

Inconsistencies in Joint and Allied Methods for Course of Action Comparison

MAJ James P. L. Holzgrefe, US Army, james.p.holzgrefe.mil@mail.mil; and Dr. Patrick T. Hester, Old Dominion University, pthester@odu.edu

Fifteen methods spread across six publications with little guidance on how to choose the appropriate one: that is one challenge faced daily by US and allied staffs comparing military courses of action (COAs) during tactical and operational planning. The effects of these inconsistencies in COA comparison are potentially catastrophic in terms of lives lost, equipment destroyed, or national objectives unachieved should the incorrect COA be selected based on a flawed recommendation. For this reason, planners, commanders, and other decision makers should reconsider the necessity of these divergent methods and consider rewriting planning doctrine to capture the best practices in multiple attribute decision making (MADM) from inside and outside existing doctrine.

Background

The US military and its allies conduct tactical and operational planning following six similar yet distinct military planning processes that are listed with their references in Table 1. One of these similarities is that each planning process includes a step that analyzes and compares potential military COAs. This step is usually called COA comparison. In this step, planning staffs evaluate COAs as discrete, predetermined alternatives against one or more criteria (i.e., attributes, goals, or governing factors) in a MADM process. Most of these processes recommend the format of a decision matrix for their evaluations as depicted in Table 2.

Organizing the Methods

Currently, the doctrine of the US Army, Marine Corps, Navy, Air Force, Joint Staff, and NATO each recommend

different decision-making methods to evaluate the COA comparison decision matrix in Table 2. In fact, 15 different methods are recommended across five of the six publications, as shown in Table 3. The Air Force is missing from the comparison in Table 3 because it leaves the method completely up to the planners with no recommendations.

These 15 methods are grouped into broad categories in the third column of Table 3 to better communicate their relationships. The “descriptive” category consists of methods that are purely descriptive and qualitative. The “additive” category groups quantitative methods that apply the simple additive model of adding criterion scores across COAs and comparing the totals. The “additive weighting” category builds on the

additive method by employing weights in each category, a MADM method commonly known as simple additive weighting. The “plus minus neutral” category groups methods that use combinations of positive, negative, and neutral

Table 1. Military planning processes.

Organization	Planning Process Name	Doctrinal Publication
US Army	Military Decision Making Process (MDMP)	Army Tactics, Techniques, and Procedures 5-0.1
USMC	Marine Corps Planning Process (MCP)	Marine Corps Warfighting Publication 5-1
US Navy	Navy Planning Process (NPP)	Navy Warfare Publication 5-01
USAF	Joint Operation Planning Process for Air (JOPPA)	USAF Doctrine Document 3-0
Joint Staffs	Joint Operation Planning Process (JOPP)	Joint Publication 5-0
NATO	Operational Level of the NATO Crisis Response Planning Process	NATO ACO COPD V1.0

Table 2. Example military decision matrix.

Course of Action (COA)	Criteria 1	Criteria 2	Criteria 3
COA 1			
COA 2			
COA 3			

Table 3. COA comparison method classification.

Organization	COA comparison method name	Type	Broad category
US Army	Advantages/disadvantages	Qualitative	Descriptive
	Unweighted decision matrix	Quantitative	Additive
	Weighted decision matrix	Quantitative	Additive weighting
USMC	Narrative description	Qualitative	Descriptive
USN	Nonweighted numerical	Quantitative	Additive
	Weighted numerical	Quantitative	Additive weighting
	Plus/minus/neutral	Quantitative	Plus minus neutral
	Advantages and disadvantages	Qualitative	Descriptive
Joint staff	Weighted numerical	Quantitative	Additive weighting
	Nonweighted numerical	Quantitative	Additive
	Strengths and weaknesses	Qualitative	Descriptive
	Advantages and disadvantages	Qualitative	Descriptive
	Plus/minus/neutral	Qualitative	Plus minus neutral
NATO	Advantages and disadvantages	Qualitative	Descriptive
	Energy course of action (COA) comparison	Qualitative	Enemy COA

ratings to select a preferred COA. Finally, the “enemy COA” category highlights a unique NATO method that focuses on the enemy’s COAs, rather than the friendly force’s COAs. Each organization addresses these categories differently, as outlined in Table 4. These inconsistencies pose challenges for the military planner both within his or her own organization and when collaborating with other organizations. One challenge within the staff lies in choosing the correct method for the data type and information available. A separate challenge in collaboration is the need for standardized communication of the method performed.

Inconsistencies

There are several layers of inconsistencies in how these methods are recommended throughout doctrine. First, there is inconsistency between organizations on which methods are recommended or allowed, as shown in Tables 3 and 4. Second, there are inconsistencies in what criteria should be evaluated. Third, there are inconsistencies in how seemingly similar methods recommended across organizations are implemented. Each layer is considered in more detail in the following paragraphs.

The inconsistencies in recommended methods between organizations may

surprise some given the interdependent and hierarchical nature of these organizations’ relationships to one another. Others may see these inconsistencies as a product of unique organizational cultures, planning in different battle-space domains, planning at different levels of war, or some combination thereof. Regardless, the variance is quite stark when comparing the two extreme cases in terms of flexibility represented by the USAF and the USMC. USAF doctrine does not recommend a method for COA comparison, leaving methodology selection completely up to the staff based on staff expertise and their planning problem’s unique

context. In contrast, USMC doctrine recommends a qualitative narrative description method and discourages any quantitative methods. The remaining organizations recommend or require some methods while giving staffs the flexibility to choose additional methods not included in their doctrine.

The second layer of inconsistency between methods is the amount of flexibility given on criteria. Each organization, except for the USAF, leaves the selection of evaluation criteria completely up to the commander and staff. What sets the USAF’s guidance apart is that it prescribes risks to forces and

Table 4. COA comparison methods by organization.

Organization	Broad COA comparison method				
	Descriptive	Additive	Additive weighting	Plus minus neutral	Enemy COA
USA	Required	Recommended	Recommended	Allowed	Allowed
USMC	Required	Discouraged	Discouraged	Not addressed	Not addressed
USN	Recommended	Recommended	Recommended	Recommended	Not addressed
USAF	Allowed	Allowed	Allowed	Allowed	Allowed
Joint Staff	Recommended	Recommended	Recommended	Recommended	Not addressed
NATO	Required	Allowed	Allowed	Allowed	Required

weighting method. The rating scales and directionalities remain different despite the common use of interval scale weights. Table 6 summarizes these differences. Once again, no two methods are the same.

Way Ahead

This article highlighted the inconsistencies in the MADM methods employed by US and allied staffs in the analysis and comparison of potential military COAs during

Table 5. Unweighted additive COA comparison methods.

Organization	COA comparison method	Rating scale	Directionality
USA	Unweighted decision matrix	Ordinal	Less is better
USN	Nonweighted numerical	Interval	More is better
Joint Staff	Nonweighted numerical	Ordinal	More is better

risks to mission as evaluation criteria that should always be used. These criteria should be considered in any planning process and are likely to be considered by planners in the other organizations, so this inconsistency is the least troublesome.

Of greatest concern are the ways that methods across organizations with the same name or similar methodology in Table 3 are not performed in the same manner. Differences in the qualitative methods stem largely from how the advantages and disadvantages of each COA are categorized, but that is primarily a difference in style rather than substance. Differences in the quantitative methods deserve additional consideration, beginning with the three unweighted additive methods. Table 5 summarizes these differences. Note that no two methods are the same.

Inconsistencies in the unweighted additive methods recommended by the Army, Navy, and Joint Staff center on

two factors represented in the last two columns of Table 5. First, there is inconsistency in the scale used for ratings of how well each COA scores in each criterion. Army and Joints Staff doctrine use ordinal rankings for their ratings, whereas Navy doctrine prescribes interval ratings. The ordinal scale allows a planner to rank COAs, but not to determine the magnitude of preference, whereas interval scales allow for both ranking and determining the magnitude of preference. The distinction between these scales is important because of the different mathematical operations that may be applied to each scale type (Stevens, 1946). The second inconsistency lies in the directionality of the scoring. The Army ratings are based on a "less is better" approach, whereas the Navy and Joint methods use "more is better." One can see the potential for confusion when moving from one organization to the other.

A similar inconsistency occurs in the different application of the simple additive

planning. These inconsistencies have the potential to result in inferior COA selection, resulting in reduced mission performance. Some critics have argued that such inconsistencies between planning processes prevent Joint Staff officers from effectively working together as envisioned in the 1986 Goldwater-Nichols Act (Anderson and Slate, 2003). We intend to carry out the research outlined below with these concerns in mind.


The first research step is to review relevant literature with three goals in mind. First, determine what characteristics make a MADM method approachable, useful, and meaningful to a military staff. Second, use those characteristics to find methods outside of military doctrine that may apply to the planning processes. Third and finally, identify a classification system for the methods. This step leaves us with a comprehensive list of methods and a means to classify them.

Continued on page 42

... **Inconsistencies Comparison** *Continued from page 37*

The second step of the proposed research will classify the methods based on the characteristics of the problems that they apply to. MADM methods must be matched to problems with the appropriate data types. This leads to step three, which will screen the classified methods based on mathematical legitimacy and mathematical approachability for a military staff. The approachability aspect is important because many MADM methods use exquisite calculations requiring significant computing power. Such complex methods are likely inappropriate for staffs operating in austere environments and relying on personnel with varying degrees of mathematical fluency. This screening should result in a smaller set of recommended MADM methods for military planning staffs.

The final step of this proposed work creates a visual decision support tool for the staff. The tool would allow a staff to quickly choose from a list of valid and approachable MADM methods based on their problem's unique characteristics, such as availability of information and data types. Similar work has already been done for MADM methods in general (Hwang and Yoon, 1981).

In conclusion, although the inconsistencies in MADM methods used in military planning may lead to planning missteps now, they also offer the opportunity to reassess their validity and create a tool for all staffs to better analyze and compare potential military COAs. In the meantime, staff members with a high degree of mathematical fluency should guide staffs to the most appropriate methods for their particular planning problem's characteristics and context. This reinforces the need for analytical experts in the headquarters of tactical and operational units, and the even greater need for that expertise in organizations that write and review planning doctrine. 

References

- Anderson, J., and Slate, N. K. 2003. The case for a joint military decision making process, *Military Review*, Vol 83, No 5, 11–19.
- Hwang, C. L., and Yoon, K. P. 1981. *Multicriteria decision making, methods and applications*, Vol 186. New York: Springer-Verlag.
- Stevens, S. S. (1946). On the theory of scales of measurement, *Science*, Vol 103, 667–680.

About the Authors

MAJ James P. L. Holzgrefe serves as a Functional Area 49 Operations Research and Systems Analysis officer in the United States Army. He is currently pursuing a PhD in engineering management at Old Dominion University full-time under the Army's Advanced Civil Schooling program. His previous assignments include tactical combat deployments to Iraq with the 17th Air Cavalry Regiment and analytical leadership positions at the Center for Army Analysis and in Army PA&E.

Dr. Patrick T. Hester is an associate professor of engineering management and systems engineering at Old Dominion University. He received a PhD in risk and reliability engineering from Vanderbilt University. His research interests include systemic thinking, multicriteria decision analysis, and enterprise performance measurement and management, and he is a member of the IIE, Performance Management Association, Society for Judgment and Decision Making, and International Society on Multiple Criteria Decision Making.