technologies enabling more widespread and effective use of sociocultural behavior models in operations, training/mission rehearsal systems capable of using cultural models, and visualization software toolsets.

6.2 Develop and validate theoretical constructions, generate knowledge products, and develop stand-alone computational models of sociocultural behavior; develop methods for visualizing sociocultural behavior variables; identify cultural competencies indexed to warfighter tasking and develop methods for flexible training; improve methods for sociocultural data collection.
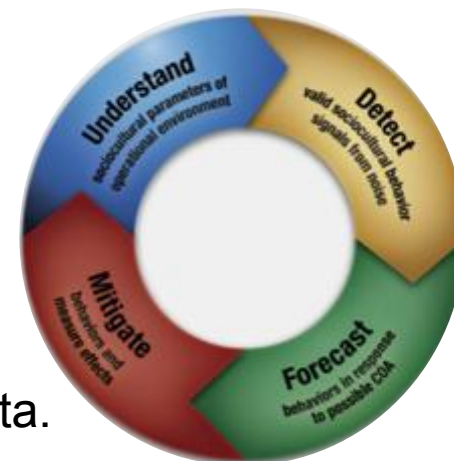
Strategy - Capability Areas Framework

Understand ~ Capabilities to support thorough perception and comprehension, grounded in social and behavioral science, of the sociocultural features and dynamics in an operational environment.

Detect ~ Capabilities to discover, distinguish, and locate operationally relevant sociocultural signatures through the collection, processing, and analysis of sociocultural behavior data.

Forecast ~ Capabilities for tracking and forecasting change in entities and phenomena of interest along multiple dimensions (time, space, social networks, types of behavior...) through persistent sensing and modeling of the environment.

Mitigate ~ Capabilities to develop, order/prioritize, execute, and measure COAs grounded in the social and behavioral sciences that are intended to influence entities and phenomena of interest.
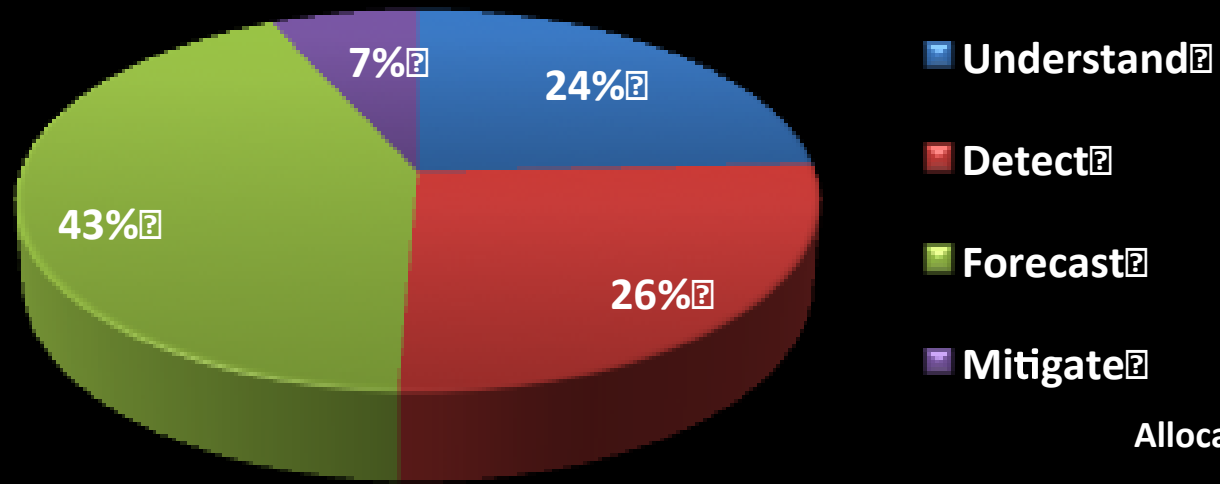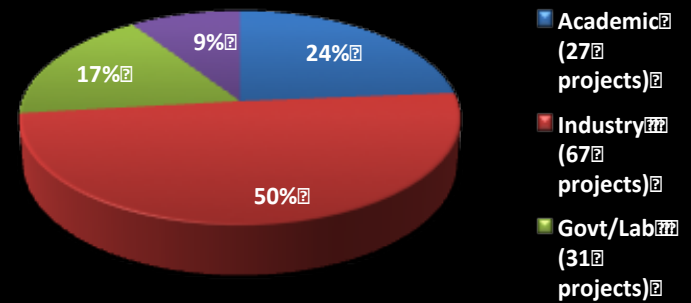
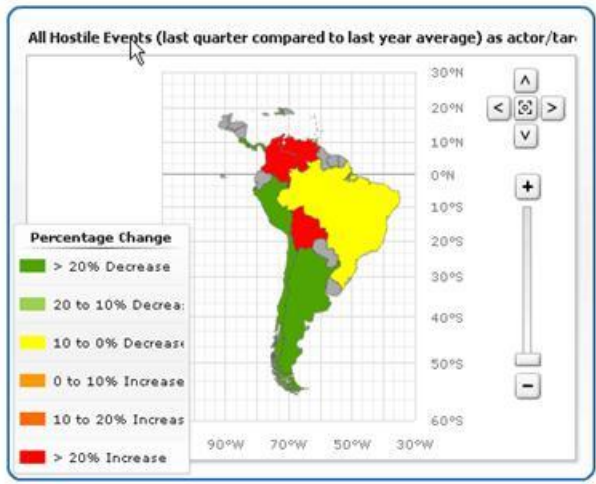# Snapshots of HSCB Program

Investment by Capability Area

- 24% Understand
- 26% Detect
- 43% Forecast
- 7% Mitigate

Allocations by Awardee Type

- 24% Academic (27 projects)
- 50% Industry (67 projects)
- 17% Govt/Lab (31 projects)
- 9%

HSCB Program Impacts

- **DoD focus for research and transition of sociocultural analysis and modeling technologies**

- **Created a positive slope in the development and application of HSCB modeling**

- **Developed metrics for HSCB domain**

- **Transitioned select technologies to Programs of Record and warfighter**

"W-ICEWS is my ISR"
- General Douglas Fraser, USSOUTHCOM

Worldwide-Integrated Crisis Early Warning System (W-ICEWS)

- **Monitor and forecast, in near real-time, de-stabilizing events in a Commander's Area of Responsibility and identify key drivers to instability**

- **Available on SIPR and JWICS through USSTRATCOM ISPAN ACAT-I Programs of Record**
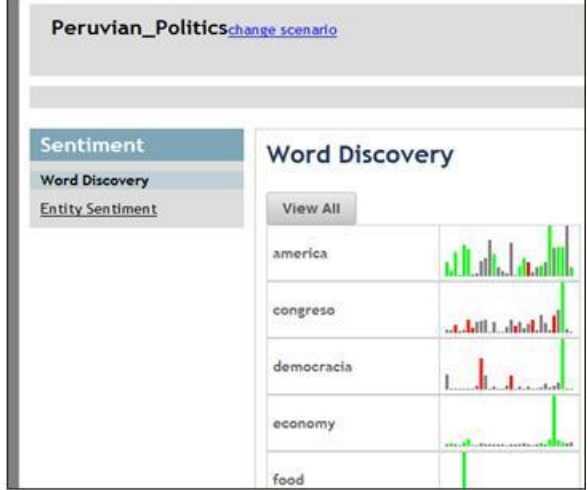
Event Coding and Analytics (iTRACE)	Instability Forecasting (iCAST)	Sentiment Analysis (iSENT)

HSCB Technology to ISPAN POR

2012
LM-ATL 6.3
iTrace

2012
LM-ATL 6.3
iCast

2013
Lustick 6.3
ABM

2014
ASU 6.2
Master Narratives

2014
SFSU 6.2
Rumors

2015
Perceptronics 6.3
CADSIM

2015
Draper 6.2
SNA Imagery

2013 - 2013
ISPAN Drop

2014 - 2014
ISPAN Drop

2015 - 2015
ISPAN Drop

2013

2014

2015

2012

2015

2013
LM-ATL 6.3
MESA V&V

2013
Sentiment Engine
Decision

2014
LM-IS&GS 6.4
iSent

2014
BBN 6.2
Bias

2014
SAE 6.2
Sentiment

2015
SAE 6.2
SubRegional

2015
UCSD 6.2
Multi-Scale Geo

2015
LM-ATL 6.3
Trust Crowds

2015
Least Squares 6.3
Social Media

ISPAN Transition Pipeline

Successes - Understand

Developed data, methods and models for relating extremist and insurgent communication to decision making and behavior.

Developed instrument to collect data on penetration of Western values in seven Mideast nations.

Developed methodology and authoring tools for simulating non-verbal behavior of virtual humans based on culture-specific social schema and values.

Data from interviews with soldiers and Marines was used to develop a training program that promotes cross-cultural assessment and awareness skills.

361 Interactive
LLC

Successes - Detect

MARCIMS provides Marine Corps with efficient and reliable field data collection management, semantic enrichment, and real time analysis in a web/mobile environment.

milcord

Developed theoretical framework for analyzing key features of extremist stories and their influence, and a method for tracking narratives across time and space.

ASU

Developed techniques to extract 8 features of bi-directional sentiment and demonstrated application to assess attitudes toward issues of national significance.

Strategic Analysis Enterprises, Inc.
SAE, inc.

Developed system to measure attitudes on issues, people, and events and monitor, in real-time, the propagation of sentiment and ideology that impact US interests.

LOCKHEED MARTIN

Successes - Forecast

Developed network based metrics for discovering change in dynamic networks, identification of emergent leaders and issues and new trends.

Carnegie Mellon

Releasing V1.0 of an affect/strategy decision tool that can be applied equally to international and domestic conflicts, as well as to their interaction.

THE UNIVERSITY OF CHICAGO

Developed interlinked system dynamics model and agent-based simulation for modeling the first- and second-order effects of alternative applications of DIME actionson inter-communal conflict.

Lustick Consulting
Modeling, Analysis, and Research

Developed algorithm to predict social ties based on spatiotemporal information and individual mobility patterns, with predictive power comparable to traditional network-based measures.

Northeastern University

Successes - Mitigate

Developed a prototype simulation system to forecast potential outcomes for N-number of Actor COAs.

perceptronics solutions

Hybrid reasoning engine supports culturally informed DIME/PMESII analysis based on multiple cultural theories within a theory agnostic framework.

SET *an SAIC company*

The MISO Planner is being used to evaluate which Information Operation messages will be more effective across demographic groupings.

charles river analytics

Simulation-based workbench combining computational models allows users to experiment with effectiveness of alternative influence actions.

Soar Technology

HSCB is "Writing the Book"

- **Sociocultural Behavior Research and Engineering in the Department of Defense Context (2011)**
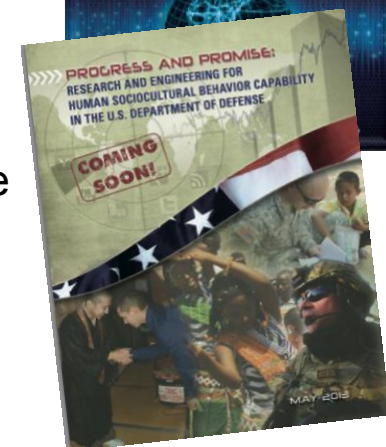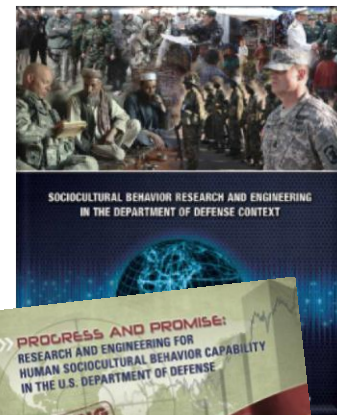
  - Summarizes progress that has been made in building the DoD's sociocultural behavior capacity and recommends future directions for DoD R&E

- **Progress and Promise: Research and Engineering for Human Sociocultural Behavior Capability in the U.S. Department of Defense (Spring, 2013)**

  - Will report on accomplishments relative to recommendations in the HSCB Report for Strategic Planning Guidance 2008-2013
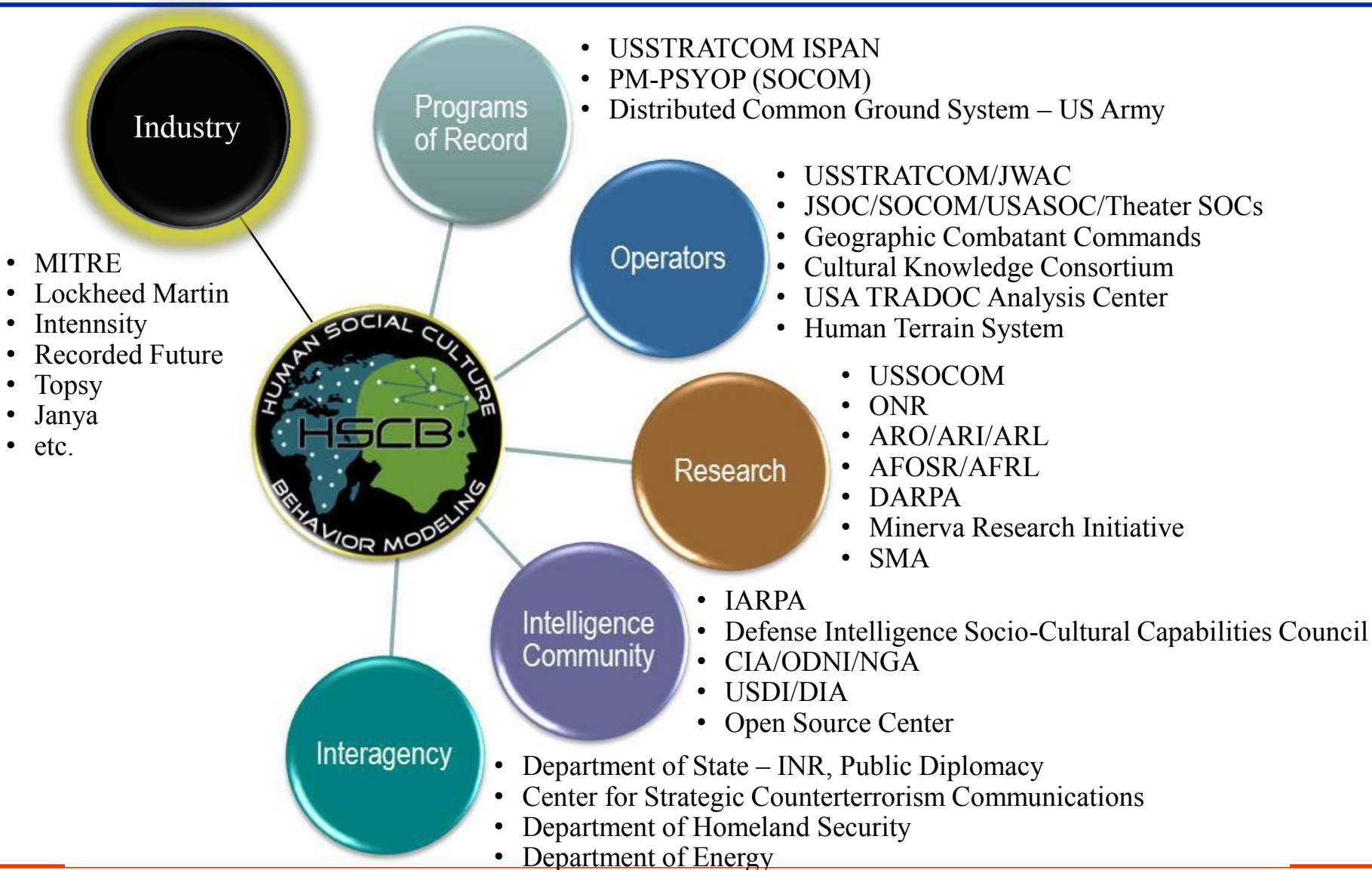
- **Sociocultural Behavior Sensemaking: State of the Art in Understanding the Operational Environment (July 2013)**

  - This edited collection will be authored by experts in the field and document the state-of-the-art in sociocultural behavior understanding

Six Years Later: A Robust Stakeholder Community

Industry

- MITRE
- Lockheed Martin
- Intennsity
- Recorded Future
- Topsy
- Janya
- etc.

Programs of Record
- USSTRATCOM ISPAN
- PM-PSYOP (SOCOM)
- Distributed Common Ground System – US Army

Operators
- USSTRATCOM/JWAC
- JSOC/SOCOM/USASOC/Theater SOCs
- Geographic Combatant Commands
- Cultural Knowledge Consortium
- USA TRADOC Analysis Center
- Human Terrain System

Research
- USSOCOM
- ONR
- ARO/ARI/ARL
- AFOSR/AFRL
- DARPA
- Minerva Research Initiative
- SMA

Intelligence Community
- IARPA
- Defense Intelligence Socio-Cultural Capabilities Council
- CIA/ODNI/NGA
- USDI/DIA
- Open Source Center

Interagency
- Department of State – INR, Public Diplomacy
- Center for Strategic Counterterrorism Communications
- Department of Homeland Security
- Department of Energy

HUMAN SOCIAL CULTURE BEHAVIOR MODELING — HSCB

Six Years Later: Progress

Core Capability	Services have standing programs focused on sociocultural behavior analysis and modeling. Geographic Combatant Commands, SOCOM, RDECOM, plus services and intelligence agencies have dedicated personnel for sociocultural research and analysis.
Transfer	Increased DoD investments in data collection, storage, and transference. OSD HSCB Program transition agreements with multiple COCOMs, and with ISPAN, an ACAT-1 Program of Record. Other tools and resources have been transferred to meet near-term operational demands.
Data and Collection	Increased focus across DoD on mobile, crowed-sourced, and remote data collection. MARCIMS exemplifies advances in mobile data collection, analysis, and visualization. Research and technology investments extending to capitalize on social media resources. Cultural Knowledge Consortium is inter-agency resource.
Models Scope and Scale	Increased DoD investment focus on hybrid models. W-ICEWS is leading example of integrating different types of models, working with multiple data formats, at global scale to support operations-ready forecasting.
Model Integration	Development and testing of architectures and infrastructure to support integration of models, particularly across operational and strategic levels. The Social Network Analysis Reachback Capability (SNARC) integrated technologies to meet warfighter and analyst requirements.
Individual Soldier Level	DoD focus on language and cultural training and retention. Formal strategy developed to actively encourage and reward warfighter sociocultural knowledge. S&T solutions for individual warfighters remains a long term goal.
Governance	DoD directives and initiatives establish governance authorities for R&D, analysis, and training. USD(I) DISCCC, IW M&S SCG, Human Systems Community of Interest convene regularly.

Progress, But…

	Progress	Capability
Data and Knowledge Acquisition		
Data Management		
Broad, In-depth Understanding of Socio-Cultural Factors		
Analytics and Modeling		
Dissemination and Visualization Tools		
Training		

Green =High/Very High

Yellow =Modest

Red =Low/Very Low

Based on survey of Service Program Managers and COCOM S&T Advisers

Review of SPG report would indicate great progress, but same recommendations could be made, plus more

# Meanwhile, Changes in the Landscape—and Demand Signal

- **It's a "wired" world**

- **Behavior can coalesce with little notice and tip over into rapid large scale change**

- **Must detect, monitor, and engage at "twitter speed"**

- **Increasing importance of Phase 0**

  "Shape phase missions, task, and actions are those that are designed to dissuade or deter adversaries and assure friends, ……by shaping perceptions and influencing adversaries' and allies' behavior; …"

  – Joint Publication 3-0 (Joint Operations)

- **DoD Must**

  - Sense and influence allies and adversaries

  - Actively engage in Phase 0 while preparing for kinetic engagement

Egypt Influence Network
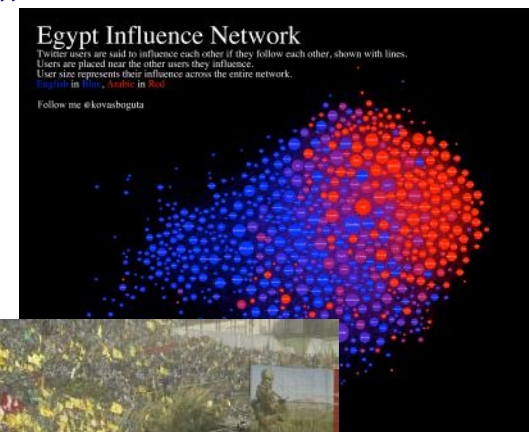
Social Radar

Vision: a global and persistent indications and warnings capability

- **Complement and enhance conventional sensors**

- **Large volumes of open source material now available**

- **Opportunity to build data at scale**

- **Will support improved situation awareness, understanding, and decision-making**

Hard Technical Challenges

- **Forecast instability accurately, reliably, and with enough time to take action**

- **Detect leading indicators of adversarial intent and behavior while modulating for deception and other "noise"**

- **Show "what if" analyses of alternative Courses of Action, including uncertainty**

- **Measure effectiveness of integrated (kinetic and non-kinetic) Courses of Action**

- **Collect, manage, and analyze diverse open source material at scale**

Meeting multiple operational demands for a population-centric intelligence, surveillance, and reconnaissance, and warning capability, "Social Radar"

Concerns About the Future

- **The original SPG only outlined research work through 2013.**

- **It was expected that the Services would take responsibility for maintaining a healthy research portfolio**

- **Strategies, missions, needs and requirements have evolved – the challenges may not be the same, or in the same places:**
    - Cyber Warning/Effects
    - Strategic-Tactical Indications and Warning
    - Humanitarian Assistance/Disaster Relief
    - Non-Combatant Evacuation Operations
    - Deception

- **DoD, IC, DOS, HHS, etc., demand for sociocultural technologies high and increasing**
    - IPL's, STIPL's, informal requirements, senior level direction

Recommendations

- DoD greatly benefits from robustly funded 6.1-6.4 research and engineering portfolios to address the range of requirements users demand in critical, emerging areas.

- Create a focused sociocultural modeling and analysis lab

- Services are best to lead service specific research programs targeted to operational to tactical requirements as well as funded POR with documented needs

- Joint PORs may be best suited to

  - address data collection, processing, NLP extraction of open source and social media data that supports wide range of specific programs

  - Sociocultural Modeling

  - IW/MISO in conjunction with above

- IC POR may be best suited to Activities Based Intelligence and Fusion

Conclusion

- **USG needs the technologies to actively engage (and stay) in Phase 0 while preparing for kinetic engagement**

    - *Satellites can't monitor influence or determine how our adversaries' narratives are spreading.*

- **HSCB and other programs have demonstrated initial success, however, investment is modest, and must continue**

    - *A five year investment in Radar would have ended research in 1939*

- **These are low cost, high payoff technologies**
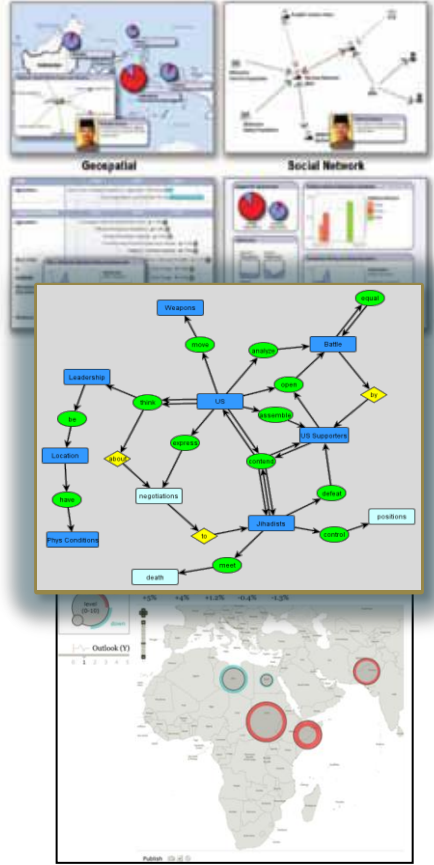
Thank you

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See you on www.linkedin.com

Backups

Transition to Combatant Commands

- **US Africa Command**
  - **J2/IKD**
    - **Design Tools Enabling Analysis and Modeling (GeoEye Analytics)**
  - **J3**
    - **Identifying and Countering Terrorist Narratives (Arizona State University**
    - **Rhetoric-based Modeling of Insurgent Groups (University of Washington/Applied Physics Lab)**
    - **Turning Text into Behavioral Processes and Public Support (Strategic Analysis Enterprise)**

- **US European Command**
  - **J2/Deep Futures –**
    - **Design Tools Enabling Analysis and Modeling (GeoEye Analytics)**

- **US Pacific Command**
  - **ISPAN POR –**
    - **Worldwide Integrated Crisis Early Warning (W-ICEWS) System (Lockheed Martin)**
  - **COBRA GOLD/BALAKATAAN Exercises –**
    - **International Stability Assessment and Analysis Capability (ISAAC) (Army Geospatial Center)**
    - **Semantic Wiki for Complex Operations (MilCord)**

Transition to Combatant Commands

- **US Special Operations Command**
  - **JSOC J5 –**
    - **Planning, Research, Intelligence Scalable Modeling (PRISM) System (BAE/BBN/Oculus)**
  - **SKOPE – Narrowing the search space**

- **US Strategic Command**
  - **ISPAN POR –**
    - **Worldwide Integrated Crisis Early Warning (W-ICEWS) System (Lockheed Martin)**

- **US Southern Command**
  - **Technology in use across many directorates and for use in preparation of Commanders travel book**
  - **Worldwide Integrated Crisis Early Warning (W-ICEWS) System (Lockheed Martin)**

United States Pacific Command, Southern Command, and Strategic Command

- **The Worldwide Integrated Crisis Early Warning System (W-ICEWS) provides planners with technologies relevant to monitoring, assessing, and forecasting the occurrence and evolution of instability events globally.**

  - **W-ICEWS technology has been fielded at USPACOM and USSOUTHCOM J8 since 2010 and 2011 as part of STRATCOM's Integrated Strategic Planning and Analysis Network, Global Adaptive Planning Collaborative Integration Environment.**

  - **As new W-ICEWS capabilities are developed, tested on the unclassified nodes, and hardened for transition, they will be fielded at USSOUTHCOM & ISPAN**

"W-ICEWS is my ISR"
- BG Fraser, USSOUTHCOM

Distribution Statement A: Approved for public release; distribution is unlimited

The HSCB Program is supporting the United States Special Operations Command (SOCOM)'s Global Planning Assessment (GPA) process by providing sentiment analysis, instability modeling, and exploitation of native-language sources to create empirically and theoretically sound hybrid models, and tools that answer what-is and what-if questions for analysts and planners.
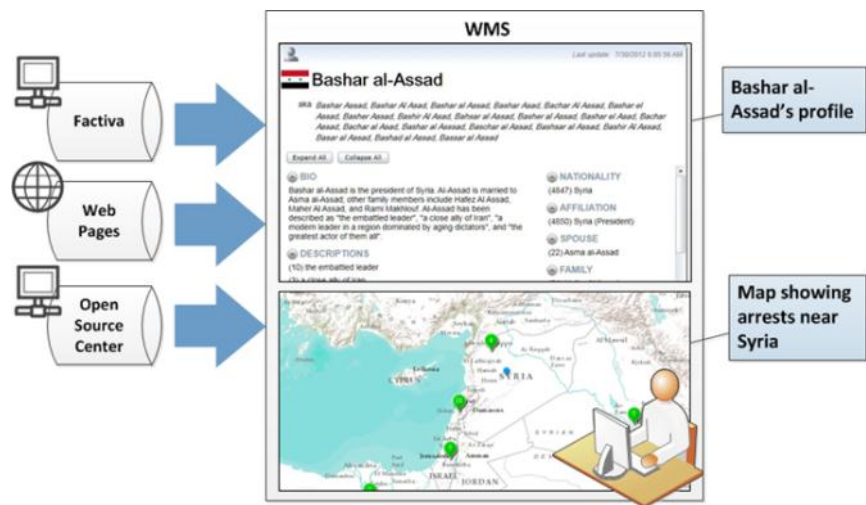
Data, Modeling and Visualization for Stability Ops and Countering Violent Extremism

Transition to Services

- **Air Force Targeting Center**
  - **Modeling Strategic Contexts (University of Chicago)**
  - **Enhanced COA Analysis by Integration of Decision and Social Influence (CADSIM) (Perceptronics)**

- **US Army Training and Doctrine Command**
  - **TRADOC Analysis Center**
    - **Semi-Automated Force (SAF) (University of California – Davis)**
    - **Military Information Support Operations (MISO) Planner (Charles River Associates)**

- **Marine Corps Systems Command**
  - **MARCIM POR (planned start FY14)**
    - **International Stability Assessment and Analysis Capability (ISAAC) (Army Geospatial Center)**
    - **Semantic Wiki for Complex Operations (MilCord)**

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United States Marine Corps

- **The HSCB Program has been working with the USMC Civil Information Management (MARCIM) system to integrate two tools:**

  - **Milcord's Semantic Wiki is a knowledge portal for Civil Information Management (CIM) that enables users to collect, organize, tag, search, browse, visualize and share structured CIM knowledge.**

  - **ISAAC provides an interoperable framework for information sharing and decision support by developing smart phone applications for performing field assessments of HADR conditions and by managing a scalable central data repository for storing and disseminating field-collected and supporting datasets**

Handheld and Web-based Civil Information Management

US Army TRADOC Analysis Center (TRAC)

- **The HSCB Program has been working with TRAC to support its Irregular Warfare Tactical War Game (IW TWG). Two HSCB tools are being integrated:**

  - **The UC Davis Semi-Automated Force (SAF) tool uses all players executed tasks, the red players scheduled (intended) tasks, the population Observed Attitude Behavior, Population Density (by zone), and other factors to produce a list of predicted tasks for Red to implement in the following week**

  - **The CRA Military Information Support Operations (MISO) Planner uses unknown population Observed Attitude Behavior from the Cultural Geography model and the total list of scenario events generated by all player tasks to evaluate which Information Operation (IO) messages will be more effective across the demographic groupings**

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