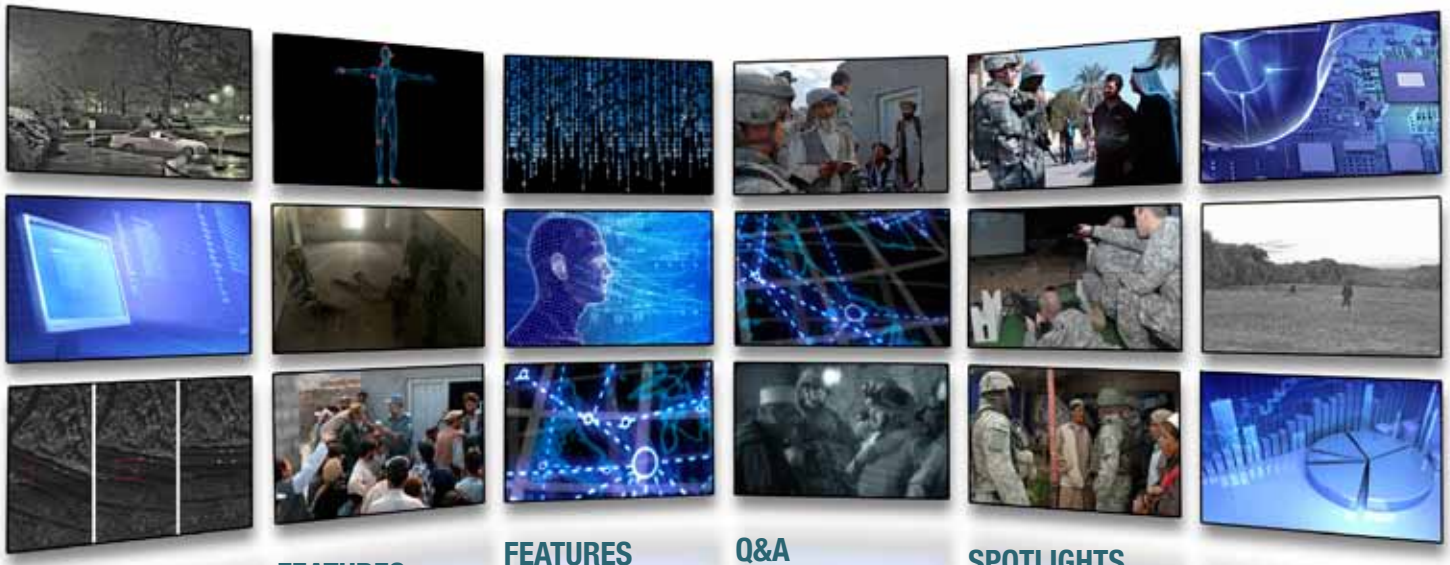
DEPUTY UNDER SECRETARY OF DEFENSE FOR SCIENCE AND TECHNOLOGY

HSCB

HUMAN SOCIAL CULTURE BEHAVIOR MODELING PROGRAM



SBIR SMALL BUSINESS INNOVATION RESEARCH

Introduction

CAPT Dylan Schmorrow, MSC, USN, PhD, is the Acting Director for BioSystems in the Office of the Director, Defense Research and Engineering and is directly responsible for science and technology (S&T) programs in the Human Systems (HS) Technology area. In this article, CAPT Schmorrow discusses with us the recent selection and funding of Human Systems-related Small Business Innovation Research (SBIR) themes which will spawn SBIR topics which small businesses can use as guidance in writing a research funding proposal that addresses the topics. The Request For Proposal (RFP) pre-release was April 21, 2010. At that time, the new SBIR topics were announced and the opportunity to ask questions of the topic authors began. RFPs for this cycle are open for bidding May 19, 2010 through June 23, 2010. For this cycle, two themes are sponsored by BioSystems: (1) Cognitive Readiness Technology (CRT) and (2) Human, Social and Cultural Technology (HSCT). There are ten topics for CRT and nine topics for HSCT (specific topic names and details were released April 21, 2010. For more information on SBIRs, please see www.dodsbir.net).

What is the SBIR Program and who competes for funding?

The SBIR Program provides funding to small businesses to conduct research that pertains to a Department of Defense (DoD) research interest or need. The SBIR submission and selection process occurs several times per year when OSD sponsors general SBIR themes. Government scientists and engineers then submit more specific research topics related to these themes to be considered for funding. Following a rigorous review process, topics submitted by government scientists and engineers are chosen, and the government command who wrote the topic puts the funding on contract with competitive small businesses following a public call for submissions and their own selection process. Once SBIRs are contracted to small businesses, the topic managers (government scientist/engineer who submitted the topic to OSD for consideration) manage the Phase I SBIR research and later consider the SBIR project for Phase II funding. As the OSD representative, my role is to coordinate project reviews and advocate for the research.

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Welcome

Welcome to the fifth issue of the HSCB newsletter. In this edition, we reflect on the origins of the HSCB Modeling Program, how the Program continues to transition, and what challenges lie ahead. The HSCB Program has now been up and running for twenty months and the results of its research efforts are beginning to transition to capabilities for the military in the form of analytical tools and models. This issue highlights how the HSCB Program is working towards delivering technical capabilities to the field in an article that highlights the work being done by Army Training and Doctrine Command (TRADOC) Analysis Center (TRAC) and the Skope Fusion Cell program at the US Special Operations Command.

Congratulations!
HSCB Director Dylan Schmorrow has pinned on 06 and is now a Navy Captain.

To date, we have technology transition agreements (TTAs) signed with three different program managers at the US Special Operations Command. One of these agreements is with the Skope program which will adapt both existing and emerging analytic tools for use in theater. This new TTA also serves as a framework for how to use emerging HSCB-developed capabilities to assess operational requirements with Fusion Cell analysts and decision-makers. TRAC has created a set of methods, models, and tools which support decision making through a prototype they created which represents ground forces conducting counterinsurgency operations. The HSCB Program is funding the identification of additional requirements and scenario detail.

As we look towards the future of the HSCB Program, we must also stop and reflect on its origins. Simply put, without the foresight and consistent support of Dr. Bob Foster, the Program would not exist. This month we say farewell to Dr. Foster as he retires from a lifetime career in the Department of Defense and we look back on how the Program began and his vision for the future.

Finally, I invite you to gain more insight into the HSCB field at the 1st International Conference on Cross-Cultural Decision Making which runs jointly with the 2010 AHFE International 3rd International Conference on Applied Human Factors and Ergonomics on July 18-20, in Miami, Florida. This conference is being held in lieu of a Program specific event (i.e. HSCB Focus 2010) this year. I look forward to seeing you there!

Dylan Schmorrow
Director, OSD HSCB Modeling Program
Acting BioSystems Director, Office of the Director
Defense Research and Engineering

HSCB PROGRAMS OF RECORD

FEATURE ARTICLE

A primary goal of the HSCB Program is to transition capabilities to the warfighter and to support integration, whether through architectures of existing Programs of Record, or open architectures that allow broad systems integration. The mission context for transition is support to intelligence analysts, operations analysts, operations planners, and wargamers. To date, CAPT Schmorrow has signed Technology Transition Agreements (TTAs) with program manager counterparts at the Special Operations Research, Development, and Acquisition Center at the US Special Operations Command, Program Executive Office for Simulation, Training, and Instrumentation, and the Skope Fusion Cell of the US Special Operations Command. Specific Programs of Record include the Psychological Analysis and Collaboration Environment, Constructive Simulation, and Skope. While the primary transition goal of the HSCB Program is sustainable transfers to formal Programs of Record with official Program Elements, HSCB also recognizes the importance of developing user advocacy and feedback at combatant commands and individual military units. HSCB staff selectively engages organizations such as US Africa Command (AFRICOM), Special Operations Command-Pacific (SOCPAC), Marine Corps Information Operations Center (MCIOC), and the Joint Military Information Support Command (JMISC) to solicit user needs, document workflows, and transfer HSCB prototype capabilities. In addition, given a portfolio comprised of applied research (6.2), advanced technology development (6.3), and engineering development (6.4), the HSCB transition strategy includes processes to move technology from 6.2 to 6.3 and 6.3 to 6.4 levels of maturity. A final component of the HSCB transition strategy is a formal assessment process designed to assess the suitability of HSCB capability transition. ♦

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Published by:
Strategic Analysis, Inc.
4075 Wilson Blvd.
Suite 200
Arlington, VA 22203

Layout and Design:
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ACCELERATE DELIVERY OF TECHNICAL CAPABILITIES TO WIN THE CURRENT FIGHT

In 2009, the Director of Defense Research and Engineering (DDR&E) introduced a set of four imperatives intended to help focus the organization's support to the Department of Defense (DoD). One of these imperatives is "accelerate delivery of technical capabilities to win the current fight." An example of how DDR&E's HSCB Modeling Program is meeting this objective is through its funding of work at the TRADOC Analysis Center (TRAC) and SPADAC/Skope that will get proven technologies into the hands of end users.

TRAC

The HSCB Program is funding the Army's Training and Doctrine Command (TRADOC) Analysis Center (TRAC) to develop irregular warfare (IW) analytic capabilities at the tactical and operational levels. A suite of methods, models, and tools (MMT) are being developed to support decision-making, through development of a prototype representing ground forces conducting counterinsurgency (COIN) operations. COIN operations are necessary when insurgents exert more influence on local populations than the national government does; setting the conditions to permit national actions to influence the local population is the crux of the COIN fight.

TRAC's effort includes data, scenario, and HSCB testbed development. The data development process is similar to the COIN Intelligent Preparation of the Battlefield (IPB) and Center of Gravity (COG) analysis: 1) determine how the insurgents leverage the population to accomplish their objectives; 2) visualize specific groups within the population in their multiple layers; 3) visualize the root causes of insurgency by specific population groups; and 4) assess the insurgent's strategy in order to forecast his most likely/most dangerous courses of action or, in other words, visualize the enemy's campaign plan and how he gains passive/active support of the population.

TRAC is developing a a Tactical Wargame, composed of a set of inter-related and IW-related COIN scenarios across a range of areas of operations at the tactical and operational levels. The scenarios focus on the population-level factors, including population demographics, faction allegiances, social networks and key individuals, and operational variable and state metrics. The HSCB Modeling Program is specifically funding the identification of additional requirements and the development of required scenario detail.

Initially focused on the tactical level, the Tactical Wargame will be used to prototype a capability that credibly represents ground forces conducting COIN operations, while accounting for the relevant relationships and interactions with the population through the use of a Cultural Geography (CG) model. The CG model is an agent-based, discrete-event simulation that represents a geographically-based population's stance on issues, derived from their cultural narrative.

The testbed will support testing HSCB capabilities, specifically intelligence fusion and data visualization and analysis tools, some of which will be selected to support TRAC's (MMT) suites, while others will support deployed and home-station data analysts. TRAC will be hosting a tactical-level Wargame in the fall of 2010—an important step to accelerate delivery of technical capabilities.

SPADAC/Skope

The Skope Fusion Cell is designated as an Army Program of Record, specializing in the discovery of non-obvious relationships across disparate sources of data. SPADAC directly supports Skope by providing analysts with the necessary algorithmic and software implementations to productively analyze data from multi-intelligence sources. Many SPADAC/Skope activities include socio-cultural analysis as part of their core mission. Skope has recently signed a Technology Transition Agreement (TTA) with the HSCB Modeling Program to rapidly adapt both existing and emerging analytic tools for use in theater across a number of COCOMS and with coalition partners. The TTA also provides a framework for bringing emerging HSCB developed capabilities to assess operational requirements with Fusion Cell analysts and senior decision makers. SPADAC/Skope, therefore, represents a rapid transition opportunity for HSCB capabilities.. For example, SPADAC/Skope will be implementing some of its rapid transition tools in response to community requirements in theater on 20 May 2010 at the USFOR-A and ISAF partner level.

The HSCB Program is assisting to shape Skope tools into a capability suitable for use outside the Skope Fusion Cell, via the Tyton project—adapting existing Skope tools into a collection of web services suitable for use in a "cloud computing" architecture. Cloud computing distributes the processing of tool functions across a number of network computers to support scalability, accreditation, and dynamic mission requirements. With the creation of additional data adaptor services, the Tyton toolkit will become relatively data agnostic, making it specifically suitable for use with data sources currently available on a variety of in-theatre networks. Tyton will be the core of Skope's analytic toolkit and will be deployed to coalition and COCOM analysts directly supporting the fight.

The HSCB Program also funds SPADAC to develop Canvas as a new tool within Tyton. Canvas is a high throughput, dynamic visualization tool that analysts will use to filter millions of messages on-the-fly based on discovery of emergent relationships. Canvas allows the analysts to add and remove concepts (entities or context) from the visualization. Canvas uses data discovery and advanced visualization to suggest non-obvious relationship among large, complex, multi-intelligence source data sets, and allows insightful context configurations to be shared and re-used, creating domain specific filters and theme discovery. Skope analysts are currently assessing Canvas's capabilities, prior to integration with the Skope Tyton toolkit. Both Canvas and Tyton are being documented and processed for accreditation in the field with DDR&E HSCB funding, accelerating delivery of technical capabilities to win the current fight. ♦

Q&A ROBERT E. FOSTER, PHD

Robert E. Foster, PhD
Dr. Foster was the Director, BioSystems, Research Directorate, Office of the Director, Defense Research and Engineering. He was responsible for coordination and oversight of the DoD's biomedical, human systems, training, counterterrorism and environmental quality science and technology programs. He was also responsible for oversight of the Department's animal and human use regulatory affairs program. Dr. Foster holds a PhD in neuroscience and psychology from Duke University and a B.A. in psychology from the University of Virginia. He is acquisition level 3 qualified and a graduate of the Program Manager's Course at the Defense Systems Management College. His military experience was as a Regular Army, enlisted Nike Hercules Fire Control Maintenance Technician from 1968 to 1971.

Introduction

With nearly thirty years in government service, Dr. Foster retired in April. Below are some of his reflections on the HSCB Modeling Program. We wish him all the best in his retirement, while we also congratulate CAPT Schmorrow on his new role as Acting Director of BioSystems.

Q: How did the Human Social Culture Behavior (HSCB) Modeling Program originate and what was its intent?

Foster: The HSCB Program began when I received a draft study proposal for Strategic Planning Guidance (SPG) in 2006, which had been drafted by the Office of the Undersecretary of Defense for Policy. The proposed study was lacking in orientation toward human science. I redrafted the proposal suggesting assignment to DDR&E and this made it into the SPG. The original idea for a SPG study arose from an emerging understanding that insurgencies and regular conflict areas are more difficult to analyze than the more traditional, conventional warfare-based scenarios.

Commander Sean Biggerstaff and I took on the study for DDR&E in spring 2006 and tried to find out what was going on in the Department as regards social science research and the development of analytic technologies. After a whirlwind period of discovery, finding a very eclectic mix of work, we proposed a more organized approach to developing capabilities centered on leveraging social and cultural theory and science. The output of this study convinced the Deputy Secretary of Defense to allocate the budget we are now executing. After that point, there was a discussion with Congress as to whether HSCB should be funded. Congress became convinced it was a good idea and over a period of about nine months, we organized the current stable of managers and began the solicitation process for the Program which we knew would be largely executed outside of the DoD lab structure.

"...IT IS THE MODELS AND THE SCIENCE THAT LEADS TO THE MODELS, NOT THE WORK-STATION TOOLS, THAT SHOULD BE OUR FOCI".

I envisioned the HSCB Modeling Program to be an extramural program oriented toward the transition to operational use and rooted in the science of HSCB models and an appreciation that data might be the most difficult, technological challenge. The output of the Program would be tools that implement the models. We decided to use the capacity and reach of MITRE to help with program integration and found that both Army Geospatial Center (AGC) and Army CECOM had the technical capacity to be test-beds. Now we are in the execution phase. DoD's Institutional modeling and simulation communities are acting as our user groups. It appears that community really wants us to focus on the models and data issues. And indeed it is the models and the science that leads to the models, not the work-station tools, that should be our foci.

Q: What drove the HSCB Program at the beginning?

Foster: One driving factor in justifying the Program was DoD 6.4 funding, which was absolutely necessary. Science and technology money was not sufficient for this Program. This is a vertically integrated 6.2 through 6.4 program. Presumably it is our demonstrating/prototyping/risk reduction budget (i.e., our 6.4 monies) that acts as a magnet for the best of the output of the scientific program (6.2 and 6.3 funded).

Q: What do you see as your legacy from your career in the Department of Defense?

Foster: It is my contribution to general public service. Getting very bright scientists to attend to defense issues and, with some success, motivating them to use their skills toward national defense is very gratifying. Leading bright, motivated people to do good work leading to future national security capabilities is fun.

Q: What part of the HSCB Program most excites you?

Foster: That the Program is finally maturing into a rhythm and that we have some very good people trying to move us forward both scientifically and technically.

Q: Is there a particular piece of the HSCB Program or community which you will miss the most?

Foster: Always the people who are performing the work and who challenge us almost every day with new, creative ideas. They care about this area of research deeply and they are really smart.

Q: What advice do you have for the research community in general?

Foster: Stick to developing theory and models but don't forget to attend to the data issues. Avoid the allure of fancy computer programs with no underlying body of science. Pay attention to the integration of modeling approaches. In 2006 it was apparent that the biggest challenge would be integration of agent-based, system dynamics, and game-theoretic modeling approaches, and then this is compounded by the fact the models themselves have to be developed. Some foundation work in integrating theortical approaches, such as the recent work of RAND, should be supported. Interface with operators and analysts to understand the realm of the 'operationally possible' and to keep the 80% five-year solution as an acceptable goal in contrast to setting goals based on 20 year-to- perfection delusions.

Q: What are you most looking forward to in retirement?

Foster: I am most looking forward to the first firing of a down-draft kiln and the pots that I see when I un-brick the door. ♦

"DR. FOSTER SAW BOTH THE CAPABILITIES THAT WERE BEGINNING TO EMERGE FROM THE RESEARCH COMMUNITY AND THE GAPS THAT SHOULD BE FILLED AND REALIZED THAT THE ABILITY TO GROW AND HARVEST HSCB PRODUCTS WOULD TAKE A NEW MANAGEMENT AND COORDINATION SCHEME."

S.K. NUMRICH, PH.D.

FEATURE ARTICLE

International Conference on Cross-Cultural Decision Making

This year the place to see some HSCB performers highlight their research is at the 1st International Conference on Cross-Cultural Decision Making (CCDM) in Miami, Florida on July 18-20, 2010. This conference, co-chaired by Dr. Dylan Schmorrow and Dr. Denise Nicholson is held in conjunction with the 2010 Applied Human Factors and Ergonomics (AHFE) conference and other related conferences including the 1st International Conference on Human Factors and Ergonomics in Health Care, the 1st International Conference on Neuroergonomics, the 1st International conference on Applied Digital Human Modeling, and the 13th International Conference on Human Aspects of Advanced Manufacturing (HAAMAHA). In this article, we will highlight the CCDM conference and its contribution to HSCB research. Don't forget to mark the dates and times of the following CCDM sessions. Your support will be greatly appreciated.

Highlighted below are a few snapshots of sessions which will be held during the CCDM conference, along with commentary on potential future CCDM challenges and big-picture research goals. The context of the CCDM conference within the overall AHFE conference is also discussed.

Civilizational Change: Ideological, Economic, and Historical Change

This session will examine human behavior at the societal level and will explore the causal factors that lead to civilizational change. Such macro-level forces of change are responsible for hegemonic shifts in power that frame political and military action.

Tactical Culture Training: Narrative, Personality, and Decision Making

This session will bring together speakers who are advancing the science and application of tactical cultural training. The session will be kicked-off with three basic research presentations that will address fundamental questions about best practices for (1) modeling cross-cultural personality findings, (2) modeling cultural and personality biases in decision making, and (3) using narrative structure to help model cross-cultural decision making. The final three presentations will deal more with applied research, describing (4) a new role-playing cultural simulation called AVATAR, (5) IntelligentACT, a serious game for socio-cultural communications skills training, and (6) OLCTS, an anytime/anywhere language and culture training system.

Cultural Models for Decision Making

A universally-applicable model of culture is elusive due to the intrinsic nature of cultural studies; all models are inherently both informed and constrained by the culture of the model's

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Dr. Dylan Schmorrow and Dr. Denise Nicholson

Session Title	Time	Chair(s)	# HSCB Funded Papers
Sunday, July 18			
Civilizational Change: Ideological, Economic, and Historical Change	8:00-10:00	Michael Hail Stephen Lange	1
From Petri Dish to Gaming: Extracting Understanding from Diverse Data Sources	10:30-12:30	Julie Drexler Sue Numrich	3
Tactical Culture Training: Narrative, Personality, and Decision-Making	1:30-3:30	Sarah Schatz Daniel Barber	4
Use Cases of Cross-Cultural Decision Making	4:00-6:00	Dylan Schmorrow Denise Nicholson	2
Monday, July 19			
Socio-Cultural Models and Decision-Making	8:00-10:00	Gilles Coppin Didier Bazalgette	5
Cultural Models for Decision Making	10:30-12:30	Peggy Wu	5
Assessing and Developing Cross-Cultural Competence	1:30-3:30	Allison Abbe	3
Understanding and Mitigating the Impact of Culture on Collaboration and Negotiation	4:00-6:00	Shawn Burke Maritza Salazar	1
Tuesday, July 20			
Applications of Human, Social, Culture Behavioral Modeling Technology	8:00-10:00	Jim Frank	3
Cross-Cultural Decision Making: Implications for Individual and Team Training	10:30-12:30	Joan Johnston David Fautua	1
Hybrid & Multi-Model Computational Techniques for HSCB Applications	1:30-3:30	Paul Wiegand Daniel Barber	2
Sense Making in Other Cultures: Dynamics of Interaction	4:00-6:00	Tony van Vliet	2

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INTERNATIONAL CONFERENCE ON CROSS-CULTURAL DECISION MAKING

authors. In this session, researchers from multiple disciplines who create and apply formal models to analyze or predict human behavior will be brought together. Speakers will present work on empirically-driven frameworks as well as theoretically-based models and architectures to characterize culture, subcultures, and their impact on decision making. Applications include decision aides for achieving nation state operational objectives, adversarial recruitment, multinational communication and collaborative planning, and technology adoption.

Hybrid & Multi-Model Computational Techniques for HSCB Applications

Those attending this session will hear presentations and constructive discussion of methods for applying hybrid and multi-model techniques to HSCB modeling domains, paying particular attention to pragmatic and methodological challenges, as well as the integration of the behavioral models themselves. HSCB applications, tools, and architectures increasingly require integration of a variety of different modeling techniques into larger computational mechanisms. Techniques such as multi-agent systems, cognitive models, social networks, game theory, and others abound within the computational social sciences; however, as we strive to meet challenges presented by new programs, realistic solutions will employ a collection of many techniques.

The purview of both AHFE and CCDM conferences is quite broad, though there is a reasonable overlap between the two. The primary focus of the CCDM conference is on the intersections between psychosocial theory informed by the social sciences and methods of computational modeling informed by computer science and mathematics. While the majority of research challenges that arise from such an intersection fall reasonably under the rubric of "human factors," the potentially broad nature of these conferences suggests that the CCDM conference should focus specifically on crucial questions regarding data acquisition as well as reconciliation of mathematical and psychosocial modeling methodologies.

Two of the greatest research challenges to be addressed in the CCDM conference are 1) unification and standardization of data being collected for CCDM applications/research so these data can support as many different thrusts under the CCDM umbrella as possible; and 2) validation and verification with respect to utility and underlying psychosocial theory. Solutions for both of these challenges must be in the context of—and indeed will require—sound methods for integrating a complex array of quite distinct behavioral models and modeling techniques.

Many of the significant challenges faced by CCDM researchers involve operationalizing the work for practical uses. For instance, many CCDM theories are based upon ethnographic observations and their associated models are qualitative and descriptive, rather than quantitative and prescriptive. While such theories provide a good foundation, they are not actionable for more applied purposes, such as developing reliable mathematical models or implementing forecasting tools. A related challenge is to build an integrated pool of individual, social, and cultural data, all of which are necessary to drive and validate the applied theories and their associated products.

One problem with operationalizing CCDM research is that human behavior - and the situational contexts in which it occurs—is highly nuanced. A major challenge for CCDM researchers is therefore to define scalable models that possess the right balance between generalization and specificity, while ensuring that they are computationally tractable for use in automation. This obstacle is present when defining the boundaries of subcultures as well as types of behaviors for representation. Models must therefore balance "universal applicability" with usefulness and system complexity.

Cross cultural research has a long history, but the field continues to expand, and researchers across the social sciences, humanities, and natural sciences are all examining empirical data from larger, cross-cutting phenomena; interdisciplinary collaboration is now more essential than ever. Furthermore, with an increase in funding for CCDM research originating from the Department of Defense, an increasing number of academics and practitioners in complimentary sciences are also becoming aware of the research needs. The CCDM conference will foster expanded cross-disciplinary research efforts by lending CCDM researchers an outlet and forum to gather, discuss findings, publish, and comment on each other's work. At the 1st International Conference on Cross-Cultural Decision Making, we anticipate that CCDM researchers will witness the great deal of energy and promise that currently exists within the field and will be inspired to reach even further to incorporate research ideas from the overarching AHFE conference into their CCDM research. ♦

FEATURE ARTICLE DoD-WIDE PROGRAMS

Many programs and/or initiatives across the US government support research and development (R&D) centered on modeling socio-cultural behavior to address defense-related challenges. The number, diversity, and dispersion of these programs and/or initiatives make information sharing difficult. As a result, opportunities for collaboration, coordination, and a more coherent overall socio-cultural behavior R&D effort for national defense are probably being lost. Indeed, one goal of *Focus2010*, the HSCB Program's August 2009 conference, was to bring together stakeholders in this socio-cultural R&D community, facilitate more information exchange and, hopefully, improve awareness and coordination. It was a promising start: the event attracted more than 600 participants, many of whom manage or have a leading role in one of the relevant R&D programs.

Based in large measure on briefings from those program leaders, we have developed a picture of the socio-cultural behavior modeling R&D community. In the figure below, we offer an initial rendering of that community, organized as much as possible by formally-defined and funded programs sponsored by the Service components, Office of the Secretary of Defense, other Department of Defense elements, or other government agencies. In an effort like this, determining where to draw lines is always a challenge; almost certainly there are other programs or initiatives that should be on this list, particularly in other agencies. It is also difficult to represent relevant international efforts that no doubt exist. Moreover, as indicated by the columns of our organizing framework, we have tried to maintain focus on efforts that emphasize the leveraging of computational modeling. Even with these limits, the set of relevant programs and/or initiatives is large and growing (at least two IARPA seedlings may evolve into established programs).

In subsequent issues of the HSCB newsletter, we will profile each of the programs below, providing very basic information on objectives and points of contact. Our hope is that this will be a valuable resource for program leaders, practitioners, and more general audiences. We welcome your input. ♦

TABLE 1. TECHNOLOGIES, METHODS, MODELS, TOOLS, STUDIES AND ANALYSIS IN THE SOCIAL CULTURAL DOMAIN

		Data & Theory Building	Model & Software Development	Modeling Infrastructure & Validation	Integration & Systems Development	Training & Mission Rehearsal	Operational Use & Transition
Armed Services	Socio-Cultural Modeling of Effective Influence (AFRL)	■	■				
	Cascading Effects Modeling (AFRL)	■	■				
	Collective Behavior and Socio-Cultural Modeling (AFRL)	■	■				
	Predicting Adversary Behavior (AFRL)		■		■		■
	HSCB Basic and Applied Research (ARI)	■	■			■	
	Effects Measurement and Geospatial Services (USACE)	■	■				
	Marine Corps Intelligence Activity (USMC)	■					
	Program Manager Training Systems (USMC)	■				■	
	Affordable Human Behavior Modeling (ONR)	■	■	■			
	ONR HSCB Science (ONR)	■	■	■			
	Human Social Culture Behavior Modeling (DDR&E)		■	■	■	■	■
OSD	Joint Capability Technology Demonstration (DDR&E)					■	■
	Strategic Multilayer Analysis (DDR&E)	■		■	■	■	
	Minerva Research Initiative (OSD)	■					
	Multidisciplinary University Research Initiative (OSD)	■		■			
	Integrated Crisis Early Warning System (DARPA)		■		■		
	Applications of Social Computing (DARPA)		■	■	■		■
	Strategic Communication Assessment & Analysis (DARPA)	■	■	■			
	Conflict Modeling, Planning & Outcomes Experimentation				■	■	
Other DoD	Socio-Cultural Dynamics Initiative (DIA)	■				■	
	Behavioral/Social Sciences Research Program (DIA)	■				■	
	Social-Science Research for Anticipation & Reduction of WMD	■	■	■			
	ATHENA (TRISA)				■	■	■
	Human Terrain System (TRADOC)	■					
	Social Dynamics Awareness (JIEDDO)		■			■	■
	Socio-Cultural Behavior R&D (COCOMs)		■			■	■
Other	Social/Behavioral Dimensions of Security, Conflict,	■					
	Socio-Cultural Content in Language (IARPA)	■					
	Reynard (IARPA)	■		■			
	Trust (IARPA)	■	■			■	

Note: AFRL: Air Force Research Lab; ARI: Army Research Institute; COCOMs: US Combatant commands; DARPA: Defense Advanced Research Projects Agency; DIA: Defense Intelligence Agency; DTRA: Defense Threat Reduction Agency; IARPA: Intelligence Advance Research Projects Agency; JIEDDO: Joint Improvised Explosive Devices Defeat Organization; NSF: National Science Foundation; ONR: Office of Naval Research; TRADOC: Training and Doctrine Command; TRISA: TRADOC Intelligence Support Activity; USACE: Army Corps of Engineers

The OSD Human Social Culture Behavior Modeling Program (HSCB) was designed from inception to address research gaps and challenges, as identified by multiple, independently-operating panels of HSCB domain experts over a period of several years. These inquiries were initiated in response to shifts in military doctrine requiring deep understanding of the human, social, cultural, and behavioral domains.

The gap analyses began with a 2006 study called for by the FY 2008-2013 Strategic Planning Guidance (SPG). After conducting a thorough analysis, the study recommended the Department of Defense increase its HSCB research and development (R&D) investment in a broad range of areas. In 2008, the National Research Council (NRC) reviewed a range of modeling research programs, evaluated their methodologies, strengths and weaknesses, and determined which had the greatest potential for military use. The NRC report on their findings included guidance on the design of a research program that would foster the development of these models for the military. In 2008, the Defense Science Board (DSB) Human Dynamics Task Force, also asked to review HSCB-oriented research efforts, published an assessment of relevant S&T investment plans and recommendations for military use of HSCB knowledge and tools.

This series of reports, along with additional input gathered from experts, shaped the design and structure of the Director of Defense Research and Engineering's (DDR&E) HSCB Program. As the HSCB Program moved from Phase One of the Program into Phase Two in FY10, we took stock of our progress and performed an internal gap analysis intended to gauge progress and identify those areas demanding additional focus. To date, we have identified four research challenges that we will continue to address throughout Phase Two of the HSCB Program:

1. How do we integrate data infrastructure, model execution and visualization to support the movement from optimal decision making to robust decision making? This requires architectures and processes supporting exploratory modeling to forecast a landscape of plausible outcomes for a set of courses of action, scoring the outcomes, and displaying the resulting decision space to decision makers. This approach allows decision makers to identify robust options – ones that will have good outcomes across the broadest swath of plausible futures.
2. How do we incorporate the skills, knowledge, and abilities into an operational system that are essential resources for the usage of HSCB models? This requires the development of collaborative workflows for multi-disciplinary teams, training for organic personnel, and knowledge capture to employ computational intelligence where feasible.
3. We need accurate, usable models that can deliver results in a timely manner. When researchers develop models, they frequently rely on neat, clean datasets that contain exactly the right information and data points required for that particular model. The data that is available to model end-users is typically not curated and is most likely not as complete as a laboratory data set – we need models that are able to ingest "real" data from the field and still deliver reliable output.
4. Multiple approaches to HSCB-oriented training exist, including, but not limited to: in-person, web-based, avatar-based, game-based, culture-general, and culture-specific. What works and what does not? Answering this question requires comparative research that will help us develop best practices for HSCB-oriented training.

The HSCB Program continues to engage in a variety of gap analysis exercises – our findings, which will shape the future of the Program, will be shared in upcoming newsletter updates. On the following pages, Dr. David Sallach of the University of Chicago, discusses how the HSCB Program is addressing the first challenge presented above, and Dr. Jonathan Pfautz of Charles River Analytics Inc., describes how the Program is addressing the second hard research challenge. In the next issue of this newsletter, Dr. Keith Gremban of SET Corporation and Dr. Allison Abbe of the Army Research Institute will discuss how they are tackling the third and fourth research challenges described in this article. ♦

SBIR

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What were the two broad SBIR themes that government scientists/engineers submitted topics for most recently?

One SBIR theme was entitled "The Cognitive Edge: Enabling Cognitive Readiness in Dynamic Warfighting Environments." In it, we addressed the need to prevent warfighters from experiencing impaired decision-making and strained cognitive capacity which can occur on the battlefield for several reasons. In the complex and unpredictable environment of modern military operations, warfighters often deal with information overload, fatigue, breakdowns in technology, constraints of distributed and networked teams, joint-service operations, and the need for rapid environmental adaptations, to name a few. In this SBIR theme, we called for research to use and support the knowledge products from disciplines such as cognitive science, network science, augmented cognition, neuroergonomics, learning science, psychology, and sociology to pioneer the development of valid new technologies to enable the cognitive readiness of warfighters.

The second SBIR theme is entitled "Decision Support Technologies for Understanding Socio-Cultural Behavioral Data." Its goal is to fund research topics which can contribute technological tools to the interpretation of HSCB data. Operational decision makers, analysts, planners and war gamers need innovative decision support tools

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SPOTLIGHT DAVID L. SALLACH

Modeling Strategic Contexts

Historical and prospective scenarios of many types have shaped, and also anticipate, the formulation of effective national and international strategies. Relevant scenarios might represent civil wars, the predatory dynamics of international narco-terrorism, regional conflicts over scarce resources, the growth of ideological alliances and movements, or the flux of economic growth and dislocation.

WHILE HISTORY AND POLICY ARE INTRICATE, AND CONSTANTLY IN FLUX, COMPUTATIONAL MODELS PROVIDE NEW AND MORE EFFECTIVE WAYS OF IDENTIFYING AND TRACKING THE UNDERLYING DYNAMICS.

While history and policy are intricate, and constantly in flux, computational models provide new and more effective ways of identifying and tracking the underlying dynamics. The use of computational models has grown dramatically in the last decade. Numerous insightful notional models and empirically credible simulations have enriched the social science landscape. Computational social science, however, is still a relatively young field of research.

Large-scale social processes are inherently complex, while most social-theoretical models have remained either qualitative or overly stylized. It can be expected that computational models will require and facilitate advances in the substantive social sciences and, in turn, stimulate progress in the computational sciences as well. Ever larger models will require and apply the power of high-performance computing. As a result, there is reason to expect that, in the coming decade, significant progress will be made in the computational social sciences.

The project summarized here addresses scenarios and initiatives by grounding them in social theory and the substantive social sciences. Sponsored by the Office of Naval Research (ONR), the *Modeling Strategic Contexts* project (MSC) is developing decision tools to assist analysts and subject matter experts in exploring and assessing strategic scenarios, and the tradeoffs that underlie them. To fulfill these goals will require the representation and manipulation of multi-dimensional and textured social spaces.

At the same time, in plans and in life, scenarios are frequently disrupted and rechanneled by contextual factors and their associated consequences. Among the contextual factors that affect such scenarios are:

- The intertwining of material and interpretive factors.
- Addressing the actual (and possible) strategies of multiple actors as a single strategic ecology through which that actor must navigate.
- The 'grand strategic' dimensions, such as education, science, technology, media and culture, and how they support or undercut available strategic options.
- How higher social levels such as alliances and coalitions, and lower levels, including institutions and transnational social movements, may enable and/or inhibit the strategic possibilities of embedded actors.
- The reorganization of key institutions and organizing concepts, as they evolve over time.
- The effects within strategic spaces of geographic and temporal scales.

Addressing such contextual considerations is a major priority of the MSC project, one that can contribute to strategic models of greater depth and explanatory power. The emerging methodology of computational modeling will also need to focus on plausibility, alignment, robustness and validity at each stage of the design and development process.

Technically, the computational aspects of MSC modeling include: support for diverse communication patterns among agents distributed in complex spheres of influence, extending spatial structures to incorporate social distinctions as well, enhancing relational algebra with specifically social domains and operators, and adapting high-performance computing architectures in ways that more effectively support the representation of social dynamics. Discourse mining, based on data theory, is also being implemented as a way of supporting model parameterization and dynamic empirical tracking and realignment.

The scientific objectives of the MSC project include: 1) broadening and deepening game theory so that it can be effectively mapped to historical scenarios, 2) giving mathematical expression to existing qualitative social theories, 3) synthesizing fragmented social theories, 4) identifying and expressing cross-scale social dynamics, and 5) formalizing bridging mechanisms that translate general principles into situated interaction. When achieved, the progress inherent in these goals will contribute to the further advancement of the social sciences as well.

The overall objective remains to provide methods and tools for the analyses of regional and international conflicts using rich descriptions of the situated constraints and opportunities with which competing initiatives and campaigns are forged. When well designed, a model of multiply-interacting strategies and contexts represents the dynamic processes that give rise to implicit dangers, available types of responses, and the assessment of situated strategic choices. The decision tools developed in the MSC project are being designed to support such models. ♦

SPOTLIGHT JONATHAN PFAUTZ, PHD

An Approach to Bringing HSCB Modeling Technologies to Operational Communities

In addition to advancing the state of research in computational human socio-cultural behavior modeling, the HSCB Program is working to transition related technologies that address near-term warfighter needs. For a DoD program, this goal might appear self-evident, yet achieving this goal is anything but obvious or trivial. In fact, numerous research questions surrounding the operational application of HSCB modeling technologies remain unanswered. Here, we present our approach to identifying and addressing these research questions—an approach we have used to successfully bring HSCB technologies to military users.

Charles River Analytics Inc. has been involved in the development of HSCB models, modeling tools, and model-based applications for over 25 years. Most recently, the author and his colleagues have developed a suite of tools that are being used today around the world to support non-kinetic operations. Designing, developing, and deploying these tools forced our team to examine many of the cold, hard facts of how HSCB technologies are currently perceived by potential users at strategic, operational, and tactical levels. Among our discoveries, we identified a genuine desire for HSCB-enabled technologies that was accompanied by a deep and persistent skepticism, a mistrust that went beyond simply "seeing that it works." Therefore, at the core of our effort was a deep and consistent commitment to not simply identify and acknowledge user needs, but to systematically analyze those needs and their cognitive, socio-organizational, and environmental roots.

This approach to developing HSCB-based applications embraces human factors engineering research, specifically Cognitive Systems Engineering (CSE), which was developed in part to address the needs of the nuclear power industry in the 1980s. CSE includes multiple methods for the formal study and analysis of "sociotechnical systems" (that is, humans and machine/computational systems, considered individually and as a whole) from the perspective of *driving system design*. That is, CSE represents a pragmatic approach to guiding how systems should be designed to be maximally effective through the study of users and user organizations.

Within an iterative design, development, and evaluation cycle, CSE methods help define a user's cognitive and perceptual tasks, skills, and knowledge (existing and trained), as well as organizational (and human/system) information flow, workflows and task responsibility, and environmental constraints. Such methods (Cognitive Work Analysis, Work Domain Analysis, Cognitive Task Analysis) include a set of analytic tools for observing and interviewing users in their work domain. For example, we may conduct "cognitive walk-throughs" of hypothesized systems, study and code inter-personal communication to define work processes, and compare documented organization processes (such as field manuals) to actual and observed work processes.

In our experience, the practical application of the CSE approach faces three key challenges. First, the analysis of users can easily become a research project unto itself—if the underlying need to drive real-world system design does not remain the highest priority. Second, while translating the results of an analysis into user needs and design constraints is straightforward, developing a system that meets these needs and constraints still requires specialized expertise and creativity to find optimal solutions. Third, because CSE relies on frequent interaction with representative users for knowledge elicitation and both formative (during design and prototyping) and summative (after implementation) evaluation, continued access to real and/or representative users is critical.

Many theoretic and practice-oriented texts are available to help understand and use CSE methods [1-4]. In addition, we have published the results of applying these methods, including some of our analyses of human use of HSCB models, as well as some design implications and solutions for HSCB models and model-based tools. As demonstrated by our work with the HSCB Program, the application of CSE methods and an overall user-centric perspective on research and development has the potential to align the goals of the research and development community with the overarching needs of warfighters everywhere. ♦

References:

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2. Rasmussen, J., Pejtersen, A. M., & Goodstein, L. P. (1994). *Cognitive Systems Engineering*. New York: Wiley and Sons.

3. Vicente, K. J. (1999). *Cognitive Work Analysis*. Mahwah, NJ: Erlbaum.

4. Woods, D. & Hollnagel, E. (2006). *Joint Cognitive Systems*. CRC Press.

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that allow them to forecast socio-cultural and behavioral (human terrain) responses at the strategic, operational and tactical levels. We were looking for topics for this theme which went beyond simple model development to develop and validate decision support tools for integration with current socio-cultural and behavioral data, models, and modeling output.

Research by small businesses that falls under each of these topics will be funded by the affiliated government command, so any interested parties should read the SBIR solicitations on the websites for these government commands.

What makes a successful SBIR project?

What gives a SBIR project an edge is its ability to go farther than some other research projects is to create a transition-friendly deliverable that meets the needs of the eventual end-user of the technology. SBIR topics are often very focused and pointspecific in addressing a DoD problem using an innovation or technological advance. However, point solutions should also be examined in view of the larger picture: who is the service user on the other end of this technology/innovation? How will the technological advance help the service user? I believe the best SBIR projects have been managed by people who have understood the big picture of their SBIR funding since day one of their proposal- a SBIR project should be crafted to have a clear focus on the eventual customer, ie., the ultimate acquisition customer. I should note, too, that working with two or three people who are "in the military" or "associated with Warfighters" as part of the SBIR project is not sufficient. A successful project needs to be focused on the acquisition program that would ultimately sustain what is developed as part of the SBIR program.

Making a well thought out technology development roadmap when you write your SBIR proposal can help you get on track to a successful SBIR project. With a good roadmap in place, the ingenuity of a small business can meet with federal funding and result in the creation of truly unique technologies for transition. However, being an excellent, innovative researcher and having a good technological innovation does not directly translate into running a successful SBIR project. SBIR projects require exceptional researchers who can think past the fundamental research question to manage the whole effort with a true business model. SBIR researchers should know well ahead of time how their new technology might (or better yet can) be inserted into existing systems or technologies. It helps to examine your project from a systems engineering level; determine by working backwards how you need to move forward. ♦

CALENDAR OF UPCOMING CONFERENCES AND WORKSHOPS

Date	Event	Location	Sponsor	Website
June 22–24, 2010	78th Military Operations Research Society Symposium	Quantico, VA		**www.mors.org/events/78thsym.aspx**
July 17–20, 2010	2010 AHFE International 3rd International Conference on Applied Human Factors and Ergonomics *Jointly with* 1st International Conference on Human Factors and Ergonomics in Healthcare 1st International Conference on Cross-Cultural Decision Making 13th International Conference on Human Aspects of Advanced Manufacturing	Miami, FL		**www.ahfe2010.org**
August 16–17, 2010	Unifying Social Frameworks: A Workshop	Washington, DC	National Academies of Science	
September 27–October 1, 2010	54th Annual Meeting of the Human Factors and Ergonomics Society, 1st International Conference on Cross-Cultural Decision Making	San Francisco, CA	Human Factors and Ergonomics Society	**www.hfes.org/web/HFESmeetings/2010annualmeeting.html**