THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Behavioral Modeling and Simulation: from Individuals to Societies

Greg Zacharias and Jean MacMillan, co-chairs
The Committee on Organizational Modeling from Individuals to Societies
National Research Council of the National Academy of Sciences

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overview

Context and motivation
Charter and membership
Military needs, status, and challenges in individual/organizational/societal (IOS) modeling & simulation (M&S)
State-of-the-art in the broader IOS M&S community
General pitfalls and common challenges
Recommendations going forward

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Operational Context: 2006 Quadrennial Defense Review (QDR)

Defeating multi-national multi-ethnic terrorist networks

…that "seek to break the will of nations that have joined the fight alongside the United States by attacking their populations"

Defending the homeland in depth

… "because nation-states no longer have a monopoly over the catastrophic use of violence."

Shaping the choices of countries at strategic crossroads

…to affect our current and future relationships with "major and emerging powers… [and]…to shape these choices in ways that foster cooperation and mutual security interests."

Preventing the acquisition or use of weapons of mass destruction (WMD)

…because "non-state actors can conceal WMD programs and related activities, [we] must expect further intelligence gaps and surprises."

Refining the Department's force planning construct for wartime

…from a two-front conventional campaign capability to more loosely defined "distributed, long-duration operations"

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Motivation for the Study

DoD and other agencies recognized a critical need for advanced planning/training/acquisition tools based on validated individual/organizational/societal (IOS) behavior models

1998 NRC/DMSO study on "Modeling Human Behavior and Command Decision Making" found:

- Science and technology (S&T) investments have focused on computational representations for "normative" individual behaviors
- Efforts beginning to address advanced modeling issues
- But relatively few S&T efforts focusing on the "bigger picture"
  - ie, the individual in larger group contexts

1998 NRC/DMSO study made several recommendations for developing & accrediting behavioral models…

…but most of these were focused on the individual, not the individual/group/organization/culture/society/…

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this study's focus is on producing a roadmap to address this S&T gap

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Study Charter

Review state-of-the-art in IOS modeling applications serving DoD and related agencies, emphasizing computational modeling and simulation (M&S) based approaches

Review state-of-the-art in related S&T communities outside DoD, and identify relevance, strengths, and shortcomings

- Traditional social sciences research communities
- Cognitive science and individual behavioral M&S community
- Network analysis and multi-agent organizational M&S community
- Multi-resolution M&S community

Identify how gaps in IOS M&S applications serving DoD and related agencies might be filled

Develop an R&D roadmap to fill current application gaps, for the near-, mid-, and far-term

Committee Membership

AREA	MEMBER	SPECIALTY	ORGANIZATION
Co-Chairs	**Greg Zacharias**	Individual behavior modeling	Charles River Analytics
	Jean MacMillan	Team decision-making	Aptima
Cognitive Modeling	**Eva Hudlicka**	Cognitive/affective modeling	Psychometrics Associates
	Leigh Tesfatsion	Utility based decision-making	Iowa State U
	Greg Zacharias	Individual behavior modeling	Charles River Analytics
Organization Modeling / Analysis	**Holly Arrow**	Small group/crowd modeling	U of Oregon
	Richard Burton	Organization theory design	Duke University
	Kathleen Carley	Multi-agent modeling	Carnegie Mellon U
	Catherine Dibble	Multi-agent modeling; networks	U of Maryland
	Jean MacMillan	Team decision-making	Aptima
Social Network Analysis	**Steve Borgatti**	Social network analysis	U of Kentucky
	Jeff Johnson	Social network field work	East Carolina U
Modeling & Simulation	**Scott Page**	Complex systems modeling	U of Michigan
	Andrew Sage	Systems engineering/OR	George Mason U
	Mike Zyda	Agent-based simulation; games	USC/ISI

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Traditional DoD Uses of M&S

Analysis and forecasting for planning and operations

- eg, effectiveness of different types of weapons against different kinds of targets

Simulation-based training and mission rehearsal

- eg, simulating the dynamics of blue/red sensors and weapons systems

Design and evaluation for acquisition

- eg, use of electronic models to predict range improvements from a proposed sensor enhancement

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…but these are focused primarily on the physical part of the HSI equation *and* on traditional "kinetic" operations, *not* PSYOPS, IO, CA…

The world is changing…

Changing Role of the Military

New DoD Demands Placed on M&S

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Dealing with a wide range of missions and "response options", including kinetic, tactical/operational IO, and strategic DIME/PMESII manipulations

- DIME : Diplomatic, Infrastructure, Military, Economic
- PMESII : Political, Military, Economic, Social, Information, Infrastructure

Developing much broader spatiotemporal representations of entities and events

Extending existing computational representations for "normative" individual behaviors

Addressing advanced modeling issues

Moving out to look at the "bigger picture"

Potential Payoffs to DoD

Analysis and forecasting for planning and operations

- Understanding, forecasting, shaping, and responding to adversary behavior. For example
  - Forecasting adversary intent, goals, courses of action (COAs),…
  - Understanding enemy command and control structures
  - Conducting IO BDA
- Understanding, forecasting, and shaping societal behavior
  - eg, forecasting intended and unintended consequences of friendly actions on local population

Simulation-based training and mission rehearsal

- Populating the simulated battlespace with adversaries, neutrals, and friendlies

Design and evaluation for organization and acquisition

- Understanding impact of organizational changes, personnel training, and technology injection on one's own organization
- Development of weapons systems to attack adversary C2 systems

Study Review of Current DoD IOS M&S Efforts

DMSO Master Plan for M&S

- M&S Resource Repository (MSRR) contains >1850 citations
- 1% deal with individual/organizational/societal behavior

Current study reviewed selected DoD IOS M&S efforts

- Individual and small-unit models (OneSAF Family)
- Task network models and tools
- Cognitive and cognitive-affective architectures and models
- Multiagent systems models
- Massively multiplayer online games (MMOGs)
- DIME/PMESII models
- Simulation frameworks and tools
- And several others

Generated example overview table as “kickstarter”

- 50 models & frameworks surveyed
- Includes brief description, categorization, sponsor/developer, and website
- Basis for a more comprehensive effort

Major Challenges for IOS M&S in DoD

Funding and centralization

Interoperability challenges

Data collection (DC) and V&V

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Funding and centralization

- Variable funding profiles makes long-term development difficult
- Uncontrolled “mom and pop” efforts are uncoordinated, fragmented, and often uninformed by theory or fact, but…
- …rigid centralization a demonstrated failure (eg, JSIMS)

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Interoperability challenges

- Focus is on syntactic interoperability (eg, HLA) rather than semantic interoperability (the hard problem)
- No “vision” of how to address changing needs of DoD by supporting enabling technologies over specific models (eg, extensible architectures, development tools, V&V testbeds,…)

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Data collection (DC) and V&V

- DC/V&V done piecemeal and stovepiped
- No real resources placed on developing DC/V&V methodologies/technologies/frameworks
- Classification issues separate knowledgeable but uncleared modelers from cleared applications users

Major Challenges for IOS M&S in DoD

Funding and centralization

Interoperability challenges

Data collection (DC) and V&V

…but as we'll see, these are not unique to DoD IOS M&S efforts

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Overview of State-of-the-Art: Process

Define a specific modeling category/approach
- Then, for each category/approach…

Review the state-of-the-art
- Limited-scope effort with major focus on open literature

Identify relevance to military needs
- How could modeling approaches be used to solve practical military IOS M&S needs?
- Can they address the “so what” question for specific scenarios/vignettes?

Identify major limitations
- Address practical issues like: does the data exist to build the model? Is the approach scalable?...

Discuss verification & validation (V&V) issues
- What’s the current status and ongoing efforts?

Suggest model-specific future science & technology (S&T) directions

Overview of State-of-the-Art: Modeling Categories/Approaches

Conceptual and cultural models

- Verbal models
- Cultural models

Micro-models

- Cognitive architectures
- Cognitive/affective models
- Expert systems
- Decision theory & game theory

Meso-models

- Voting and social decision models
- Social networks
- Link analysis
- Agent-based models

Macro-models

- Systems dynamics
- Organizational models

Games

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General Pitfalls and Common Challenges

Matching the model to the real world

Designing internal structure

Dealing with uncertainty and adaptation

Combining components and federating models

Collecting the right data

Addressing verification, validation, and accreditation

Developing frameworks and toolkits

Matching the Model to the Real World

Model-problem mismatch

- Issues
  - Fail to understand the problem sufficiently
  - Use “off the rack” components just because they are available and familiar (e.g., Hofstede culture dimensions, game theory)
- What is needed?
  - A tighter connection between model developers and operational users
  - Better sharing of theory and data across disciplines

All-Purpose models that ultimately serve no purpose

- Issues
  - “Swiss Army knife” approach is doomed to fail (e.g., JSIMS)
  - “Kitchen sink” models keep adding variables for “realism” without a clear theoretical or empirical justification
  - IOS models are a work in progress, so interoperability must be dynamic, not static
- What is needed?
  - Flexible, adaptive components
  - Semantically interoperable models
  - Federated model standards and architectures

Designing Internal Structure

Unvalidated universal laws

- Issues
  - Universal laws of human behavior are yet to be discovered
  - Contrast with Newtonian physics, refined over several hundred years
    "Theory-free" models proliferate
- What is needed?
  - Rely on Subject Matter Experts and/or empirical data
  - Make assumptions explicit
  - Compare models around common problems

One-Dimensional Models

- Issues
  - It is easy to oversimplify and leave out important input variables
  - Parsimony should have a purpose
    - "Focus is good, myopia is unwise"
- What is needed?
  - Variables should be based on a clear sense of model purpose
  - Comparative studies to address the same problem from different perspectives

Dealing with Uncertainty and Adaptation

Unrealistic Expectations

- Issues
  - Humans are unpredictable—the best we can do is map out a space of plausible outcomes
  - IOS models cannot be measured solely in terms of their uncertainty reduction
- What is needed?
  - Give a range of possible outcomes with probabilities
  - Need better methods to communicate uncertainty in forecasts

Illusions of Permanence

- Issues
  - Organizations and societies are dynamic, not static
  - Structure changes over time/events
- What is needed?
  - Treat structure as a variable, not a fixed attribute
  - Build variability over time into models
  - Communicate uncertainty of results to users

Combining Components and Federating Models (1 of 2)

Moving from individual to collective action

- Issues
  - Crowds/groups don't behave as one big person
  - Many individual models do not include social behaviors
  - Collective action requires rules for group decision making
- What is needed?
  - Social capacities must be explicitly modeled
  - Comparative studies are needed to determine useful levels of granularity

Using collective attributes to predict individual action

- Issues
  - Appropriate boundaries for homogeneity are far from obvious
  - People have multiple social identities
- What is needed?
  - Better methods to represent shifting identities
  - Comparative studies to assess benefits of granularity and modeling dynamic affinities

Combining Components and Federating Models (2 of 2)

Stove-piped S&T efforts

- Issues
  - "Cylinders of excellence" grow up around different research communities and modeling technologies; little effort devoted to integration/comparison
- What is needed?
  - Broader and enduring connections across the communities, with common problem sets, testbeds, and metrics

Assemblage of parts

- Issues
  - Linking components is a promising way to build complex models, but…
  - No systematic methods/standards exist for federating models
  - Connections among federated models are themselves components to be modeled
- What is needed?
  - Considerations needed for compatibilities across interfaces, ontologies, formalisms, and domains
  - Standards, guidelines, methods, and architectures needed for model federation
  - Theory should guide models of linkages

Collecting the Right Data

Issues

- Data for testing theories and models is sparse and often lacking in the detail needed to answer critical modeling choices
- Data used in two primary ways
  - Model development
    - Initial identification of the key entities and their relationships
    - Subsequent refinement of developing model
  - Model validation
    - Comparison of model "predictions" of existing or to-be-collected data and model-driven experimentation
- Because of the scale of many IOS models, it is rarely possible to generate useful data from controlled laboratory experiments

What is needed?

- Guidelines for reusing existing data (cheap) or collecting it from scratch
- Understanding the costs associated with the different types of data
  - directly observable/measurable or does it have to be inferred?
  - acquired via interactive interviews?
  - "tacit" (eg, embedded in larger contextual issues)?
  - remotely collectable or "on the ground" observers needed?
- Understanding statistical sampling design

“All models are wrong, but some are useful”

G.E.P Box (1979)

Verification, Validation, and Accreditation (1 of 2)

Definitions

- Verification
  - Did I build it right?
- Validation
  - Did I build the right thing?
- Accreditation
  - Can I get the buyer/user to sign off?

Validation dimensions

- Validation for understanding and exploration
- Validation for decision aiding and action

Guidelines for developing and validating IOS models

- Keep the model as simple as possible for its purpose
- Check with multiple experts
  - Scenario/domain expert, model developer, user
- Examine “What Might Be” as well as “What Is”
  - Don’t just overfit; explore range of possibilities

Verification, Validation, and Accreditation (2 of 2)

Issues

- Validation methods developed for physical system models are not appropriate
- Comparison with real world data in controlled testing is often impossible
- No well-defined criteria for success (eg, a practical Turing Test), nor any widely accepted definitions and methods for V&V

What is needed?

- Validation for action must be driven by model purpose
- Requires clear specification of model use/purpose
- New methods are needed (eg, “triangulation”, “docking”, “model touching”)

Frameworks and Toolkits

Frameworks and toolkits should

- Support development of simpler and focused submodels to represent specific features of the behavior of interest
- Support integration of those submodels into a cohesive representation
- Provide a path for data acquisition and V&V

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Good examples exist, for specialized niches

- OneSAF's Product Line Architectural Framework (PLAF)
- Integrated Development Environments (IDEs) for cognitive architectures
  - Python ACT-R, EPIC IDE, iGEN, OMAR, AgentWorks, SDB,...
- Multi-agent modeling and network simulation frameworks
  - Construct, OrgAhead, BRAHMS, CONNECT, DDD...
- DIME/PMESII IDEs

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Need to establish functional requirements for IOS toolkits

- Intuitive graphical model development environment
- Model analysis infrastructure that enables user-driven causal and diagnostic reasoning
- Suite of model verification and validation tools
- Model management infrastructure

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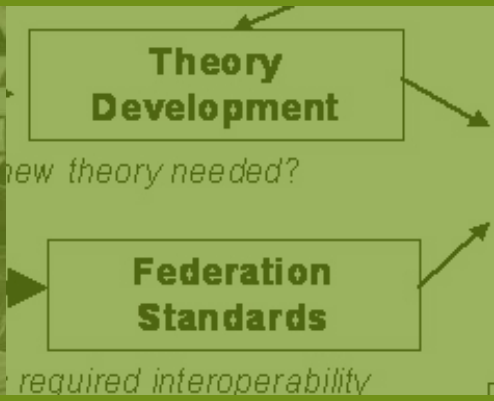

Recommendations

Large-scale, integrated cross-disciplinary research programs

Six critical research areas to pursue

Multidisciplinary conferences, workshops, and other information exchange forums

Roadmap

Large-Scale Research Programs

Provide incentives for researchers in diverse disciplines to work together on DoD-relevant problems

- Large-scale problems
- Incorporate different perspectives and level-of detail
- Ensure multi-year funding for long development time needed

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- Use a common program dataset (eg provide SMEs, scenarios, knowledge bases,…)

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Benefits

- Researchers learn about the complex military domain
- Users learn about the limits to understanding human behavior

Six Critical Research Areas to Pursue

Theory Development

Theory on which to base models is often fragmented and incomplete

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Basic research needed to understand fundamental social behaviors (eg, joining a gang) that are building blocks for DoD-relevant IOS behaviors (eg, joining terrorist group)

Basic research also needed in emotion and emotion-cognition interactions to understand motivation and interpersonal behavior

Challenge problems should guide research, but need not be DoD-related

Academic institutions and the DoD Labs should play the key role, but they need incentives, steady funding, and support for understanding the issues/problems currently facing DoD

Uncertainty, Dynamic Adaptability, and Rational Behavior

Most models fear to tread into areas that “make us human”

2

Uncertainty, Dynamic Adaptability, and Rational Behavior

Most models fear to tread into areas that "make us human"

Basic research needed in many areas including

- "Uncertainty in the small" with individuals and small groups
- "Uncertainty in the large" associated with large groups and populations
- Dynamics of learning and adaptation over time
- Understanding rational and "irrational" behavior and the contributions of cognition, affect, culture, and society

Applied research needed on how to deal with combinatoric explosion of parameter values in representing these multiple drivers of behavior

Data Collection Needs

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Many ethnographic data collection techniques are currently in use, but they need to be better tailored to the needs of IOS models

- Bring modelers and data collectors together to develop data ontologies, joint specifications, and data collection methods/ tools

Consider using massive multiplayer online games (MMOGs):

- For collecting social and behavioral data on a large scale
- To test, verify, and validate IOS models

Improve methods for collecting affective data, including physiological monitoring and indirect assessment

Federated Models

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Needed is a federated approach where components are created to be interoperable across different levels of aggregation and detail

Federating requires both syntactic compatibility and semantic interoperability, neither of which is done well now

Research is needed for

- Ensuring that federates embrace compatible concept abstractions, entity resolution, time scale resolution, uncertainty, adaptability, …
- Determining trades between encapsulation and exposure
- Understanding how to link different model classes (eg, cognitive to social networks)
- Providing ways to ensure extensibility

These problems are not unique to IOS modeling, but they still need to be solved

Validation and Usefulness

Current VV&A concepts and practices were developed for the physical sciences; a different approach is needed for IOS models

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VV&A processes and standards should be developed *de novo*, not as an adjunct to conventional VV&A standards

This should be started with a National Workshop charged to identify candidate processes and outline a roadmap for developing IOS-specific VV&A processes/standards

A DoD-wide authority should be charged with maintaining those standards, processes, and tools, and with their promulgation throughout DoD

5

Tools and Infrastructure for Model Building

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Reducing this barrier will occur with more sponsored research, sponsored “challenge problems,” workshops, and conferences, but more is needed

DoD should develop and maintain an on-line web-based catalog of general approaches, models, simulations, and tools, one that goes far beyond current efforts

Careful consideration needs to be given to organization, content, currency, usability, and its ability to “reach out” far beyond the DoD M&S community

6

Multidisciplinary conferences/workshops are needed to bring together the diverse IOS modeling community

Multidisciplinary Conferences/Workshops

IOS modelers interested in working on DoD-relevant problems need to be educated on:

- Nature of the military decisions for which models are relevant and of the operational situations in which the decisions must be made
- Desired model functionality
- The most useful form(s) for presenting model results
- The value of work performed by others outside their discipline
- Feasible and appropriate VV&A approaches for IOS models

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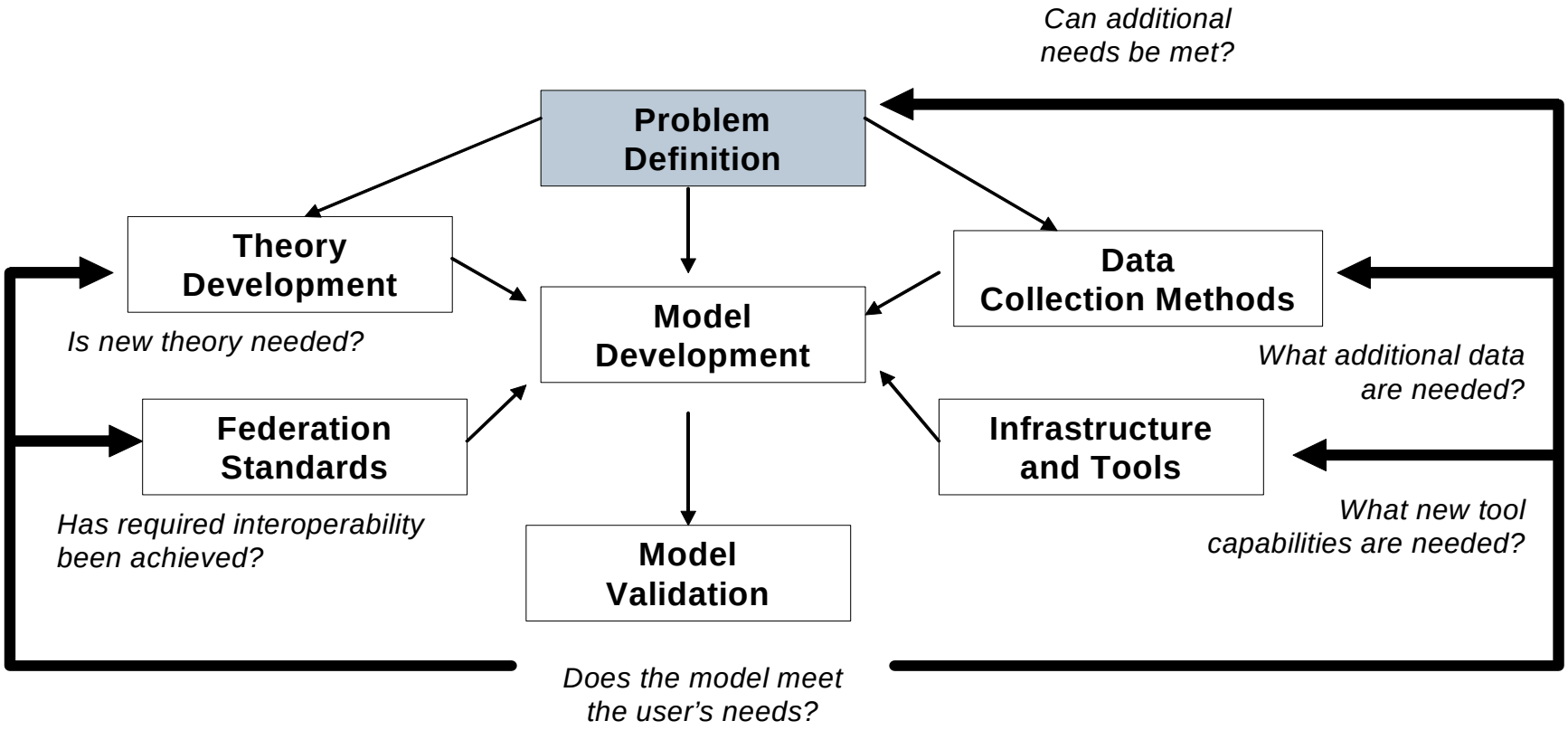
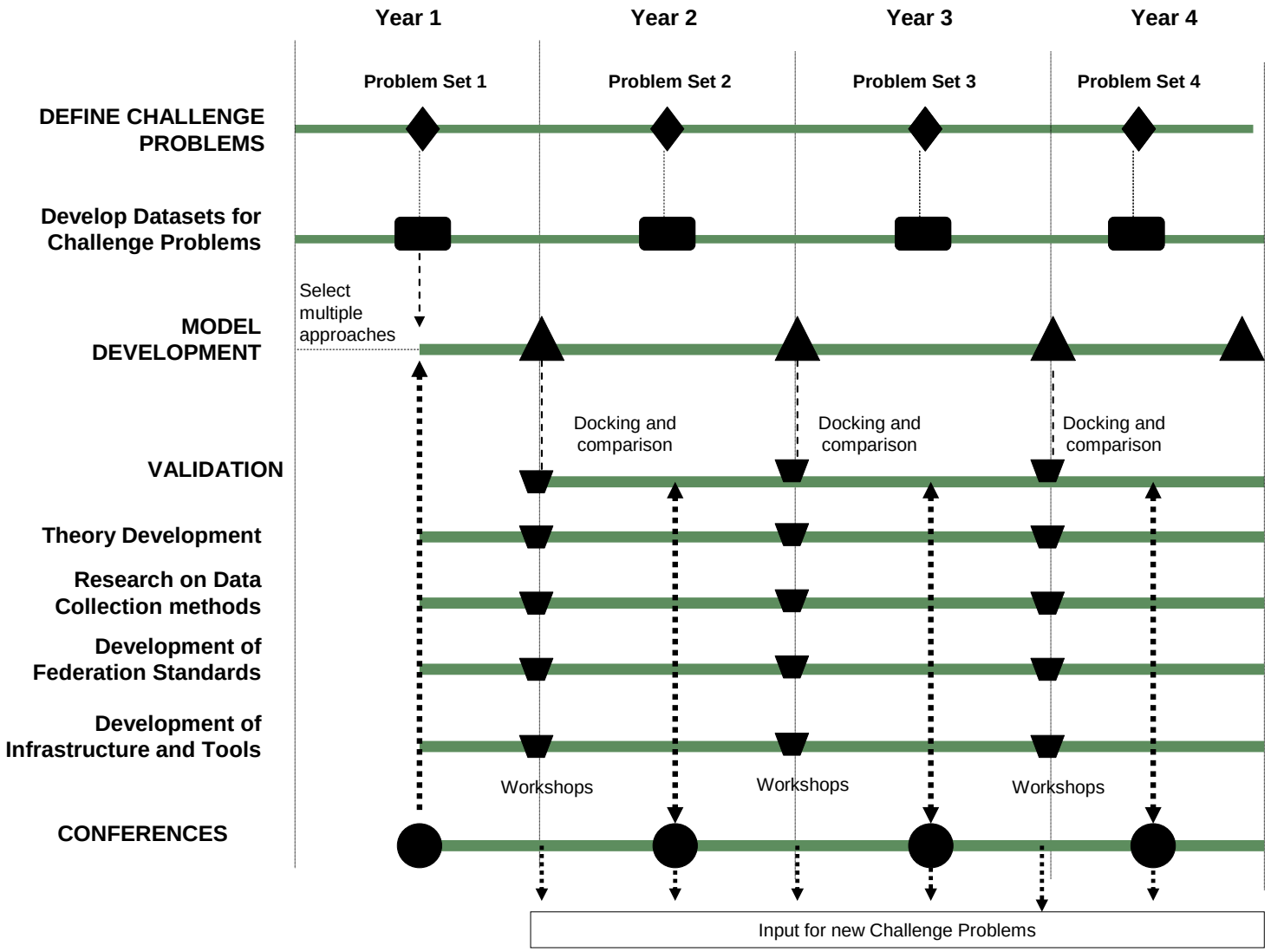
Operational users and managers need to be educated on:

- Value of multidisciplinary approaches and the need for review of models from multiple perspectives
- The inherent uncertainty associated with IOS model predictions
- The value of models for sensitivity and trade-off analysis
- The design of virtual experiments to assess results over a range of conditions
- Reasonable definitions/approaches for IOS model VV&A

Roadmap for Recommended Research: Process



Roadmap for Recommended Research: Timeline



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John Tangney, AFOSR (now ONR)

Consultants and Briefers

NRC Staff

Susan Van Hemel, Study Director and Kristen Butler, Research Assistant
Kristin Martin Conlin, Matt McDonough, Sr. Project Assistants

With much support from Christine Hartel, Director, Board on Behavioral, Cognitive, and Sensory Sciences and Anne Mavor, Director, Committee on Human Factors

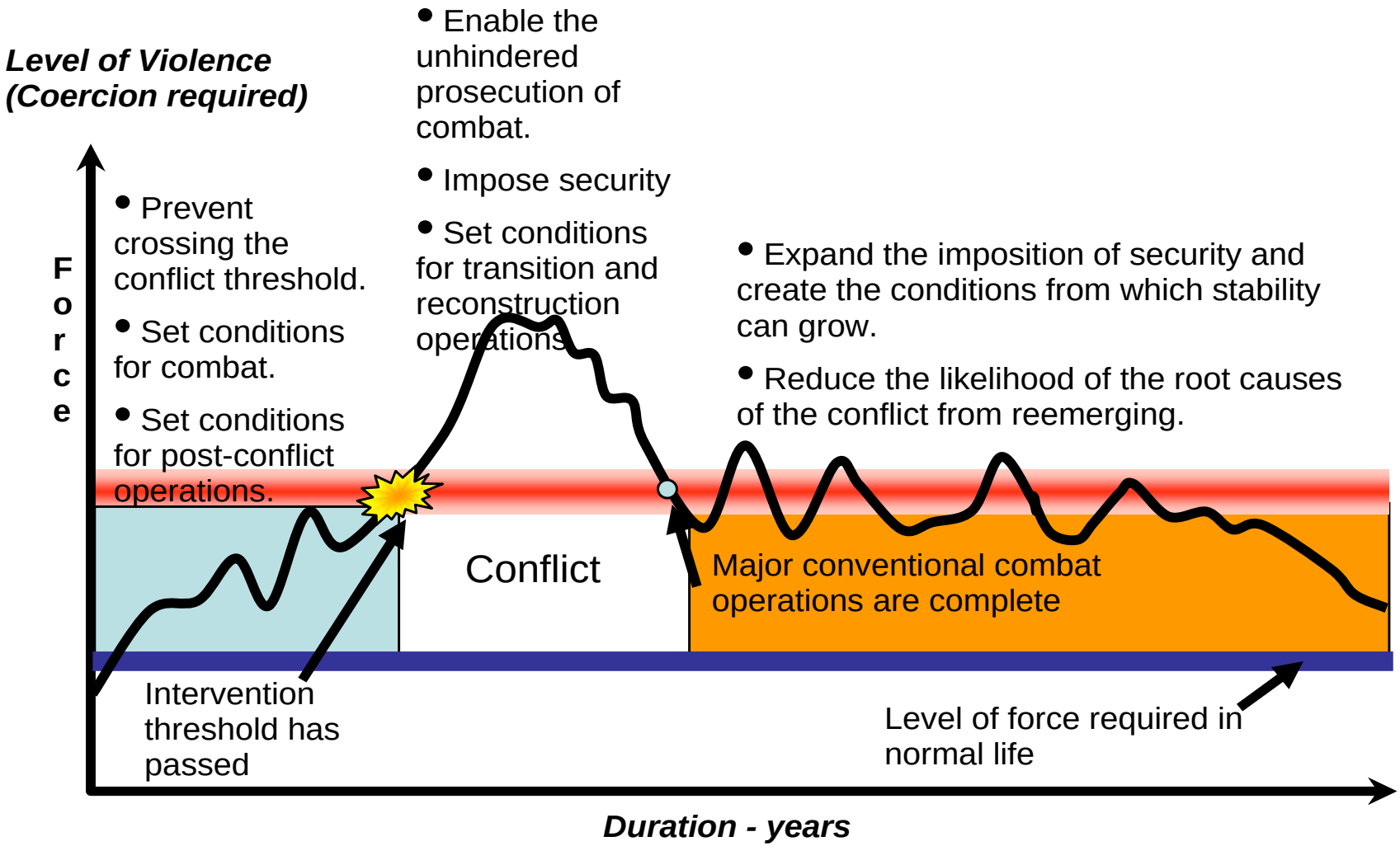
Reviewers

Duncan Luce, Review Coordinator, and eight external reviewers

Thank you

Backups

Expansion of Spatiotemporal Time Scales (Cebrowski, 2001)



Formalization into USECT Phases of Conflict (Joint Pub 3-06)

Understand

- Evaluate the urban battlespace, including the urban triad [the physical terrain, the urban infrastructure, and the population] and the threat, to determine the implications for military operations

Shape

- Seize the initiative and set the conditions for decisive operations to begin. Exert appropriate influence on adversary forces, friendly forces, the information environment, and particularly the elements of the urban triad

Engage

- Bring the full dimensional capabilities of the force to bear in order to accomplish operational objectives, ranging from full combat in war to humanitarian assistance

Consolidate

- Protect what has been gained, retain the initiative to disorganize the adversary in depth, and contend with issues concerning physical damage, noncombatants, and infrastructure

Transition

- Transfer routine responsibilities over to civilian authorities, another military force, or regional or international organizations. Transition may occur in one part of an urban area while engagement still is going on in another [“three-block war”]

Urbanization and the “Three Block War”

The “Three Block War”*

- “In one moment in time, our service members will be feeding and clothing displaced refugees — providing humanitarian assistance. In the next moment, they will be holding two warring tribes apart — conducting peacekeeping operations. Finally, they will be fighting a highly lethal mid-intensity battle. All in the same day, all within three city blocks. It will be called the three-block war.”

Constant shifting between military objectives and social/political objectives

Coordination and collaboration across a range of entities with differing organizational objectives and structures

- Coalition Operations
- Joint Operations
- Inter-agency coordination
- NGOs

* Krulak, "The Three Block War: Fighting in Urban Areas," National Press Club, Vital Speeches of the Day, 15 December 1997.

Combining Components and Federating Models

Incompatibilities between models

Type	Definition
Interface	Mismatch between the data types of different models or outputs of one model and inputs of another (eg, real number vs. Boolean)
Ontological	Different relationship structures, naming schemes, etc., in ontologies for different models
Formalism	Different logic and inferencing mechanisms and procedures for different models
Subdomain gaps	Differing domains and dynamics between PMESII model dimensions (eg, economic vs. social)

Resolving these incompatibilities

- Many specific “point” solutions to dealing with these problems, especially in first three domain-free incompatibility types
- Bridging subdomain gaps requires common expertise in both domains

Analysis of State-of-Art against Needs

Study goal was to complement the state-of-art technology-assessment approach ("bottom up")…

- Review relevant model categories/approaches
- Describe state-of-art, relevance to general DoD modeling requirements, major limitations, and V&V issues

…with a user-centered requirements-driven approach ("top down")

- Five representative problems were used to structure the analysis (see backup)
- Speculate how models/tools might help commander/staff in those situations
- Identify modeling gaps in the current state-of-the-art

This approach was not very productive

- Limited committee resources precluded detailed problem specification or model development
- Most approaches can be used for multiple problems

However, many common pitfalls, challenges, and limitations emerged

- Not specific to model type or military application

Scenarios/Vignettes for User-Centric Analysis

Analysis and forecasting for planning

- Disrupt terrorist networks
- Forecast adversary response to COAs
- Societal forecasting

Training and rehearsal

Design and evaluation for acquisition

Analysis and Forecasting for Planning (1 of 4)

Disrupt terrorist networks

- Fuse uncertain and partial information from multiple sources to identify the dynamic network structure of a terrorist organization. How can we best disrupt those networks?

Questions

- Tribal leader Muhkta is on the fence about whether or not to support the intervention. Which is likely to be the most effective way of gaining his support—overt recognition, overt financial reward, covert financial reward, covert protection of family, or a combination of methods?
- We need to disable/disrupt the clan of followers of Sheik Mustafa while our troops are moving toward the city. If we ensure he is disconnected from his clan during this phase of the operations, is it likely to degrade the clan's decision making as related to their willingness to conduct offensive military operations?
- In order to reduce IED attacks, are the terrorist networks with their support base in our target city more vulnerable to selective attacks on their leadership or interruption of their recruitment programs?
- Abdul X is the leader of a terrorist network. Mohamed is on the network council and more radical than Abdul X. If Abdul X is killed, how likely is it that Mohamed will become the leader of the network?

Analysis and Forecasting for Planning (2 of 4)

Forecast adversary response to COAs

- In an urban operation, forecast the likely response of local insurgents to friendly force movements, basing, and logistics. Identify likely counters to proposed COAs and identify early harbingers of those counters

Questions

- What will impact the local economy the least, denial of transportation fuels or denial of electricity?
- The JTF can plan on placing its logistics support base either within the bounds of the city or in the adjacent countryside. Which population in the area, urban or rural, will be less hostile to the presence of the logistics base?
- To establish crowd control early in the urban environment, is controlling an area, like the civilian neighborhood, or a point of special interest, like a mosque, more likely to mitigate crowd behavior?
- In neighborhoods not committed to radicalism, what is the most influential means to insert forces, in combat vehicles or on foot?
- JTF wants to use disinformation to partially protect our intentions of moving from forward operating base (FOB) to the city. Is the most effective point of insertion of the disinformation the few public media outlets or the informal rumor mill/the tribal network?

Analysis and Forecasting for Planning (3 of 4)

Societal forecasting

- Forecast the effects of alternative DIME (diplomatic, infrastructure, military, economic) courses of action (COAs) on attitudes and behaviors of residents in a region of interest. Assess the likelihood of state failure and identify actions that will lead to escalation of violence

Questions (1 of 2):

- Troops give a lot of meals ready to eat (MREs) to locals. Considering the items in MREs and the local culture, will MREs be a better giveaway than basic grains and cooking oil?
- Entry phase combat will be kept at the lowest level possible. Given local conditions and the impacts of the blockade, which will the locals respond better to initially, engineers/civil works or medical response teams?
- Considering the effect of the blockade, which will have the psychological effect most supportive of our mission end state, overwhelming force or “helping hand” intervention?
- Which approach will least offend locals as we travel from the initial entry area to the city, keeping civilian vehicles in a separate convoy or infusing them into tactical convoys?
- Can we forecast the response by the local religious leaders to the presence of female soldiers on the streets of the city?

Analysis and Forecasting for Planning (4 of 4)

Societal forecasting

- Forecast the effects of alternative DIME (diplomatic, infrastructure, military, economic) courses of action (COAs) on attitudes and behaviors of residents in a region of interest. Assess the likelihood of state failure and identify actions that will lead to escalation of violence

Questions (2 of 2):

- A specific Mosque is known to be the headquarters of a particular militia. Joint forces will destroy the mosque, in order to deny access by the militia. Which will produce the least negative impact in the neighborhood, announcing our intentions to destroy the mosque or destroying it unannounced?
- How do attitudes differ between the tribal regions of the country and the urban area we are targeting?
- What is the formal communication dynamic between the host national government (HNG) and the population? What is the informal communication dynamic? (How do people get information on a day-to-day basis—coffeehouses, religious structures, etc.?) How great is the delta between formal and informal communication dynamics?
- What are the expectations of the population about the government's ability to provide services?
- Is the HNG a government on the road to collapse?

Training and Rehearsal

Crowd control training

- Create an immersive virtual training environment in which soldiers can learn to take appropriate action based on the correct interpretation of the behavior of small groups of citizens and understand the triggering mechanisms for violent responses violent responses by the crowd

Questions

- To effectively control crowds we need to know where the leaders are. In this setting, are crowd leaders more likely to be leading from the front, urging from the rear, or not on site? Given the answer, should we use information operations or force to control the crowds?
- Given the nature of the small villages along the route from our FOB to the city, is it likely there will be crowds along the route, are they likely to be friendly or hostile, and in either case will stopping to interact with them be likely to alter their feelings?

Design and Evaluation for Acquisition

Organizational Design

- Force Composition and Command and Control Architecture. The Army is moving toward modular forces focused on joint and expeditionary capabilities. These units of action will be rapidly reconfigured and equipped for specific mission requirements. The Navy is fielding expeditionary strike groups that include marine expeditionary units capable of amphibious operations attached to Navy ships. The Navy and the Marines follow different doctrine and are in the process of defining flexible supporting and supported relationships

Questions

- Develop a recommended force composition (systems, equipment, units and personnel) for a humanitarian assistance mission.
- What command and control architecture will be most effective for this mission?
- What are the appropriate organizational coordination points for most effectively working with NGOs during the humanitarian assistance mission?
- Is the force composition structure recently used for a humanitarian assistance mission appropriate for a disaster relief operation that requires immediate deployment?
- Are new roles needed to take advantage of the information rich network centric environment? For example, would an information commander/coordinator role result in more effective mission performance?