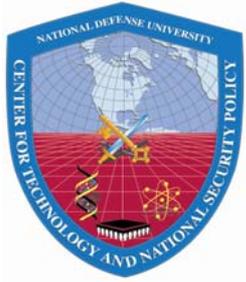


HSCB



Day 1 Outbrief
Operations Research
Working Group

Chair: Mike McGinnis
Co-Chair: Bob Sheldon
Synthesis: Al Sciarretta



Agenda: OR Working Group



1330-1340: Introductions

1340-1350: WG study Goals & Research Questions

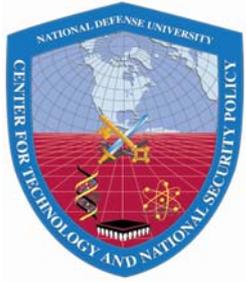
1400-1515: Background / Practitioner Presentations

- Dr. John Sokolowski (VMASC) – Pop. & Social Dynamics Modeling
- CDR Brett Pierson (J8) – Systems Dynamics Modeling
- Lt. Col. Larlai Guermantes (USAF Staff) – Terrorism & CT M&S
- Mr. Mike Ottenberg (OSD PA&E SAC) – Wargaming / Gaming
- Mr. Jack Jackson (TRAC-Monterey) – Counter-Insurgency Modeling

1515-1530: Break

1530-1700: Discussion of HSCB and OR/M&S/Analysis (USA/USMC background study - MAJ Jay Persons TRAC-FLVN)

1700-1730: Wrap Up



Operations Research Working Group

Day 1



Chair: Dr. Mike McGinnis

Co-Chair: Dr. Bob Sheldon

Mr. James Morris

Dr. Charles Worrell

Dr. Dipak Gupta

Lt Col Victor Wiley

Mr. Al Sciarretta (ST)*

Mr. Skip Cole (ST)

Mr. Matt Nickens (ST)

Dr. Ben Wise

CDR Brett Pierson

Dr. John Hummel

Dr. Al Sweetser

MAJ Jay Persons

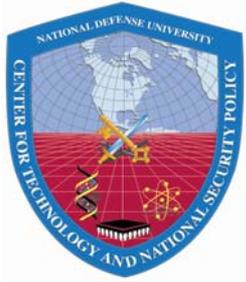
Prof. Dave Davis

Mr. Gary Citrenbaum

Mr. Kevin Roney

Mr. Vince Roske

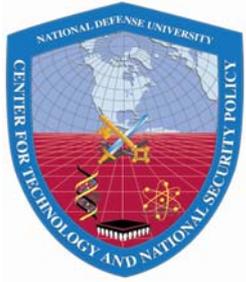
Ms. Krista Elefante



Operations Research Working Group **Process & Content**



- **Introductions**
- **Discussion of Workshop Goals**
 - Discussion & Identification of decision maker's needs
 - Discussion of alternate approaches for HSCB model development
- **Presentation Topics: Current Efforts & Areas of Concern**
 - Discussion of FM 3-24 (counterinsurgency)
 - Challenges in modeling terrorism
 - Taxonomy related to war games
 - Multi-agent systems model (Civilian Populations in Stab Ops)
 - Study of insurgency in Columbia
 - Army/USMC Study: IW Methods, Modeling, & Analysis Working Group
- **Discussion of HSCB Topics: OR/M&S needs, taxonomies, decomposition, etc.**

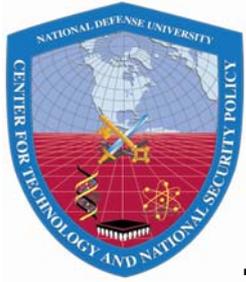


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Key Discussion Points



- **Additional information needed for HSCB model development**
 - What are the key questions HSCB models will answer?
 - Identify enduring, reoccurring questions that arise in military operations
 - Partially addressed by Army/USMC IW Study
 - What are the HSCB theories that drive how the models function?
- **Concerns for senior military & program decision makers**
 - How to handle proprietary information?
 - How to handle “personal” information (privacy and use of information)?
- **Concerns related to VV&A**
 - How do modelers reduce uncertainty in “squishy” HSCB models?
 - How much uncertainty reduction is feasible/sufficient?
 - Subjective nature of models suggests data will be required for both V&V and to train the model?



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General Discussion Points



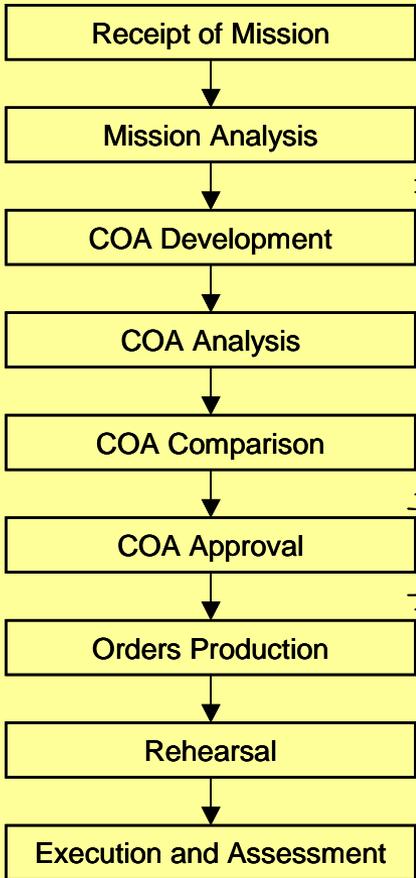
- **Types and Levels of Models**
 - Systems dynamics not an adaptive modeling environment but very appropriate for high level aggregated cause and effect modeling
 - Agent based models better suited for modeling complex adaptive behaviors
- **Semantics, Lexicon, Taxonomy, Standards, and Repository**
 - HSCB modeling requires standards and definitions of common terms for both OR and social science communities
 - Need a resource repository for HSCB models and data
 - Establish / identify references & organizations to oversee (provide) validated models and data similar to those for warfare models (e.g., Joint Munitions Effectiveness Model)
- **Improve understanding and manage expectations.** Key groups: HSCB model users / consumers. For what purposes: prediction, forecasts, exploration (branches/sequels), and discovery & exploration of black swans
- **Alternate / Complementary Approaches:** holistic architecture (level TBD) versus vignette/scenario driven. Which is most appropriate for deriving needs for these models?



Frameworks & Methodologies

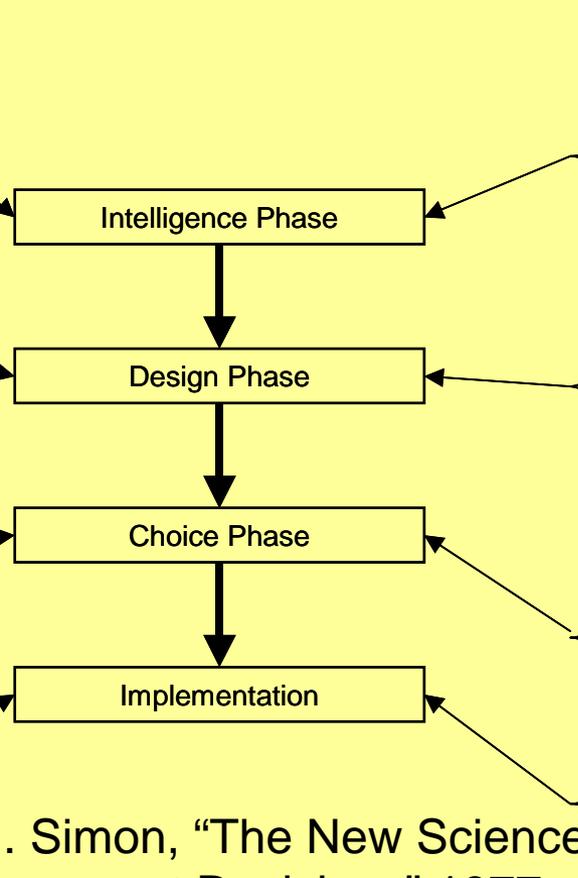


Military Decision-making Process^[1]



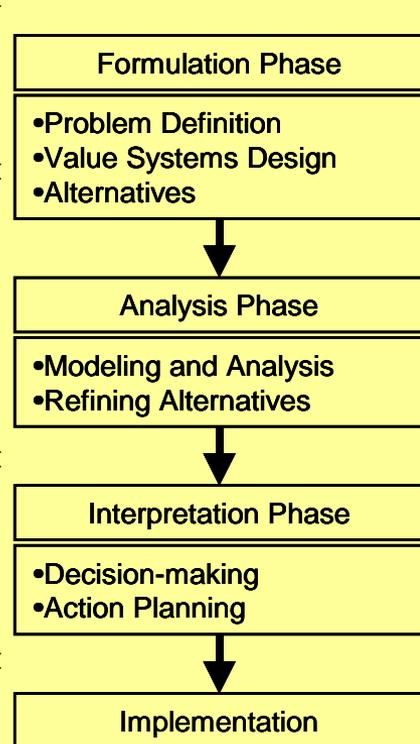
[1] FM 101-5, May 17, 1997

Simon's Decision-making Process^[2]

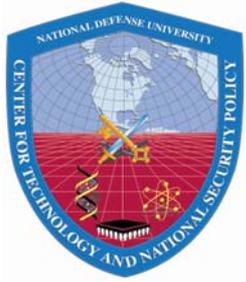


[2] H. Simon, "The New Science of Management Decisions", 1977

Systems Engineering Decision-making Process^[3]



[3] Sage, Systems Engineering, 1992, and Hall, 1969.

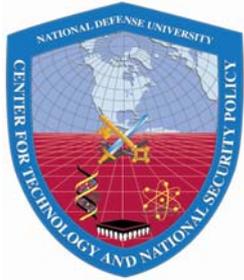


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General Discussion Points



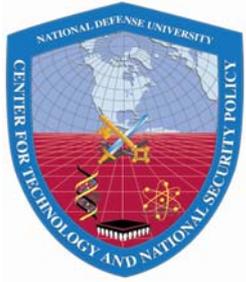
- **Standards for data lexicon, semantics, and ontology**
 - Must include metadata & HSCB protocols
 - Must be developed within the real-world context of the model
- **Decomposition of the problem domains**
 - See for example various ‘candidate decomposition’ of the IW environment presented during the session.
 - HSCB Model Architecture requires flexibility to integrate / aggregate domains; e.g., integrate social-religion-political domains when dealing with the Muslim world
- **HSCB Model Review**
 - HSCB modeling would benefit from inclusion of Bayesian analysis with SMEs to take into account a combined scale/score
 - Need a consistent approach to dealing with SME evaluations
 - Need to identify / include multi-disciplinary & cross-disciplinary experts when conducting model review
- **Identify output metrics relevant to make decisions**



Operations Research Working Group Capabilities & Needs Discussion



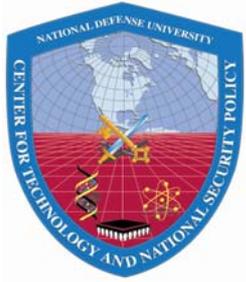
- **Tailorable and adaptable HSCB models**
 - Focus on identification of common factors as a baseline for HSCB models (e.g., ODU/VMASC Insurgency Studies of Columbia and Nigeria found 60 of 125 insurgency factors to be common)
 - Easily change/add non-common factors
- **Define / design a family (framework) of HSCB models that can be integrated and federated to model specific scenarios and casual effects**
- **Adopt a model framework that can accommodate meta-model and meta-data aggregation and disaggregation**
- **To make models efficient & cost effective. Minimize model development costs, runtime and overhead (admin, user, and developer).**
- **To replicate real world activities and instantiate HSBC theory/protocols/methods**
- **To represent 'external' influences (e.g., ever-changing views/norms, local/societal demographics, and processes of individuals and societies) that in turn influence both physical and cognitive environments.**



Operations Research Working Group USA/USMC Related Study Results MAJ Jay Persons. TRAC-FLVN



- Army/USMC Identification of IW Capability Gaps
 - Details
 - Identified 160 key issues/questions
 - Derived 14 decision issues; 56 required analytical capabilities
 - Identified 35 gaps
 - 20 of 35 associated with soft science (behavioral)
 - 34 of 35 gaps associated with data
 - Gaps (soft science)
 1. Knowledge, data, and algorithms that account for the effects of influencers (operational activities) on the attitude/behavior of the civilian population based on ethnic, tribal, cultural, religious, and political considerations
 2. Data and algorithms that translate civilian attitudes into levels of cooperation with friendly forces and result in corresponding levels of HUMINT provided by the civilian population
 3. Knowledge, data, and algorithms to account for discrimination between civilian and adversary actors based on presented physical and behavioral signature (e.g., insurgent in civilian clothing)

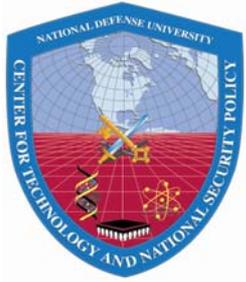


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USA/USMC Related Study Results



- Army/USMC Identification of IW Capability Gaps (continued)
 - Gaps (soft science)
 4. Knowledge, data, algorithms that account for how affiliations and support for other actors change based on the application of influencers (e.g., friendly operations, government activities, adversary operations)
 5. Data and algorithms that account for changes in target audience attitudes caused by the application of PSYOPS
 6. Knowledge, data, and algorithms that reflect adversary HUMINT networks (e.g., attributes of the HUMINT network, how the network is formed, how the network adjusts if a node or element is removed, what adversary activities tend to facilitate or discourage the population's provision of HUMINT)
 7. Knowledge, data, and algorithms to account for unique adversary PSYOPS techniques and the effect of those techniques on the target audience
 8. Data and algorithms to represent the effects of CMO on the attitudes of the civilian population (or other target audience)

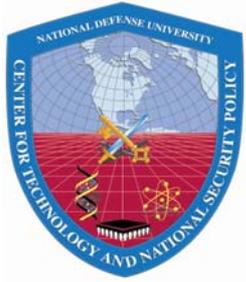


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USA/USMC Related Study Results



- Army/USMC Identification of IW Capability Gaps (continued)
 - Gaps (soft science)
 9. Data to implement the effects of essential services (or lack thereof) on civilian population's attitudes/behaviors
 10. Knowledge, data and algorithms accounting for the effect of governmental corruption on governmental institutions and on the civilian population's attitudes/behaviors
 11. Knowledge, data and algorithms reflecting the attitudes/behavior of actors (e.g. civilian population) based on the state of physical infrastructure used by the actors
 12. Knowledge, data and algorithms accounting for non-homogeneous groups of actors. This is particularly problematic when group members have overlapping affiliations (e.g. a single actor or group belongs to multiple groups - religious groups, ethnic groups, political groups, tribal groups, etc.)
 13. Data and algorithms accounting for levels of civilian support for and the provision of physical or monetary resources to adversaries

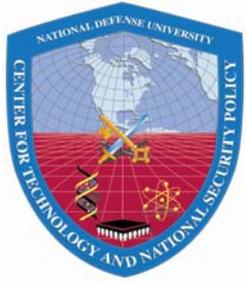


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USA/USMC Related Study Results



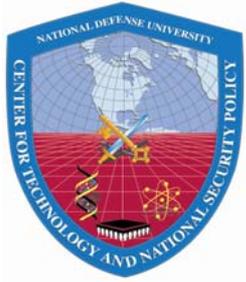
- Army/USMC Identification of IW Capability Gaps (continued)
 - Gaps (soft science)
 14. Knowledge, data and algorithms accounting for the performance/effectiveness of actor organizations based on the level of cooperation between those organizations (e.g. USAID and local government)
 15. Knowledge, data and algorithms accounting for the behavior of actors (e.g. civilian population, religious leaders) based on their level of support for the existing government
 16. Knowledge, data and algorithms accounting for the legitimacy of the existing government as viewed from outside the nation by external groups and the effect of international legitimacy on government effectiveness
 17. Knowledge, data and algorithms accounting for the of the state of the existing legal system and its impact on the attitudes/behaviors of the civilian population
 18. Data to define civilian attitudes/behaviors based on existing economic conditions and how the attitudes/behaviors change as the economic conditions change
 19. Knowledge and data about the effects of media activity on the attitudes/behaviors of actors
 20. Knowledge and data about the effects of friendly operations on media themes and activity



Operations Research Working Group Workshop Process Feedback



- Helpful if we had developed ahead of time
 - HSCB modeling frame of reference to provide a context to development of our (OR-WG) set of requirements
 - Reference problem/case study/scenario/vignette to bound the scope of the problem-space which would have in-turn helped focus discussions
 - Included interagency involvement and attendance at this workshop
- Workshop II Considerations: Reset the working groups versus keep same groups; form new groups based on WS II agenda; Invite interagency personnel; Sequence sessions and presentations to maximize information flow and knowledge generation & sharing



Operations Research Working Group
Recommendations to NDU



Questions - Discussion