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

Decision 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 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.
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.