Workshop Out-brief: Human, Social, Cultural Behavior (HSCB) Modeling

July 28-30, 2008
National Defense University
Washington, DC

Presented to Bob Foster on October 2, 2008

This annotated briefing documents the deliberations of the Synthesis Panel at the National Defense University's workshop to support Human, Social, Cultural Behavior (HSCB) modeling.

Agenda

- Context -- Workshop Plans
- Approach -- Workshop Composition
- Insights on Nature of the Problem
- Observations and Needs
- Workshop Observations

The Synthesis Panel report consists of five sections. As a context, the first section provides basic data about the workshop and planned future workshops.

The second section identifies the composition of the workshop (e.g., panel leadership; overall participation; Synthesis Panel).

The third section summarizes insights on the nature of the problem that the Synthesis Panel derived. These insights were developed from the remarks of the plenary speakers and the papers that were circulated prior to the workshop.

The fourth section synthesizes the observations and needs that were derived by the disciplinary and multidisciplinary panels.

The final section provides some overarching observations about the Workshop.

Basic Data

- What: Characterize the capabilities needed to perform effective HSCB modeling in support of operational users and senior decision makers
- Who
  - Primary Sponsor: Bob Foster, Director, BioSystems, DDR&E
  - Workshop organizers: CTNSP, NDU
  - Workshop participants: approximately 120 people from social sciences and operations analysis communities
    - Government
    - Academia
    - Industry
    - FFRDCs
- When: July 28 - 30, 2008
- Where: National Defense University

The primary goal of the Workshop was to characterize the capabilities needed to perform effective HSCB modeling in support of operational users and senior decision makers. The Workshop was conducted under the direction and oversight of Bob Foster, Director, BioSystems, DDR&E. The actual workshop was organized and conducted by the staff of the Center for Technology and National Security Policy (CTNSP), NDU.

To achieve the primary goal of the workshop, approximately 120 participants were assembled from the social science and operations analysis communities. Participants were drawn from government, academia, and industry.

The Workshop was held on July 28 - 30, 2008 on the campus of NDU.

BLUF

- There are significant shortfalls and needs in 12 key areas of HSCB modeling
  - Social sciences (e.g., definitions, basic research, theories, Measures of Merit)
  - Operations research (OR) (e.g., tools, representation in tools, design of experiments, prediction)
  - Multidisciplinary (e.g., data, Verification, Validation & Accreditation (VV&A), education & training, outreach)
- Several key HSCB modeling needs warrant special attention
  - Creation of a Social Sciences - Operations Research – User Community of Interest (COI)
  - Creation and evolution of a HSCB Modeling Test Bed

Philosophy of Workshop

- Characterize the capabilities needed to perform effective HSCB modeling in support of operational users and senior decision makers through three vehicles
  - Plenary sessions
    - Characterize the nature of the problem
    - Depict the state-of-the-practice and the steps needed to achieve desired capabilities
  - Workshop sessions
    - Discipline decomposition -- Characterize needed capabilities from the perspective of key disciplines (e.g., social sciences; operations research)
    - Inter-disciplinary decomposition -- Characterize needed capabilities from the perspective of issues posed by operational users and senior decision makers (e.g., deterrence; counterterrorism; counter insurgency; SSTR operations)
- Synthesize the insights from the various perspectives into a holistic picture of needed capabilities

Future Workshops

- This workshop will be followed by two subsequent workshops
  - Workshop 2
    - Characterize the state-of-the-art/practice in HSCB modeling
    - Compare the state-of-the-art/practice to desired capabilities (identified in Workshop 1) to identify major gaps
  - Workshop 3
    - Establish criteria for prioritizing key gaps
    - Apply the criteria to the gaps identified in Workshop 2 to prioritize the gaps
    - Formulate a Science & Technology Roadmap to address the highest priority gaps
- The results of the workshops will be used to justify the allocation of resources for HSCB modeling to OSD, Congress
- As necessary, follow-on workshops will be conducted to characterize progress, re-evaluate priorities

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The second section identifies the composition of the workshop (e.g., panel leadership; overall participation; Synthesis Panel).

Disciplinary Working Groups

Disciplines	Chair	Co-Chair
Social Sciences -- Micro	Jerry Post	Larry Kuznar
Social Sciences -- Macro	Richard Lobban	Lauren Cobb
OR (Theories)	Mike McGinnis	Bob Sheldon
OR (VV&A)	Dean Hartley	Marina Arbetman-Rabinowitz

On the first day of the workshop, the panels were organized along four disciplinary lines: Social Science (Micro), Social Science (Macro), Operations Research (Methods, Tools), and Operations Research (Verification, Validation, and Accreditation; data). The table identifies the individuals that served as the panel chairs and co-chairs.

Problem Domain Working Groups

Problem	Chair	Co-Chair
Deterrence	Pat McKenna	Yuna Wong
COIN	Paul Goldstone	CPT Brett Pierson
CT	LTC (“G-Man”) Lailari	Diptak Gupta
SSTRO	Paul West	Dick Deckro

On the second day of the workshop, the panels were organized along four inter-disciplinary lines: deterrence, counterinsurgency, counter-terrorism, and stability, security, transition, and reconstruction (SSTR) operations. The table identifies the individuals that served as the panel chairs and co-chairs.

Workshop Participants

- Government
  - OSD/Joint Staff (e.g., DDR&E, OASD(PA&E), OUSD(Policy))
  - COCOMs/Services (e.g., JFCOM, NRL, AFRL)
  - Academia (e.g., NDU, USMA, AFIT, NPS, AWC)
  - Interagency (e.g., USIP, DOS, DHS)
- FFRDCs/UARCs (e.g., IDA, MITRE, RAND, JHU/APL)
- Industry (e.g., Sentia, IBM, BAH, Phase One Communications, Group-W, SAIC, EBR)
- Academia (e.g., U of Maryland, U of Penn, GMU, Florida State University, Purdue, U of California (San Diego), GWU, ODU, Virginia Tech)
- Non-profit (e.g., Potomac Institute, Alaska Native Heritage Center)
- International (e.g., Canada)

To achieve the multiple perspectives needed to achieve the Workshop goals, the participants were invited from a variety of organizations. These included the government personnel (e.g., COCOMs/Services, OSD/Joint Staff, selected agencies and interagency organizations), Federally Funded Research & Development Centers (FFRDCs) and University Affiliated Research Centers (UARCs), industry, academia, non-profit organizations, and international participants.

Synthesis Team

- Myriam Abramson, NRL
- Chuck Barry, NDU
- Doug Clark, NRL
- Skip Cole, USIP
- Dave Davis, GMU
- Dean Hartley, Hartley Consulting (Co-Chair)
- Margaret Hayes, EBR
- Richard Hayes, EBR
- Roger Hillson, NRL
- Pat McKenna, USSTRATCOM
- Al Sciarretta, CNTSI
- Stuart Starr, NDU (Chair)
- Ted Woodcock, GMU

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The third section summarizes insights on the nature of the problem that the Synthesis Panel derived. These insights were developed from the remarks of the plenary speakers and the papers that were circulated prior to the workshop.

Plenary Presentations (1 of 2)

- Presenters
  - Context
    - Bob Foster, DDR&E ("The social sciences are the HARDER sciences")
    - Andre van Tilborg, DUSD, S&T – key needs
      - Acquiring evidence-based, convincing data
      - Developing a suite of tools that can be transitioned to the warfighter
  - Patricia Partnow, Dean Hartley, "Using Cultural Information to Model DIME/PMESII Effects"
    - Develop a holistic approach to DIME-PMESII modeling that builds on the strengths of anthropology, OR
  - David Carment, "Approaches to Country Risk Analysis and Early Warning"
    - What criteria should be used to rank-order nations with respect to legitimacy?
  - Eli Berman, "Sects and Violence for Economists"
    - Discussed two models for terrorists
      - Club model
      - Hearts and minds model

During the workshop, two different types of plenary presentations were provided. To set the stage for the workshop. Bob Foster, DDR&E, and Andre van Tilborg, DUSD(S&T) provided a charge to the Workshop participants. That was followed by a series of presentations that provided a context for the workshop.

The following vugraphs briefly characterize key "take-aways" from those sources. They are not intended to be comprehensive in nature. Note that the plenary presentations tended to be highly interactive. Thus, they elicited extensive reactions from the Workshop participants. Overall, the sources dealt with key needs and state-of-the-practice methods and tools.

Plenary Presentations (2 of 2)

- Presenters (concluded)
  - Will Moore, “Cross-National Correlates of Terror: An Economical Inquiry of the Late 20th Century”
    - Identified the variables that influence the amount of dissident terror
  - David Siegal, “Social Network Structures and Counterinsurgency / Counterterrorism…”
    - The inclusion of both social network and psychological responses can greatly alter outcomes
  - Barry Silverman, “Systems Engineering is the New Social Science”
    - There is a need for a HSCB modeling test bed
  - Thomas Ferleman, “Modeling Global Futures…”
    - Presented, exercised a DIME-PMESII model
  - Bob Sheldon, World Congress on Social Simulation 2008
    - “Heavy on computation, light on social sciences”
    - “Mathematically, many of the M&S are **under-determined”**
    - “The communications between the social scientists and the developers of algorithms is **poor”**
- Characteristics of the plenary presentations
  - **Highly** interactive (e.g., many follow-on questions)
  - Focused on
    - Key needs
    - State-of-the-practice (methods, tools)

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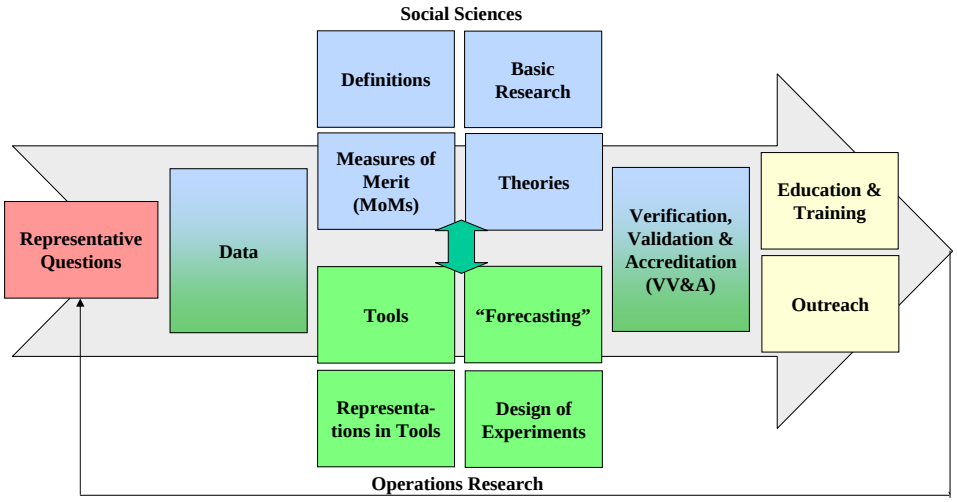
The fourth section synthesizes the observations and needs that were derived by the disciplinary and multidisciplinary panels.

Capabilities Needed for HSCB Modeling



Needs Arising from Representative Questions

- **Forecast**, *inter alia,* refugee flows, contagion of disease, authenticity of cultural change
- **Support** the generation of Theater Security Cooperation Plans (TSCPs), situational awareness
- **Balance** flow through the SSTR process (e.g., integrity of host nation decisions while supporting US interests)
- **Prioritize**:
  - SSTR operations to undertake
  - S&T investments
- **Understand**, *inter alia,* failed states, legitimacy, deterrence/influence/containment, why people become insurgents, unintended consequences, governance

Observations and Needs (1 of 7)

- Data
  - Observations: Existing HSCB data sets
    - Are diffused, difficult to find and access
    - Lack necessary information to support analysis (e.g., adequate metadata, indications of pedigree)
    - Are rarely ready for use – they require clean up, conversion to fit current needs
  - Needs:
    - Develop appropriate HSCB taxonomies, ontologies,…
    - Implement efforts to *tailor* HSCB data to satisfy the intended purposes
    - Perform and record data V&V efforts (e.g., integrity, consistency, reliability, source) as metadata
    - Update local and national data, with appropriate periodicity
    - Capture data capabilities in many dimensions (e.g., environmental, medical, attitudes, affiliations, legal systems)
    - Perform an assessment of the desirability of a Central HSCB Data Repository (issues: classification, access, open source data, legal, granularity, qualitative data, maintenance, dissemination)
- Definitions
  - Observations:
    - Many HSCB-related definitions are too vague, ambiguous (e.g., “counterinsurgency”)
    - Many definitions are discipline specific and not widely understood
  - Needs:
    - Develop more specific definitions to drive action
    - Develop a variety of products including, *inter alia,* library of ontologies, semantic descriptions, thesaurus, dictionary, data lexicons with metadata, standards

Observations and Needs (2 of 7)

- Measures of Merit (MoMs)
  - Observation: We do a poor job in
    - Formulating Measures of Performance and Measures of Merit for HSCB,
    - Developing the relationships (cause and effect) that link them
  - Needs:
    - We need to tailor the MoMs to HSCB problems of interest and develop relationships that link them
    - We need to display HSCB MoMs to operational users and senior decision makers in a fashion that conveys appropriate levels of uncertainty and risk
- Theories
  - Observations:
    - In selected areas of social sciences, there are excessive numbers of theories (e.g., “the root causes of terrorism”)
    - However, there are key areas where needed theories are lacking, too particular, or too general
  - Needs:
    - When multiple theories exist, we need codes of best practice / guidelines on which theory to use, when
    - We need to develop appropriate social sciences theories to address key gaps or mismatches

Observations and Needs (3 of 7)

- Basic Research
  - Observation: Many critical HSCB areas are not well understood at the social sciences level
  - Needs: Representative needs include, *inter alia,*
    - Interior cognitive models
    - Influencers on attitude/behavior of civilians based on ethnic, tribal, cultural, religious, and political considerations
    - Local legitimacy
    - Trust
- Representations in Tools
  - Observations:
    - The entire DIME/PMESII spectrum needs to be represented
    - Each individual tool need not cover the entire spectrum
  - Needs:
    - Model ourselves as well as “others”
    - Provide feedback between “micro” and “macro” representations
    - Capture
      - Organizational performance
      - Cultures and institutions
      - All types of operations
      - Situational awareness of all parties

Observations and Needs (4 of 7)

- Tools
  - Observations:
    - There is no such thing as a “silver bullet” model that will satisfy all of our HSCB modeling needs
    - Many existing HSCB tools are too limited in their scope (e.g., counterinsurgency tools can not address multiple insurgencies, simultaneously)
    - We must understand the limits to prediction when addressing HSCB issues
  - Needs:
    - We require an HSCB Modeling Test Bed to support multiple functions (e.g., evaluation, transition)
    - The proper architecture/framework for the HSCB ModelingTest Bed is an open question; however, there are many suggestions
      - The suite of tools should include a balanced mix of techniques that take advantage of the strengths of the tools while ameliorating their weaknesses (e.g., system dynamic models; agent based models; wargames)
      - Consideration should be given to creating a “collaborative environment” in which selected models can be linked/federated and evaluated (particularly with respect to “precision”)
      - Consider the use of a “service bus” for data repositories
      - Ensure that models are tailorable
      - Employ hierarchical modeling with meta-model/meta-data aggregation/disaggregation
      - Assemble a resource repository of models and data

Observations and Needs (5 of 7)

- "Forecast"
  - Observation:
    - Not all models need to "forecast" things (see representative questions, above)
    - "Forecasting" may mean likelihoods of occurrence of multiple possible events
  - Need:
    - "Hard" prediction of events
    - "Soft" prediction of likelihoods
    - Exploration of possibilities
    - Situational awareness and understanding
- Design of Experiments
  - Observation: Many users of HSCB M&S do not understand how to derive statistically meaningful insights from their tools
  - Need: We should draw on the insights developed in academia (e.g., at NPS for M&S characterized by large numbers of variables) to characterize the interesting parts of response surfaces using innovative experimental designs (e.g., focused fractional factorial designs)

Observations and Needs (6 of 7)

- Verification, Validation & Accreditation (VV&A)
  - Observations:
    - Most creators of HSCB M&S and selectors of data do not do an adequate job of V&V
    - We need to broaden the concept of V&V to theories and selection of Subject Matter Experts (SMEs)
    - It is important to initiate the VV&A process even when key issues are still unresolved (e.g., precise definitions, levels of accomplishment, descriptions of pitfalls)
    - V&V of DIME/PMESII data is significantly more complex than V&V of combat model data
  - Need:
    - Generate guidelines that enable us to perform V&V (for theories, tools, data, SMEs) credibly, with acceptable levels of resources
    - Pay additional attention to the accreditation function
    - Use V&V to create “tags” for theories, methods, models, and data to allow retrieval of desired item when needed
    - Create open data on detailed VV&A status of models and data

Observations and Needs (7 of 7)

- Education and Training
  - Observation:
    - It will take high performance, compatible, multidisciplinary teams (e.g., social scientists, operations analysts) to create and employ HSCB modeling
    - However, those diverse communities have a difficult time in communicating
    - it is even more difficult to communicate HSCB assumptions and results to decision makers than for combat models
    - It is extremely important and difficult to “train as we fight” in a HSCB environment
  - Need:
    - Augment the curriculum for social scientists and operations analysts to give them adequate education to enhance cross-discipline communication
    - Create and sustain a HSCB Community of Interest (COI) (perhaps drawing on MORS Social Sciences COI) to foster high performance, multidisciplinary teams
    - Develop the tools and data needed to “train as we fight” to support both the education & training and operational communities
- Outreach
  - Observation:
    - The HSCB community must include Interagency participants
    - HSCB modeling is of interest to our international partners
    - Some members of the social sciences community have argued that it would be “unethical” to collaborate with DoD
  - Need:
    - Expand the HSCB COI to include balanced interagency participants (e.g., NSC, USIP, DOS, DOJ)
    - Participate in international forums that address HSCB modeling issues (e.g., NATO SAS initiatives on HSCB, Irregular warfare)
    - Develop a compelling narrative to explain the value of a collaborative relationship between the social sciences community and DoD

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The final section provides some overarching observations about the Workshop.

What Was Special About This Workshop?

- Participation:
  - **Highly** diverse subject matter experts; over 120 participants
  - Mix of communities
    - Government- Academia- Industry
    - Social scientists-operations analysts
- Experience:
  - Context provided by experienced practitioners
    - Plenary
    - Panel chairs (selected SMEs)
    - Workshop participants
  - A survey provided near real time feedback on the experience
- Preparation
  - **Many** papers were prepared prior to the workshop
  - These products provided a rich foundation for the groups' deliberations

From the perspective of the Synthesis Panel, there were two factors that made this workshop special. First was participation. There were over 120, highly diverse participants at the event. The majority of the participants were drawn from the social science and operations analysis communities (from government, academia, and industry)

Second was the issue of experience. Context for the deliberations was provided by experienced practitioners. These included internationally known Plenary and Panel chairs. This was complemented by a survey that provided near real time feedback on the experience.

Furthermore, there was extraordinary preparation for the workshop. Many papers were prepared prior to the workshop and these products provided a rich foundation for the groups' deliberations.

Survey Insights

- Respondents were generally satisfied with the overall quality of the workshop
- However, most also indicated that establishing a common ontology and lexicon prior to the workshop would have added significant value to working group outputs
- Nearly all respondents noted that the cross-disciplinary working groups on Day 2 produced better discussion
- Future workshops in the HSCB Modeling series could benefit from more formal facilitation and moderation

Workshop Lessons Recorded

- It is difficult for the social scientist and operations analyst communities to communicate!
  - Acronyms!
  - Jargon (e.g., “DIME-PMESII models”)
  - Context -- lack of familiarity with major DoD products (e.g., QDR, doctrine)
- As a foundation, we need to formulate and agree on the definitions of key terms
- Given the constrained time, it proved useful for the panels to address several issues in parallel; e.g.,
  - Deterrence (focus on alternative entities to be deterred)
  - SSTR (multiple groups attacking the same problems from multiple perspectives)
- The workshop provides the basis for a HSCB modeling Community of Interest (COI)
  - The COI can be used in future workshops to identify and prioritize key gaps
  - It will be desirable to augment the COI with Interagency participants

It is clear that it is difficult for the operational and S&T communities to communicate! There are three major reasons. First, both communities speak in (non-intersecting) “acronymese” and jargon. Furthermore, most of the social science participants lacked familiarity with major DoD products (e.g., the 2006 Quadrennial Defense Review; joint doctrine).

Second, there are many terms that are key to this area of study (e.g., irregular warfare, counterinsurgency). As a foundation, we need to formulate and agree on the definitions of those key terms

Third, given the constrained time for the workshop, it proved useful for the panels to address several issues in parallel (e.g., focusing on alternative entities to be deterred).

Finally, the workshop provides the basis for a HSCB modeling COI. The COI can be used in future workshops to identify and prioritize key gaps. Ultimately, it may be desirable to augment the COI with interagency participants.

Broad Findings

- The HSCB modeling community faces broad challenges in the areas of
  - Data (dealing with metadata, pedigree, access)
  - Definitions (employing terms that are clear, unambiguous)
  - Measures of Merit (tailoring to the issues of interest)
  - Theories (selecting consistent, appropriate theories)
  - Basic research (ensuring that HSCB areas are will understood at the social sciences level)
  - Tools (developing and transitioning a suite of tools to the analyst, operational user)
  - Representation in Tools (capturing culture, institutions)
  - “Prediction” (providing “hard” prediction of events, “soft” prediction of likelihoods)
  - Design of Experiments (exploring response surfaces efficiently and effectively)
  - Verification, Validation & Accreditation (tailored to societal M&S)
  - Education and training (creating and sustaining high performance multidisciplinary teams)
  - Outreach (working effectively with Interagency and International participants)
- There is a need for
  - A Social Sciences – OR -- User Community of Interest
  - A HSCB Modeling Test Bed