

Multi-Criteria Decision Analysis: When and How to Implement to Meet Stakeholder Demands

Kevin Marsh, PhD Senior Research Scientist and Senior Director, Modeling & Simulation
Sumitra Sri Bhashyam Research Associate, Modeling & Simulation

Introduction

In the June 2012 and November 2012 issues of this newsletter, Evidera published articles highlighting the role that multi-criteria decision analysis (MCDA) could potentially play in healthcare decision making. Since then, much work has been done to develop and apply MCDA methods in this area.

While some companies are using MCDA to support their product development and value communication, many others have limited knowledge of MCDA or may only know the term and are still unsure how it will impact what they do. They are interested in practical advice on what, when, and how they should be using MCDA.

This article intends to address some of the questions frequently asked by our clients, including:

1. What is MCDA?
2. Is MCDA merely of academic interest or is it being applied by decision makers?
3. When should I implement MCDA?
4. How should I implement MCDA? Is there best practice guidance that I should follow?

What is MCDA?

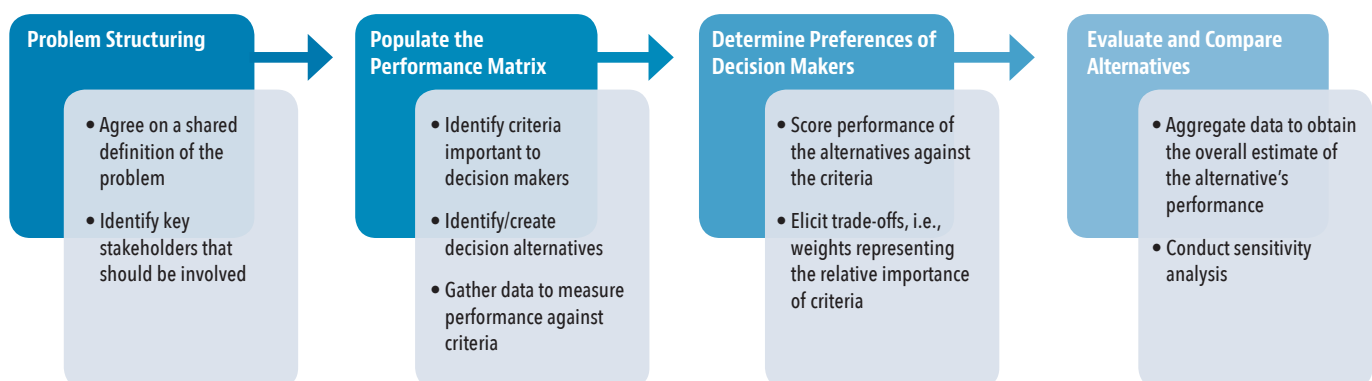
MCDA is a collection of analytical methods used to support decision making in the context of multiple, often conflicting objectives. While MCDA encompasses a multitude of methods, there are several steps that are common to many of these methods¹ (Figure 1).

The combination of these steps has been referred to as "... a formalization of common sense for decision problems which are too complex for informal use of common sense."²

Put another way, MCDA provides a framework for breaking down a complex decision into more manageable components; defining and understanding the relationship between these components; measuring each component; and then combining them to identify solutions. In this way, MCDA enables decision makers to think through a problem systematically and minimize the use of heuristics, as often happens when humans are faced with complex problems. This brings a number of benefits:

- Ensuring that all relevant criteria are considered by decision makers
- Providing a transparent synthesis of both quantitative and qualitative evidence on performance of options against criteria

Figure 1: Steps common to many MCDAs



- Quantifying stakeholders' priorities and preferences, an element of decision problems that is often not addressed systematically
- Fostering a shared understanding of a decision problem and identifying areas of important disagreement
- Forming a transparent link between judgments and decisions

Is MCDA merely of academic interest or is it being applied by decision makers?

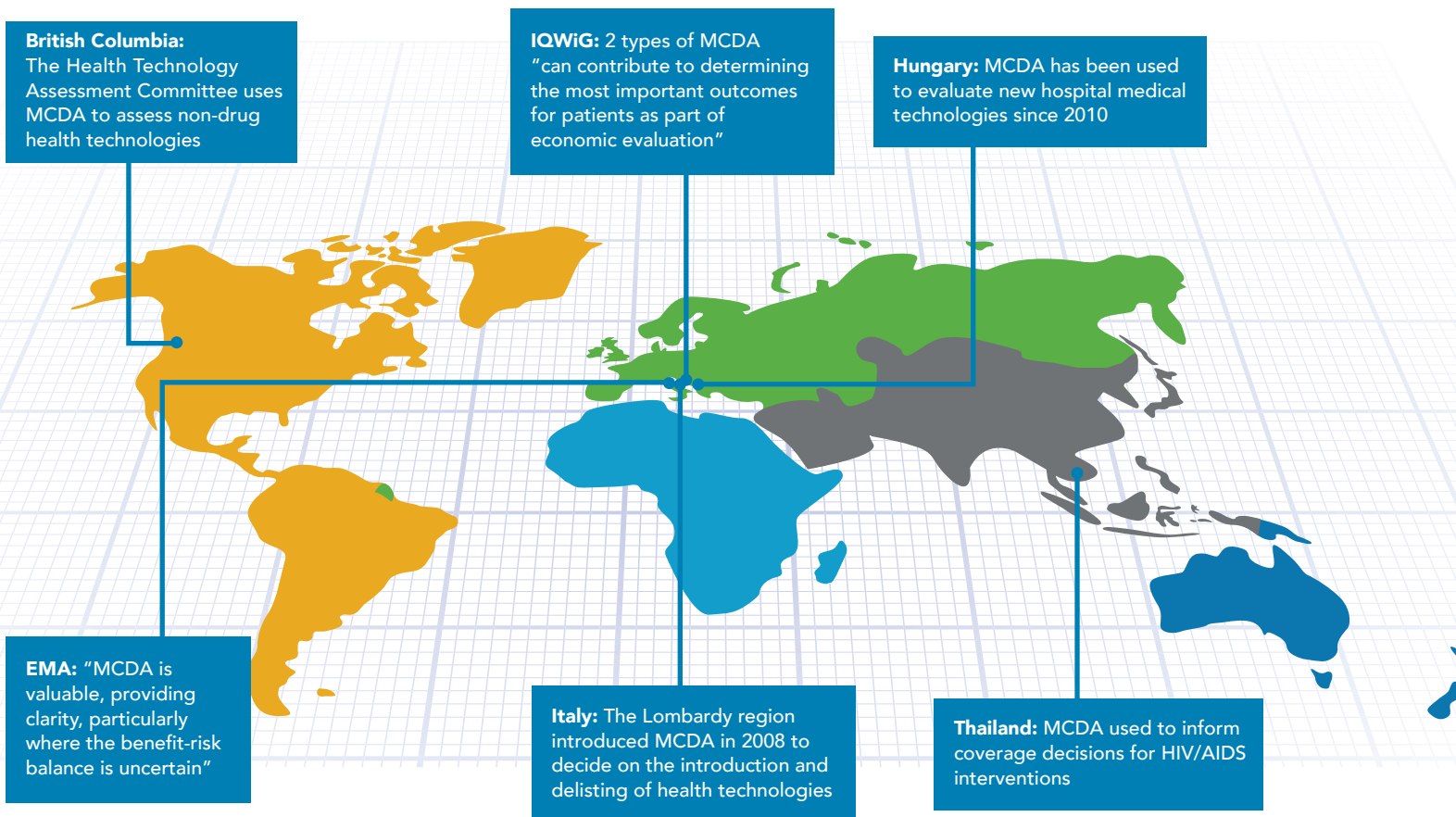
While healthcare has been relatively slow in realizing the value of MCDA, recent years have seen payers and regulators consult on, pilot, and employ MCDA to support their decision making. Figure 2 illustrates the range of ways in which MCDA is being integrated into healthcare decision making.

A number of observations can be drawn from the examples shown in Figure 2.

Decision types: MCDA is being used to support a range of decision makers, including regulators and national and regional HTA agencies.

Method: Even within decision types, the MCDA methods adopted by decision makers display important variation. For instance, the Institute for Quality and Efficiency in Healthcare (IQWiG) has suggested the use of the analytical hierarchy process (AHP) or discrete choice experiments (DCE) to generate criteria weights,^{3,4} while much more simple, direct weighting methods are employed in Hungary⁵ and the Lombardy region.⁶

Figure 2: Examples of the use of MCDA by healthcare decision makers



These examples also point to how MCDA is being employed by HTA agencies despite the concerns of critics. For instance, the discussion of the role of MCDA in healthcare often focuses on its use as a replacement for cost-utility analysis. In this context critics point to the difficulties of constructing a willingness-to-pay threshold for a multi-dimensional notion of value such as captured in an MCDA. The examples summarized in Figure 2 point to alternative ways that MCDA can support HTA, including:

1. MCDA can be seen as a way to better structure decision-making committees' consideration of evidence across multiple criteria, as is the case in Hungary and the Lombardy region in Italy.
2. MCDA can be used to generate aggregate benefit estimates with which to construct efficiency frontiers — graphical representations of the interventions that provide the most value for any given level of investment — as has been proposed by IQWiG.

When should I implement MCDA?

The focus of this article has so far been on the use of MCDA at launch — as part of either regulatory or reimbursement decisions. However, industry's use of MCDA extends beyond this. Figure 3 summarizes the stages of the product development process where MCDA is currently employed by industry, including:

Pre-launch: It important to incorporate MCDA early in the product development process. This not only ensures that evidence generation focuses on those data required to inform the MCDA undertaken later in the development process, but MCDA can also support internal decisions

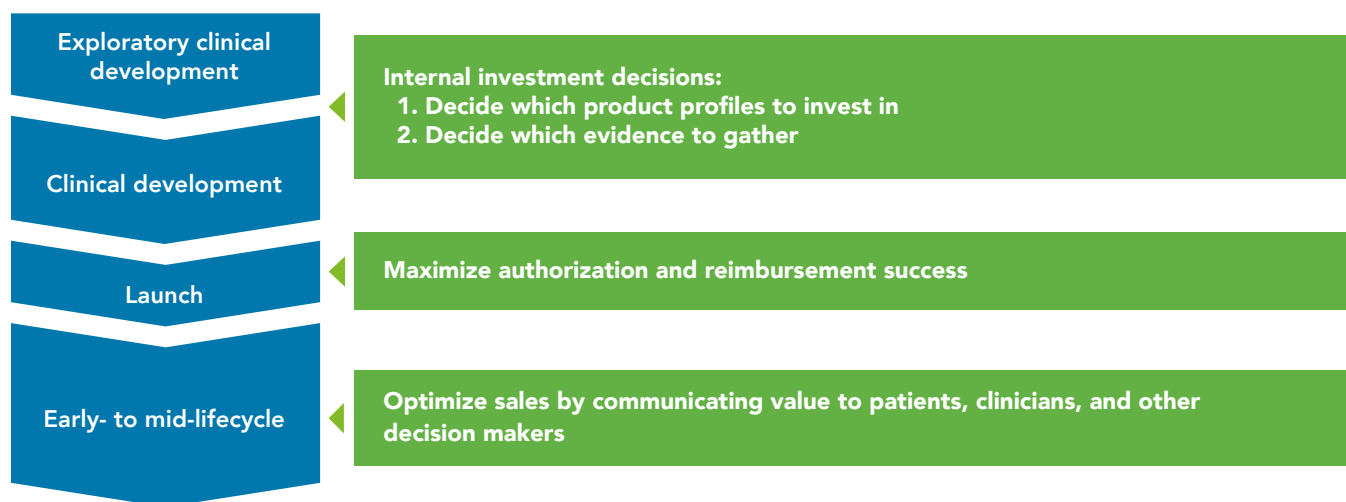
about which molecules, target product profiles, or evidence generation strategies in which to invest.

Post launch: Subsequent to launch, industry uses MCDA to help communicate value messages to clinicians and payers, with its ability to synthesize multiple value messages into a single quantitative estimate of overall value.

A good example of the early use of MCDA for project prioritization is the Allergan experience.⁷ Allergan commissioned an MCDA to prioritize 52 potential investments across five therapy areas. An efficiency frontier approach was adopted, expressing the value for money of investments based on cost and a multidimensional measure of benefit. An MCDA was conducted to estimate the benefit of investments based on four criteria: 1) whether investments addressed unmet medical need; 2) whether the investment protected existing franchises; 3) the probability that the investment would prove successful; and, 4) the contribution of the investment to the strategic goal of developing a specialty pharmaceutical company.

The performance of the investment against these criteria was measured by the marketing and product development teams. A two-day workshop was held to elicit stakeholders' preferences for criteria and to review and interpret the results of the MCDA. Participants were positive about this experience. One noted that the MCDA was "the first time I have seen all our projects on one display," and others said that it stimulated teams to re-think strategies and motivated them to seek products that would provide better value.

Figure 3: MCDA is applied throughout the process of product development



How should I implement MCDA? Is there best practice guidance that I should follow?

The diversity of approaches to implementing MCDA (see Marsh et al., 2014⁸) creates challenges for industry. Clients often come to Evidera with a range of questions, such as: Which criteria should we include in our MCDA? and Which scoring and weighting techniques should we adopt? Figure 4 illustrates some of the diversity of methods that are used in MCDA, just considering weighting methods. This divides the methods into four types:

1. **Ranking:** Stakeholders are asked to rank criteria, and assumptions are made to translate ranks into weights.
2. **Direct weighting:** Stakeholders provide their assessment of the importance of criteria by, for instance, giving each criteria a weight of between 1 and 5, where 1 denotes lowest weight and 5 denotes the highest (such as in some versions of EVIDEM⁹), or by allocating 100 points across the criteria in a manner that reflects their relative importance.
3. **Pairwise comparison:** Stakeholders compare pairs of criteria, indicating their relative importance. For instance, the Analytical Hierarchy Process asked stakeholders to rate pairs of criteria on a 9-point scale, where 1 indicates the criteria are equally important and 9 indicates that one criteria is extremely more important than the other.
4. **Multi-attribute utility theory (MAUT)-based methods:** Stakeholders' preferences are elicited in a manner that corresponds with the axioms of utility theory — transitivity, completeness, independence. For instance, Discrete Choice Experiments provide respondents with choices between hypothetical interventions, from which weights are inferred.

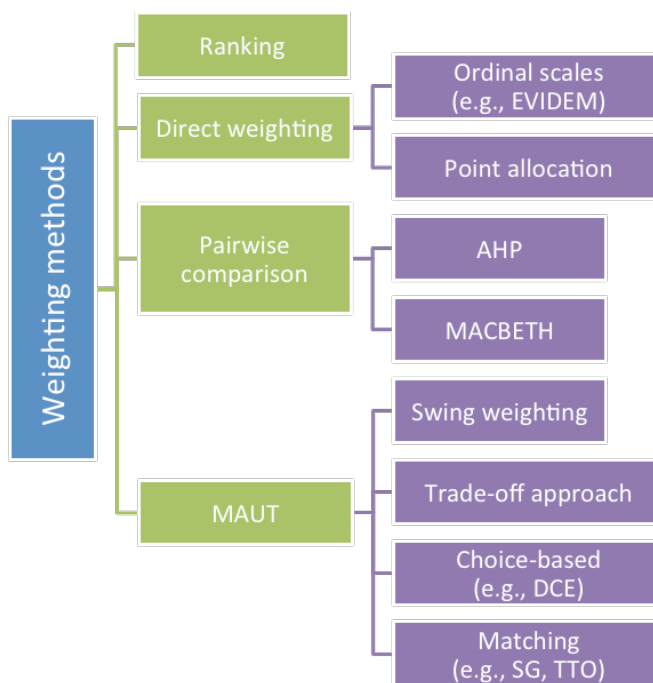
While not intending to be comprehensive, Figure 4 already illustrates the diversity of techniques available.

The non-health literature contains frameworks that are useful starting points for understanding the differences between MCDA methods, as for example, in Guitouni and Martel, 1998.¹⁰ These emphasize factors such as the required transparency and meaning of weights; the nature of decision makers' objectives; cognitive burden on participants; the opportunity for stakeholder learning processes; and, cost and time. Evidera would agree with the conclusion often drawn by authors that there is no "best" MCDA method. Rather the appropriate approach should be determined based on decision

makers' objectives, the stakeholders who are providing preferences, and the level of precision called for. In other words, a balance needs to be struck between the cognitive effort placed on the decision makers and the quality of the models' outputs, given the stakes involved in the resulting decision.

Further work is required to provide guidance to those working in healthcare on selecting appropriate MCDA approaches. Work to develop such guidance is underway. In particular, the International Society of Pharmacoeconomics and Outcomes Research (ISPOR) recently established the "Multi-criteria Decision Analysis in Health Care Decision Making Emerging Good Practices Task Force." It aims to help define MCDA and provide best practice guidance for conducting MCDA to aid healthcare decision making. Evidera is delighted to be involved in this important initiative and looks forward to sharing initial guidance during the ISPOR Annual Meeting being held in Philadelphia, May 16-20, 2015.

Figure 4: Overview of weighting methods employed in MCDA



AHP = Analytical Hierarchy Process
DCE = Discrete Choice Experiment
EVIDEM = Evidence and Value: Impact on Decision Making
SG = Standard Gamble
TTO = Time Trade-off

Conclusion

Since our earlier articles written about MCDA in this publication, much work has been done to develop and apply MCDA methods to support healthcare decision making. These efforts will help bring the benefits of MCDA — transparency, rigor, consistency, and accountability — to healthcare decision making.

Recent experiences implementing MCDA in healthcare also point to a number of lessons for industry:

1. MCDA should be applied throughout the production development process to support investment decisions, submissions and value communication.
2. MCDA includes a diversity of methods, and it is not possible to identify a “best” approach. Rather, it is important that researchers are aware of the different demands of decision makers for MCDA, as well as the insights that are generated from ongoing efforts to generate best practice guidelines for healthcare.



For more information, please contact Kevin.Marsh@evidera.com or Sumitra.SriBhashyam@evidera.com.

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