



# Modern Decision Science Suggests New Methods and Tools to Support Military Decisionmaking

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**D**ecision support systems (DSS) are intended to help commanders make good choices, often in the face of complex and uncertain situations. DSS includes methods and tools such as computer programs, models, games, and other means of analyzing information and presenting alternatives. These methods and tools are based on a diverse and evolving body of research, called decision science, that seeks to understand how people make decisions and how those decisions can be improved. Modern developments in decision science suggest that many changes of emphasis in decision support are appropriate. These are discussed in a RAND Project AIR FORCE (PAF) survey of modern decision science conducted to assist the Air Force Research Laboratory plan its research programs for improving decision support.

## Toward a Synthesis of Research About Decisionmaking

Recent years have seen advances in knowledge about how people make decisions and the beginnings of change in the “prescriptions” as to how people *should* make decisions. The “rational-analytic” school, with its emphasis on examining the pros and cons of diverse options, maximizing expected utility, and avoiding the “cognitive biases” that sometimes arise from the use of heuristics, should arguably be supplemented by lessons from the “naturalistic” school, which emphasizes how people use intuition, action, and adaptation to deal successfully with situations that involve uncertainty and risk. Although the related academic debates are sometimes fractious and comparisons are sometimes confused by philosophical differences that ultimately prove extraneous, the PAF survey argues that the frontier of research is seeking to synthesize these different viewpoints and

### Key findings:

Evolving methods of decision analysis include

- Understanding the system and related modeling
- Methods for “out of the box” planning
- Planning under uncertainty
- Planning for adaptiveness
- Capabilities-based planning
- Command and control and networking

to produce practical suggestions to support decisionmaking that is both analytical and intuitive. For example, while commanders in the midst of battle will and should depend heavily upon intuition, their intuition can be much improved by peacetime education and training that have been structured to teach the right lessons, to build the right pattern-matching skills, and to remove true bias. Another aspect of synthesis is learning how to package the fruits of analysis effectively, whether in peacetime or wartime. This may, for example, involve alternative, coherent “stories,” alternative depictions of the adversary’s potential reasoning, or graphical summaries of evidence that convey the intended information more intuitively than do many traditional analyses.

## Paradigm Changes in Methods of Analysis

The methods of analyzing decisionmaking and their related tools have also evolved in recent years—indeed, rather drastically. Classical approaches, such as systems analysis, game theory, and cost-benefit analysis, focus on optimizing choices for a given situation that is often idealized.

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More-recent developments focus on the need to understand the target systems, to confront ubiquitous uncertainty, and to identify strategies that are flexible, adaptive, and robust rather than optimal for some point case. Developments include the following:

- **Understanding the System and Related Modeling.** There is a drive to build more realistic models and simulations, enabling decisionmakers to employ different perspectives and levels of detail to understand a system more fully. This approach calls for multiresolution families of models and games that are better conceived and more mutually informed than in the past.
- **Methods for “Out of the Box” Planning.** These methods help military planners think creatively about new challenges and develop flexible strategies for dealing with them. “Uncertainty-Sensitive Planning” identifies branches (i.e., uncertainties that will be resolved when events proceed down one path or another) and shocks (i.e., events that are unlikely to occur but are plausible and potentially disruptive). “Assumption-Based Planning” encourages planners to step outside of traditional frameworks and to ask deep questions about their assumptions. “Day After” games force participants to confront plausible bad developments outside their normal projections and to think about how to avoid such developments.
- **Planning Under Uncertainty.** Rather than focus on optimizing strategy subject to a great many highly uncertain assumptions, planning under uncertainty emphasizes *exploratory analysis* to assess the range of conditions under which a given strategy would give good enough results, the range of conditions under which the strategy would fail, and so on. That is, the paradigm of exploratory analysis is one of searching for flexible, adaptive, and robust strategies that are relatively less sensitive to problems such as being surprised by an enemy tactic.
- **Planning for Adaptiveness.** In practice, a key feature of planning under uncertainty is planning for adaptiveness because things *will* go wrong. The issue then becomes how quickly good

course corrections can be made. This is a function of organization (e.g., the size and character of building-block units), command, and plans.

- **Capabilities-Based Planning (CBP)** is a broad term now used by the Department of Defense for planning under uncertainty. Beyond such generalities as planning for adaptiveness, it includes some special features in force planning designed to ensure that when “capabilities” are acquired, actual operations can be executed in the field. A key to CBP is conceiving programs in terms of mission-capability *packages* based on what has been termed mission-system analysis. The basic idea here is that to accomplish a mission the commander must have *all* the critical components of relevant capability. Weapons are not enough; the commander must also have command and control, logistics, and so on. Implementation of capabilities-based planning is much assisted if decisionmakers have “portfolio-management” tools that highlight where proposed investment choices do and do not cover all of the critical components of desired capabilities. Having a balanced portfolio is often more important than investing even more heavily in a particular, popular component of capability while ignoring other critical components.
- **Command and Control (C2) and Networking.** Modern decision science emphasizes C2 structures, processes, and mechanisms for adaptation, as well as ubiquitous networks that allow tasks to be accomplished with resources appropriate to a problem. Information science is playing a central role, especially through such concepts as shared information awareness, virtual collaboration, and virtual organizations.

These advances in decision science, methods, and tools can help make military decisionmaking more flexible, adaptive, and robust. The Air Force and other military services should internalize these advances in future development of DSS. ■

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This research brief describes work done for RAND Project AIR FORCE and documented in *Implications of Modern Decision Science for Military Decision-Support Systems* by Paul K. Davis, Jonathan Kulick, and Michael Egner, MG-360-AF (available at [www.rand.org/publications/MG/MG360/](http://www.rand.org/publications/MG/MG360/)), 2005, 166 pp., ISBN: 0-8330-3808-7. Copies of this research brief and the complete report on which it is based are available from RAND Distribution Services (phone: 310-451-7002; toll free: 877-584-8642; or email: [order@rand.org](mailto:order@rand.org)). The RAND Corporation is a nonprofit research organization providing objective analysis and effective solutions that address the challenges facing the public and private sectors around the world. RAND's publications do not necessarily reflect the opinions of its research clients and sponsors. RAND® is a registered trademark.

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