Willingness to Take or Refuse Courses of Action (COA)

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Willingness theory clarifies military doctrine to help commanders make decisions in a timely manner. It attempts to explicitly integrate moral values into calculations of willingness, which may then be compared numerically to identify a potentially superior COA.

Context for Military Doctrine

Military decision-makers (MDM) require critical information from their staff to facilitate timely command and control.[1] Lessons learned give MDMs insight into consequences of a proposed COA.[2]

When an MDM contemplates a COA, there may be time to study the potential consequences of deciding whether to take it. Taken to an extreme, such deliberative effort can turn into over-thinking.

The consequence of refusing to take a COA is not simply the opposite of what results from taking it. One consequence of waiting too long to take a COA is losing the opportunity to take it at all and thereby learn additional lessons by experience.

Willingness theory applies to "go/no-go" decisions about a proposed COA, although one may use it to consider more than two COAs.[3] One example is when military acquisition authorities either allow an acquisition program to continue past certain milestones ("go") or suspend and/or terminate further funding ("no go").

[1] Joint Publication 3-0: Joint Operations; Chapter III: Joint Functions; Section 2: Command and Control; Subsection h: Commander's Critical Information Requirements, August 2011a

[2] Joint Publication 3-0: Joint Operations; Chapter III: Joint Functions; Section 2: Command and Control; Subsection j: Creating Shared Understanding, August 2011f

[3] In the case of deciding whether a proposed COA is a "go" or a "no-go," this is actually deciding between two COAs. It may be possible to consider additional COAs, such as "wait for more information."

Current Doctrine

Current doctrine refers to "likely elements of a risk management process," but does not specify a single process.[4] The doctrine only makes suggestions as to what types of risk to actively manage.

The concept of value appears in current doctrine as an "intangible factor" that is an invisible part of the operational environment.[5] The existing doctrine does not explicitly consider moral values pertinent to recommendations to either take, or refuse to take, a COA.

[4] Joint Publication 3-0: Joint Operations; Chapter III: Joint Functions; Section 2: Command and Control; Subsection k: Risk Management; Subsection (k) and Figure III-3: Risk Management Process, August 2011e

[5] Joint Publication 3-0: Joint Operations; Chapter IV: Organizing for Joint Operations; Section 2: Understanding the Operational Environment; Subsection d: Visualizing the Operational Environment, August 2011d

Clarification of Doctrine

An MDM is often able to quantify moral value judgments about losses that are acceptable, although not desirable. Moral value judgments "translate" different types of potential loss into a common scale to enable comparison and calculation.[6]

An MDM's intent is never clear until the commander's values are clear to all subordinates.[7] This theory mathematically incorporates the MDM's moral value judgments, but does not require her or him to precisely estimate or quantify them.

This theory provides a way to estimate and quantify both an MDM's willingness to take a COA, and one's willingness to refuse it. Greater willingness indicates a recommendation that is more in line with the MDM's moral values.[8]

As a starting point, consider a mathematical formula for willingness,[9] where w denotes willingness to take, or refuse, a COA; c denotes consequent loss in such a situation, and a denotes acceptable loss expressed in the same units as c:

$$w(\text{COA}) = 1 - \frac{c(\text{COA})}{a},$$

Note that without a positive number for acceptable loss, willingness to act does not exist; in other words, risk is a necessary condition for values-based decision making.[10] The numerical quantity of willingness may also change with time (especially time spent deliberating or studying prior to making a decision).[11]

Estimating $c(\text{COA})$ and/or a may be a daunting decision in and of itself. For example, even after finding a posterior distribution using probability theory, many point estimates are possible.[12]

A point estimate does not carry information about precision or the lack thereof. Therefore, one may opt to calculate intervals:[13]

$$\left(w_{left}(\text{COA}) \, , \, w_{right}(\text{COA})\right) = \left(1 - \frac{c_{right}(\text{COA})}{a_{left}} \, , \, 1 - \frac{c_{left}(\text{COA})}{a_{right}}\right),$$

where $\left(w_{left}(\text{COA}) \, , \, w_{right}(\text{COA})\right)$ is an interval for willingness to take a COA; $\left(c_{left}(\text{COA}) \, , \, c_{right}(\text{COA})\right)$ is an interval for consequent loss; and $\left(a_{left} \, , \, a_{right}\right)$ is an interval for acceptable loss.

Multiple kinds of losses may merit simultaneous consideration.[14] In the absence of value judgments, formulas for willingness become intractable when considering more than one type of loss, because the formulas are only defined in terms of one unit of loss, and only moral value judgments can transform one type of loss into another.

[6] In World War II, General Eisenhower judged that an opportunity to stop Adolf Hitler's army was of greater value than the lives of thousands of soldiers whom he might have estimated would die on D-Day.

[7] Joint Publication 3-0: Joint Operations; Chapter II: The Art of Joint Command; Section 5: Joint Operation Planning; Subsection e: Key Planning Elements, August 2011c

[8] If point estimates for willingness are very close together, the difference may not be significant enough to matter.

[9] One may use any system of numbers, such as the real number system, where the operations of subtraction and division are adequately defined.

[10] The ubiquity of computers can make it easy to become overly dependent on machine support. However, the formulas for willingness are equally suitable for mental calculation and/or lengthy execution by clusters of supercomputer processors.

[11] It may be possible to estimate how long deliberation will take, as well as the consequences of inaction due to study, which is a meta-decision about how much time to spend preparing to decide whether to take a COA.

[12] The median, mean (average), and mode (maximum likelihood estimate) are all choices of a single number to represent an entire distribution.

[13] One may use confidence intervals, inter-quartile ranges, credible intervals, or any one type of interval, within any one interval calculation; note that point estimates are intervals of zero width.

[14] For example, blood and treasure are both assets one may not desire to lose.

Overcoming Impediments to Doctrine Adjustment

THE GREATEST ARGUMENT against willingness theory is a lack of resources for numerically characterizing consequent and acceptable losses. However, there are many reasons to believe the computational complexity of such endeavors may not be excessive.[15]

First, an MDM may refuse to quantify acceptable loss, especially as a single number.[16] Therefore, before calculating point estimates for consequent losses, a sensitivity analysis may be in order.[17]

Second, quantifying consequent losses must consume so much time that the relevant COA becomes impossible to take and/or refuse. Even estimating how much time is left for study or deliberation may require more time than is practical.[18]

Finally, when considering different types of loss, the moral value judgments which transform quantities of one type of loss into another type may be very imprecise.[19] Therefore, a non-mathematical, non-scientific "sensitivity analysis" might recommend against spending any time at all quantifying acceptable and/or probable consequent losses, or, for that matter, calculating willingness at all.[20]

Users of willingness theory may opt to use more than one type of point estimates and/or types of intervals. There is no requirement to use only a single type of point estimate and/or interval, except that a single method should be used for each calculation of willingness.

When graphing an interval for willingness, plotting one or more point estimates on the same figure could facilitate greater visual understanding. Therefore, the fact that many methods exist for producing point estimates is not an obstacle to using willingness theory.[21]

One possible obstacle is the multitude of approaches to probability theory, which often conflict dramatically with one another. However, willingness theory allows any single logic to prevail, because each probability theory refers to a single type of logic[22].

Immediate Recommended Action for Implementation

THIS PAPER RECOMMENDS clarification of risk management and related doctrines in Joint Publication 3-0: Joint Operations. The most pressing need is to explicitly recognize, embrace, and clarify the "inherently human aspects" of fast-paced decision making.[23]

Explaining how to calculate (or when to not calculate) willingness could make other doctrines easier to understand and implement. To improve simplicity, all other discussions of risk management could defer to a single exposition of the doctrine of willingness.

[15] Computational complexity is a computer science theory about how long a program or algorithm could take to run or implement as the amount of relevant data increases. Computational effort may occur in many forms, from second-long verbal conversations to multi-volume written treatises.

[16] What is acceptable is a psychological attribute of MDMs, which may be easier to quantify with an interval than a single number, or point estimate.

[17] A sensitivity analysis examines the effect of increased precision on the results of a calculation.

[18] If quantifying loss consumes so much time that it no longer facilitates the calculation of willingness, it is wasted effort; similarly, if quantifying the remaining acceptable time for study prevents deliberation, it is a travesty.

[19] The Declaration of Independence mentions lives, fortunes, and sacred honor. One's honor may be more valuable than one's life and/or fortune, but how precisely can one quantify such a moral value judgment?

[20] As Albert Einstein once reportedly said, "Not everything that can be counted counts, and not everything that counts can be counted."

[21] For example, although the mean of a probability distribution is very common and easy to calculate, plotting the median, or both mean and median, could actually promote greater understanding.

[22] Charles G. Morgan. Logic, probability theory, and artificial intelligence—Part I: the probabilistic foundations of logic. *Computational Intelligence*, 7:94–109, 1991

[23] Joint Publication 3-0: Joint Operations; Chapter II: The Art of Joint Command; Section 2: Commander-Centric Leadership, August 2011b

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Joint doctrine already recommends comparing consequent loss to acceptable loss, but without suggesting mathematical formulas. However, the requirement that a non-zero level of acceptable loss must exist is made most clear within the formulas for willingness.[24]

Joint military doctrine on willingness theory may be adapted in the future to consider more than "go/no-go" recommendations regarding consideration of only two military COAs at a time. However, this paper makes it clear that it is possible to simultaneously consider any number of COAs.

[24] Notice that the formulas have no meaning at all if the acceptable loss, a, is zero.

References

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