Mindsets, rationality and emotion in multi-criteria decision analysis

By

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Abstract

This paper discusses the paradigm of multi-criteria decision analysis (MCDA), and relates it to other disciplines. It concludes that MCDA needs a larger, not smaller, emphasis on values and subjectivity to increase rationality in decision-making.

The paper bases the argument on a conciliation of ethics, philosophy, neuro-psychology and management paradigms. It observes that the MCDA "mindset" relates to consequentialism, as opposed to virtue ethics and rule based ethics. Virtues and rules play an important role in practical decision-making, however.

Findings in neuro-psychology show that reliable decision-making requires emotions. Elicitation of emotions is therefore required in MCDA value trade-off processes. This leads to a concept of emotional rationality, which defines rationality as a four-dimensional concept that includes well-founded values and breaks radically with common notions of rationality.

Virtues do not easily lend themselves to value trade-off, but questions of virtue usually creates strong social emotions, as opposed to the feebler global emotions that may arise in connection conventional trade-off of end values. The conclusion is that MCDA should not be shy of subjectivity and emotion, but instead put more emphasis on it to increase rationality. A part of this challenge is how to deal with questions of virtue in decision-making.

Introduction

Although the roots are deeper, many consider the seminal book "Decisions with Multiple Objectives" by Keeney and Raiffa (1976) to be the decisive factor that started the scientific field of Multi Criteria Decision Analysis (MCDA). The book uses multi-dimensional value functions to represent decision-maker preferences. A prominent feature of these functions is that they are decomposed; subjective weights that represent the relative importance of the decision criteria are separated from scores that represent beliefs about consequences. The word "belief" is here used in the sense of "belief in matters of fact". Beliefs are models of the real world, and can be right or wrong.

The idea of modelling subjectivity in one form or other was of course not new. Bayesians already used subjective prior probabilities; and in decision theory, utility functions represent risk preference. Bayesian statistics is controversial however, and for all its good merits, it has never managed to compete with classical statistics in hypothesis testing. The reason is that many scientists perceive subjective probabilities as arbitrary and unscientific, the output becoming an inscrutable mix of facts and subjective beliefs.

For similar reasons, decision makers often feel that the use of subjective weights taint decision analysis with arbitrariness that obscures rather than clarifies. They look at the elicitation of subjective preferences with ambivalence, if not outright scepticism. Thus, an initial enthusiasm over the prospect of comprehensive and consistent analysis becomes mixed with doubt and hesitation over the prospect of taking subjective preferences seriously. Clients would much prefer a "rational" analysis based on facts, rather than incorporating feelings based on "irrational" emotions.

Such very understandable attitudes pose a serious obstacle for the general acceptance of MCDA. As a result, some members of the MCDA community prefer to limit themselves to identifying Pareto-optimal solutions, for instance through data envelopment analysis – thereby avoiding the unclean business of subjectivity. To develop and improve objective methods are of course laudable activities; the more we can say on an objective basis, the better. The general problem with Pareto-optimal methods, however, is that they tend to produce several solutions; and choosing among them still requires subjective preferences. There is no alternative.

The purpose of this paper is to advocate a change in attitude and approach. One should not consider elicitation of subjective preference as a problem and a threat to rationality. Rather the contrary: the modelling of subjectivity is a unique strength of MCDA that fulfils the requirements of rationality. This reasoning is based on a reconsideration of the concept of rationality. I shall argue that rationality requires emotions. If emotions are not allowed to play a carefully monitored role in the decision making process, decisions are liable to arbitrariness. I shall introduce the notion of *emotional rationality* which emphasises what I consider the most important challenge of MCDA, namely to work with the decision-maker's emotions to elicit values that are *well founded*. I base the argument on the observation that emotions are indispensable precursors to any action; awareness of this helps both analyst and client. It follows that MCDA, with its focus on values, is in an eminent situation to provide a truly rational approach to decision-making. What might appear a weakness of MCDA is therefore instead a potential strength.

The paper is organized as follows:

- I first give a brief account of the current MCDA paradigm, emphasizing that MCDA is designed to attack value-laden decision problems and that its method is to separate values from beliefs.
- To better understand the mindsets of MCDA practitioners, we explore the antecedents of MCDA. Ethical theory provides a good basis to understand the paradigm. We observe that MCDA fits closely with consequentialism, as opposed to virtue- or rule-based ethics. While all three mindsets are important in actual managerial decision-making, MCDA appears ill fit to handle virtues.
- We explore the psychological or physiological processes through which values affect decision-making by reviewing neuro-physiological evidence for the role

of emotions in actual decision-making. We notice that people without emotions are prone to make bad decisions in uncertain and value-laden contexts. The implication is that good decision-making requires emotion.

– We define rationality in a way that directly links it to the different phases of MCDA. The definition includes well-founded values, which again requires emotions, leading to the concept of emotional rationality.

– Finally, we discuss elicitation of emotion in relation to virtues versus ends, and observe that the related emotions probably are of different kind and strengths. We conclude that it is an important challenge for MCDA, and review some applications that have made steps in this direction.

The MCDA paradigm

Scientists who identify themselves with the MCDA community share a common understanding of how to approach complex decision problems. Although there are sub-schools within MCDA, as revealed by acronyms like MCDM (multi-criteria decision making) and MAUT (multi-criteria utility theory), one simple idea appears communal: MCDA people are convinced that decision problems that appear complex do so partly because of the presence of conflicting objectives. When values are incommensurable, conflicts cannot be solved by pure calculation. Therefore, the decision problem cannot be solved by technical analysis alone. Pareto-efficient techniques carry us a long way, but the final step of choosing among the Pareto-optimal alternatives still remains. Something more than conventional analysis is therefore needed – and this very lack of an obvious way to proceed makes the problem appear complex.

According to the MCDA paradigm, value laden decision problems should be structured by separating values from beliefs about facts. One such approach is called *value focused thinking* (Keeney, 1992), where one starts by identifying and structuring the decision-maker's objectives in order to produce a set of decision criteria. After this, one considers alternative actions and evaluates them by weighting their presumed impact on the decision criteria.

MCDA practitioners share a common notion of *value*. According to Keeney, "Values are what we care about. As such, values should be the driving force for our decision-making. They should be the basis for the time and effort we spend thinking about decisions." Thus, MCDA values are not only moral values – in fact, they are usually more tangible than moral values. Values are anything a decision-maker might want to achieve, including profit.

The paradigm appears simple, straightforward and unobjectionable, but it entails two salient features that set MCDA apart from other traditions.

First, the paradigm is essentially consequentialistic. In practise, decision-makers never know exactly the consequences of decisions or do not even think in terms of consequences. MCDA, however, requires *beliefs* about consequences. One of the axioms of decision analysis is the separation of beliefs and preferences; that is, what we want to happen should not influence what we think is going to happen. According to the paradigm, the decision-maker selects the action that is believed to have the best consequences, judged according to a set of objectives. The objectives represent the decision-maker's values. Every important concern is supposedly included in the set of objectives; there is therefore apparently no restriction to the approach. In practice,

however, MCDA focuses on *outcomes*, and not on the actions. For instance, in a relocation decision, MCDA objectives would not include that the decision itself be correct, brave, appropriate or prudent. MCDA theory prescribes that one should try to select decision criteria that represent ends in themselves, and not means to achieve ends (Keeney, 1992).

Second, while other decision-making methods tend to use one-dimensional value functions, MCDA considers competing values explicitly and offers well-founded methods to handle conflicts among objectives. Few other decision analytic paradigms do that, and since clients are often unfamiliar with it, it represents a special challenge for MCDA practice.

Mindsets

Some decision-makers are receptive to the methods of MCDA – others are not. Decision-makers think and feel differently as if different principles for choice are tacitly in operation – in other words; decision makers have different *mindsets*. A natural place to start is with ethics. Ethics separate situations we aim for and situations we seek to avoid (Blackburn, 1998) and lies at the root of decision-making. Virtue ethics, duty ethics and consequentialism are classical principles to guide decision-making. The following is an attempt to relate the principles to MCDA, with a focus on mindsets, not on whether decisions are morally good.

Virtue ethics

If we are primarily concerned with displaying the right attitude when we act, we are guided by virtue ethics. Confucius (551-479 BC) created a system of virtues consisting of *chung* (loyalty to one's true nature), *shu* (reciprocity) and *hsiao* (filial piety) that has characterised Chinese society through the history. In the west, Aristotle (384-322 BC) is a well-known classical authority. Forgiveness, gratitude, regret, remorse, loyalty, humility, compassion, courage, prudence and loyalty are examples of Aristotelian virtues. The focus is on acts and attitudes – or moral character, not on consequences. Courage is important, not survival. Virtue promotes human flourishing, according to Aristotle – and in saying so, he gives a consequentialistic argument for virtue ethics as a principle of decision-making. The important point, however, is that of *mindsets* – the way the decision-maker thinks or feels. The mind of a virtuous person is set on attitude, not consequence. The story of the Good Samaritan that Jesus told (Luke 10, 25-37) deals with the virtue of compassion – a virtue that is integral in taking the right action when faced with the decision of what to do with a wounded man whom you do not like.

Corporate core values

Today we see an emphasis on virtues on company web pages, displaying the intended moral character of the company as a list of corporate core values. Integrity, honesty, equality, impartiality, loyalty, respect, prudence and tolerance are currently on the top of the list of corporate virtues. Although this is part of corporate image building, it also reflects a felt need for more virtuous behaviour.

Duty ethics

Duty ethics – or deontological ethics – classify actions according to whether they are right or wrong with respect to a system of rules. The Ten Commandments is a duty based system where actions are judged according to whether the commandments are obeyed or not, not because of the consequences of the actions. A classical example is Homer's Iliad where Hector is honour bound to go out and fight Achilles – even though he knows without doubt that he will be killed. There are also famous citations that show the importance of duty ethics in real decision-making. Gaius Calpurnius of Piso, one of the plotters against emperor Nero, is credited with the saying "*Fiat justitia, ruat Caelum*" (Let justice be done, even if the skies fall down), and the maxim of Emperor Ferdinand 1st (1503-64) was "*Fiat justitia, pereat mundus*" (Let justice be done, even if the world perishes).

Immanuel Kant (1724-1804) is the most important contributor to a deontological system. He could not accept that arbitrary personal sentiment should be the basis for moral choice, and tried to formulate a principle whereby rules for ethical choice could be deduced through introspective reasoning. He insisted that our actions possess moral worth only when we do our duty. Consequences do not matter. His principle for determining what is our duty is known as the categorical imperative: "Act only on that maxim through which you can at the same time will that it should become a moral law!" The United Nations' Universal Declaration of Human Rights of 1948 is a notable example of a system of Kantian rules for public policy, where the rights are considered absolute regardless of their consequences. The objective of a Kantian system of moral laws is to create a good society. Thus, the underlying motivation is consequentialistic – and again, the important point is that the mindset of a Kantian decision maker is not concerned with those ultimate ends, but with whether actions are right or wrong, judged according rules only.

Rule Based Management

Max Weber formalized the principle of Rule Based Management. He described the ideal bureaucracy as an organisation where there are fixed jurisdictional areas that are ordered by rules (Weber, 1947). There is a well-defined hierarchy of positions for people to occupy; and management – or decision-making – is prescribed through well-defined procedures. Empirical studies indicate that Weber's ideal type of bureaucracy seems to correlate well with a random sample of organizations (Watson and Buede, 1987) and it is therefore widespread. Weber states that a major social consequence of idealized bureaucratic control is a world without need for emotional decision-making:

> "The dominance of a spirit of formalistic impersonality, *sine ira et studio*, without hatred or passion, and hence without affection or enthusiasm. The dominant norms are concepts of straightforward duty without regard to personal considerations. Everyone is subject to formal equality of treatment; that is, everyone is in the same empirical situation. This is the spirit in which the ideal official conducts his office."

Notice Weber's warning against emotion. To follow rules does not require emotions; only reasoning about what is right and wrong, and that requires just brains. It is another matter that rule following is *controlled* by strong emotions like shame and guilt, (March, 1994).

MCDA has little to offer a decision-maker with a rule following mindset, since there is no occasion for trade-offs. To discuss trade-offs between rule bending and profit-maximisation, for example, would require a different mindset.

Consequentialism

Under consequentialism, the value of an action derives entirely from the value of its consequences, and this contrasts both with virtue ethics and duty ethics (Blackburn, 1994). Matthew (12, 10-12) provides an early example of the contrast between duty ethics and consequentialism when the Pharisees attempt to trick Jesus into endorsing work on the Sabbath:

> And behold, there was a man which had his hand withered. And they asked him, saying, is it lawful to heal on the Sabbath days? that they might accuse him. And he said unto them, What man shall there be among you, that shall have one sheep, and if it fall into a pit on the Sabbath day, will he not lay hold on it, and lift it out? How much then is a man better than a sheep? Wherefore it is lawful to do good on the Sabbath days.

In this passage, Jesus may be seen as a spokesman for consequentialism. An act should be judged by its consequences, not whether or not it follows rules. Of course, one could construe the passage to mean that Jesus is just substituting the old rule – Do not work on the Sabbath! – with a new one – Do good on the Sabbath! However, there is an essential difference. The first rule is concerned only with the act itself and it requires no judgement to follow it. The latter is concerned with the consequences of the act, and in order to follow it one has to judge what is good. Note also, how Jesus – interestingly – appeals to emotions by introducing sheep in the discussion!

Consequentialism has broader applicability than virtue- and duty ethics. In principle, it can be applied to any decision problem where consequences can be identified, not only to moral questions. The mindset of a consequentialist is forward looking, and the basic method is to separate facts from values. One of David Hume's (1711-76) important contributions was to describe the apparent "gulf" between belief and value. He used the term "belief" to denote conception of facts – what "is". Beliefs are, according to Hume, vivid or lively ideas regarding matters of fact, and beliefs about consequences require cause-effect reasoning. He noted that reason can show us the best way to achieve our ends, but it cannot determine our ultimate desires: "'Tis not contrary to reason to choose my total ruin, to prevent the least uneasiness of an Indian or a person wholly unknown to me". In other words, to have such preferences is to have certain values and feelings; they are not matters of reason at all. Beliefs about consequences are created through reasoning while action is prompted by feelings (Hume, 1748).

The MCDA paradigm fits obviously well with consequentialism. It is especially interesting to note how Keeney's notion of value-focused thinking – where he emphasises 'values first' (Keeney, 1992) – mirrors Hume's idea of values as given *a priori*.

Management by Objectives

Peter Drucker (1993) introduced the concept of Management by Objectives (MbO) in 1954. He advocated specification of performance objectives that are jointly determined by subordinates and their superiors, periodic review of progress toward objectives and rewards allocated on this basis. MCDA, with its emphasis on multiple

objectives, is related to MbO. According to Huczynski (1996), MbO has the distinction of being among the most widely used and most influential management techniques in the post-war period, and has entered the sub-consciousness of most managers. Indeed, MbO is one the pillars of the field of strategy where the formulation of visions and goals are key concepts. It is interesting to note how well MbO coincides with Keeney and Raiffa's (1976) idea that the goal hierarchy and weights should be used as a medium for communicating organizational goals. The objective is to arrive at a shared understanding of goals and their importance. In this light, MCDA is an operational tool within the larger concept of MbO.

Although the term MbO no longer is in fashion, it still pervades managerial thinking, with modern stakeholder theory as one of the offshoots (Freeman, 1984). Particularly interesting from an MCDA perspective is enlightened stakeholder theory, which emphasizes the necessity of weighting stakeholder interests (Jensen, 2001). The balanced scorecard is another offshoot of MbO, where corporate performance measures are systematized into a multi-objective system and the emphasis is on keeping balance among the objectives (Kaplan and Norton, 1996).

MCDA's position

Can MCDA accommodate all three mindsets? Most individuals harbour all three. In routine type decision situations, we stick to rules rather than considering consequences; and when no rules apply or the consequences appear counterproductive, we may switch to a different mindset and use better judgement. Virtues are omnipresent; we do not litter, even if nobody watches. Nevertheless, people are different and under dominion of the mindsets to different degree.

Perhaps virtues and duties could be incorporated in any decision analysis, simply by regarding them as consequences and adding appropriate attributes to the list of decision criteria. The problem is that it does not work that way; virtuousness and rule following are different from ordinary consequences in that a gain in one dimension does not compensate for a loss in another. Fraudulent money does not compensate for virtue lost by cheating. Not everything has its price (even if the opposite is heard).

Observations point in the same direction. Buchanan et al. (1999) have reviewed several descriptive as well as prescriptive models of decision-making. Descriptive models describe what decision-makers actually do, while prescriptive models prescribe what people should and can do. They found that all the descriptive models were generally noncompensatory; that is, they do not allow for trade-offs. In contrast, all of the nine prescriptive models were generally compensatory. Most prescriptive models are of the MAVT type, using trade-offs to maximise a value function. Buchanan et al. found the discrepancy intriguing and proposed that decision-makers may be content not to make trade-offs and instead stop at the first satisfactory solution, because of the cognitive complexity of trade-offs, or simply to save time. We may add to this that the mindsets of decision-makers may very well be geared more towards virtue and duty than consequence; the concept of trade-off is therefore alien, and this compounds the cognitive complexity. This is similar to the decision mode Lipshitz (1994) calls matching, where decisions are made by sequential evaluation of alternatives in terms of appropriateness to the situation or compatibility with social rules and personal values according to a deontological logic.

March (1994) gives a similar description of decision-making 'as it happens'. He identifies two different mindsets at work, characterised by a logic of appropriateness

and a logic of consequence. The organisational identity of the decision-maker together with the rules determines the appropriateness of decisions. In other words, with a logic of appropriateness decision-makers internalise an identity and try to do what is expected of them, and March finds this mindset quite common. Inappropriate behaviour is controlled by strong emotions such as shame, guilt and embarrassment. The rational approach, which is to think forward and optimise consequences, is seen more seldom, although decision-makers often would like to think they do so. March's concept of appropriateness covers the mindset of virtue as well as of duty, and thus reduces the three classical principles of choice to two. In our context, however, it is useful to consider virtue and duty as two separate mindsets, since they are different with regard to emotion.

An alternative to subsuming all decision problems under the sway of consequentialism is to try to deal with virtue and consequence separately. Rules that are not themselves in question can sometimes be handled very easily as constraints in an optimising problem. Virtue is much more problematic. Føllesdal (2004) discusses how we can account for the intrinsic virtue of an action, seen apart from its consequences, but without being able to give simple answers. An important example is rights issues in environmental management. With what rights do we take risks regarding the environment? What are the rights of animals, or plants, or even mountains, and how should we evaluate those rights (Lee, 1996)? Greens find the principle of trade-off in such cases inappropriate; we do not have the right to do it. Rauschmayer (2001) proposes to take rights into account through a diligent decision-making process where classical MCDA plays only a part. Wenstøp and Magnus (2001) ran into a similar problems in a health policy analysis where Norwegian health authorities – after dutifully performing MCDA – made a decision to stigmatise an immigration group in order to limit the spread of HIV. In this case, human rights were traded off against human health by a decision panel that felt quite emotional about the possible scenarios. The outside world, however, found the decision inappropriate, and it was roundly condemned, partly in very emotional language (Awounda, 1996).

Preliminary conclusions

- The MCDA paradigm is related to consequentialism. MCDA cannot easily deal with virtues, but rules may be incorporated in MCDA as constraints if the rules themselves are not in question.
- Most real-world decision-makers apply a logic of appropriateness; that is, their mindset is inclined towards virtue and duty, not consequence.
- Rule following does not involve emotions, but rule breaking is controlled by strong emotions and accusations of lack of virtue.
- So far, little has been said about consequentialism and emotion, and we shall turn to that now.

Emotion

In this section, I shall argue that not only is there no conflict between rationality and emotion, but emotion is in fact a necessary component of rational decision-making. To do that, we shall first see how emotions actually play a vital role when we make decisions. In the next section, I shall propose a formal definition of rationality that is suitable for MCDA.

The terms emotion and feeling are often used interchangeably in common speech, but we shall find it useful to distinguish between them. Following Damasio (1994), the term *emotion* denotes physical phenomena in the body while *feeling* is reserved for the experience of such emotions. When people are surprised, delighted or disgusted, their body undergoes dynamic changes that may affect blood-pressure, skin colour, facial muscles, skeletal muscles, guts, heartbeat, breathing, and so on. These are emotions. Feelings, on the other hand, are mental phenomena. The juxtaposition of emotions and the objects that are associated with them causes feelings (Damasio, 2003). Among the basic feelings are happiness, surprise, sadness, anger, fear and disgust. When the body's emotions for some reason correspond to one of these types, we know that reason and experience the emotion, and consequently *feel* happy, surprised, sad, angry, afraid or disgusted. Sympathy is an emotion while empathy is a feeling. A woman appears sympathetic when she shows her empathy.

The beginning of a cognitive theory of emotions may be attributed to Simon (1967). He assumed that a serial processor that has to deal with many different problem situations needs a mechanism for interrupting its work on one problem to direct its attention to another. It therefore needs a hierarchy of goals to set priorities. Emotions are interrupting mechanisms directing the processor's attention to newly perceived threats or opportunities affecting urgent needs. Their function is to rearrange priorities and set a new hierarchy of goals. In the fourth edition to his book *Administrative Behavior,* Simon (1997) takes an interest in the role of emotions in decision-making. He observes that there is no intrinsic conflict between rationality and emotion, and that emotion can be conducive to making good decisions.

Elster (1996) goes a step further, and contends that emotions in fact contribute to rationality and should be taken seriously. Wilson (1998), in his comprehensive book on the Unity of Knowledge, writes (p.113): "Without the stimulus and guidance of emotion, rational thought slows and disintegrates." He notes that consciousness satisfies emotion by selecting the action that enhances well-being. Evidence for this is provided by Damasio's (1994) observations of impairment of decision-making capabilities in patients with prefrontal lobe damage, which indicate that not only do emotions contribute to rationality, but also rationality actually requires emotions.

Pathological decision-making

Medical literature reports cases where persons who sustain brain damage to the prefrontal lobes become incapable of making good decisions. The dysfunction is especially noticeable in decision contexts that are complex, such as when there are conflicting objectives and uncertainty about future consequences. Damasio (1994) reports that these individuals function normally in most respects, except that they make bad decisions when facing complex decision problems; that is, they fail to promote their own goals.

An example may serve to illustrate how this might work. Damasio conducted a series of experiments using a skin conductance meter to compare emotional reactions of normal persons and persons suffering from prefrontal damage. In one experiment, each subject played a card game with the objective to have gained a certain amount of money when the game was suddenly halted. The player selected a deck of cards from four possible decks and turned the topmost card. Depending on the card, the player would either gain or lose money. In reality, two of the decks were risky with a negative expected outcome; they would give appreciable gains with occasional

substantial losses. The two other decks were prudent, with smaller gains and losses but a positive expected outcome. The players did not know the properties of the decks when the gamble started but was supposed to find out the best strategy during the play. It turned out that, after a few big losses, normal persons soon stuck to the prudent decks and earned money. The players with prefrontal lobe damage also correctly inferred which decks were prudent, but they would still occasionally turn cards from the risky decks and thus lose money rather than gaining. All subjects revealed emotions when they were awarded money or had to pay after they had turned a card. Interestingly, however, normal people also revealed emotions when they selected a deck before turning a card. In contrast, subjects with prefrontal lobe damage revealed no emotion when they selected decks.

The neuro-physical explanation, according to Damasio, is that stimuli are passed directly to a centre in the brain called amygdala, where they are compared to *innate* archetypal representations. If a stimulus is compelling enough, signals go directly to the body that produce appropriate emotions, such as joy or disappointment of winning or losing. This is called *primary emotional responses*, and the pathway is apparently not impaired by prefrontal lobe damage. If the stimulus is not sufficiently compelling, however, higher cortices have time to reason, possibly involving imagination of consequences of alternative actions, which are compared to *acquired* dispositional representations in the prefrontal cortex. The result is unconsciously signalled to *amygdala*, which produces appropriate *secondary* emotional responses. This pathway appears to be impaired by prefrontal lobe damage.

Decision makers with prefrontal damage in the card game fail to elicit emotions before they chose the deck because they are incapable of evaluating the consequences of their choice. Thus, they have no feeling of what to do – and the result is arbitrary decision-making. Normal people feel emotions when contemplating what to do, and choose the action that produces the best feeling. Without emotions, we have no guidance. Emotions are therefore required for good decision-making.

Rationality

There is a plethora of notions of rationality. Elster (1982) has identified 20 different ones. In everyday language, being rational is some times understood as self-serving; a rational person is one who is self-interested. This is too limited; in the context of decision-making, rationality has a positive connotation as something one should try to acquire. Simon (1945) has identified five such notions: A decision is *objectively* rational if in fact it is the correct behaviour for maximizing given values in a given situation. It is *subjectively* rational if it maximizes attainment relative to the actual knowledge and expectations of the subject. It is *consciously* rational to the degree that the adjustments of means to ends are a conscious process. It is *deliberately* rational to the degree that the adjustments of means to ends have been deliberately brought about. A decision is *organizationally* rational if it is oriented to the organization's goals.

MCDA is rational with regard to all of Simon's definitions except the first, which would require perfect knowledge. However, Simon's definitions take the values as given, and that leaves out one of the most important concerns of MCDA. Values can be ill conceived, immature and leading us astray. What we need is a definition of rationality that includes the value part. Føllesdal (1982) provides us with exactly that. He identifies four dimensions of rationality: 1) rationality as logical consistency, 2)

rationality as well foundedness of beliefs, 3) rationality as well foundedness of values, and 4) rationality of action.

Logical consistency pertains to both values and beliefs. Decision theory has traditionally put a strong emphasis on internal consistency of value structures (Stigum and Wenstøp, 1987), and utility functions or value functions are instruments to achieve that. Logical consistency of beliefs means non-contradictory reasoning about consequences. In other words, the world picture needs to be consistent.

Well-foundedness of beliefs requires logical consistency, but is stronger. It requires that beliefs be well supported by available evidence so that no competing world model is better supported, as well as that a suitable amount of evidence is acquired before beliefs become fixed.

Concerning rationality as well-foundedness of values, Føllesdal writes (1982): "It is noteworthy that when we say that a person is rational, we tend to focus almost exclusively on the rationality of his or her beliefs and do not take his values into account". To achieve well-founded values, Føllesdal (2004) recommends that we employ a method where we make vivid or visualize our beliefs about possible outcomes and reflect on the positive or negative values associated with them. The process emphasizes both consistency and comprehensiveness. We need to adjust our values so that they become consistent over the range of situations that we might possibly encounter. We do that by going back and forth among our reactions to the situations, and the evaluative principles we use. We build systematically a set of judgmental principles by considering more and more issues until we reach a stable set of convictions that are relevant for the decision situation.

The method is not new; already Aristotle alluded to it. Rawls (1973) has applied it to ethics, where he called it *reflective equilibrium*. These ideas are of course by no means new in MCDA either, where a process similar to reflective equilibrium was described by Keeney and Raiffa (1976) in connection with deciding on a new site for the airport of Mexico City. One of MCDA's main concerns is actually to provide concepts and tools to produce well-founded values. We construct goal hierarchies to organize our values, and have available a host of methods to weight them or by other means create a well-founded structure of importance. In this respect, MCDA can be seen as a major (potential) contributor to rationality. What is new is the emphasis on emotions. If the decision maker does not experience emotions, values will not be engaged and decisions will be arbitrary (Damasio, 1994).

Well-foundedness of action is according to Føllesdal achieved through the application of decision theory. We first identify all viable courses of action according to our beliefs about what possibilities are open to us. Then, we combine our beliefs about probabilities for various consequences and combine these with our values, for instance by computing expected utilities.

Rationality in Følledal's sense is thus precisely what MCDA should aim at. Rationality in terms of well foundedness of beliefs is perhaps less emphasized, but means-end diagrams and influence diagrams are examples of tools made for this purpose. On the other hand, it is clear that the development of concepts and methods for achieving well foundedness of values is a major challenge for MCDA.

Rationality and decision tables

Føllesdal's definition of rationality can be readily understood if we refer to the decision table, which is familiar to most MCDA practitioners. A typical decision table is shown in table 1.

Table 1: A typical MCDA decision table

	Option 1	Option 2	Option 3	Weight
Criterion 1	*Score* (1;1)	*Score* (1;2)	*Score* (1;3)	w_1
Criterion 2	*Score* (2;1)	*Score* (2;2)	*Score* (2;3)	w_2
Criterion 3	*Score* (3;1)	*Score* (3;2)	*Score* (3;3)	w_3
Utility	u_1	u_2	u_3	

1. Logical consistency would be achieved if the scores were related to a non-contradictory world picture, and use of utility- or value functions.
2. Well foundedness of beliefs would be achieved if the scores were based on our best beliefs acquired through adequate data collection.
3. Well foundedness of values would be achieved if the weights were established through a method of reflective equilibrium by eliciting emotions in the decision-maker through procedures that eventually produce stable results.
4. Rationality of action would be achieved if the options with the highest expected utility is chosen.

Elicitation of emotion

The challenge

Theoretical approaches to emotion essentially view emotions either as a *global* phenomenon or as discrete classes. From a global point of view, emotions are general and positive or negative in orientation. Separated in discrete classes one speaks of negative and positive emotions such as fear, anger, disgust, surprise, sadness, and happiness (Connelly *et al.*, 2004). These are called primary emotions. Both global emotions and discrete emotions are trait-based as well as situationally induced, although global affect is typically viewed as less intense and longer lasting than discrete emotions (Frijda, 1993). Social emotions are derivatives of primary emotions and include sympathy, embarrassment, shame, guilt, pride, jealousy, envy, gratitude, admiration, indignation and contempt (Damasio, 2003). Social emotions arise in relations between persons and are generally strong and compelling.

What kind of emotions do we speak of in MCDA applications? As we have observed, MCDA is primarily a compensatory method with tradeoffs between outcome variables. The decision maker has to consider questions like whether she feels that one outcome bundle is better than another. We may conjecture that this requires global emotions, which generally are weaker than social emotions. Social emotions, on the other hand, arise when there is question of virtue.

Let us look at simple example. Consider a local union leader who must decide whether she will accept some layoffs now and save the company for a foreseeable

future, or refuse and thereby make the company vulnerable with more layoffs later as a possible consequence. To accept layoffs now will be perceived as a violation of identity; she will be *ashamed* and feel *guilt*. If she refuses, she may be proud of her display of power. Thus, a decision maker with a virtue-oriented mindset would be moved by strong social emotions and refuse. What has MCDA to offer? MCDA would prescribe that only end consequences count. Therefore, one should disregard virtues connected with the act of making the decision. One should instead produce scenarios of possible future consequences, and then try to assign value to them. The value assignment would also require emotions, but these emotions would be harder to elicit and weaker.

This amounts to a challenge for MCDA. Virtue mindsets are common; the associated social emotions are strong; and virtues do not lend themselves to trade-off. MCDA therefore requires first that the decision maker be cajoled into a consequentialist mindset, followed by a careful separation of virtues and end values. Then, emotions must be elicited to assign value; otherwise, we know that the result will be unreliable. Such emotions are likely to be feebler than social emotions, but still required.

Vivid consequences

Rational MCDA requires elicitation of emotion, but the concept is virtually absent from MCDA literature. One exception is Wenstøp and Seip (2001) who discuss the need for emotion in environmental decision-making. However, vivid consequences are obviously a crucial step in the right direction, which many authors within the field have noted. This short review does not intend to be complete, but serves to show that many have been thinking in the same direction.

Wierzbicki (1997) discusses the issue of intuition, which also plays an important role in decision-making. Although Wierzbicki's definition of intuition does not explicitly include emotion, the phenomenon of intuition can be explained by emotions that create feelings pro or contra certain actions in a covert, sub-conscious way without reasoning (Damasio, 1994). In a decision context, therefore, emotion can create feelings that can operate both in an open, conscious way as well as in a covert sub-conscious way that we call intuition. Wierzbicki is concerned that decision aid is conducive to creativity and intuition and recommends that decision support systems present information to the decision maker in rich multidimensional graphic terms, but he warns against insistence on consistency and procedures like pair wise trade-offs. From our point of view, however, the important thing is that decision aid helps elicit emotion, no matter whether intuition or conscious feelings are produced. Good graphics to make the scenarios vivid is therefore certainly recommendable, but to forego consistency would mean to allow for irrationality, thus violating the main principle advocated in this paper.

The idea behind pair wise tradeoffs is to simplify the cognitive burden on the decision-maker by reducing the number of dimensions in value space during the weight elicitation process. This is a crucial procedure in many decision support programs, but the cost of reducing the complexity is that the decision-maker must consider artificial scenarios. The challenge, therefore, is to develop processes that are able to still present such trade-off problems in a way that is vivid enough to elicit emotions when the decision-maker ponders the alternatives.

Without discussing emotions explicitly, Wright and Goodwin (1999) agree that inability to visualize outcomes is a serious danger associated with weighting. MCDA

weighting methods tend to produce cold numbers without the emotional power of hot reality. The artificial situations a decision maker is faced with during MCDA weight elicitation may therefore produce radically different responses from real world irredeemable choices. As a way to go, they recommend decision simulation as a means to make consequences vivid, and this should take place before value elicitation. They mention three methods: role-playing (Armstrong, 1987), outcome psychodrama (Janis and Mann, 1977) and scenario planning. Scenario planning is a well known method where one creates detailed descriptions of possible alternative future states of the world. Because of the details, each scenario has a low probability, but the advantage is that they may help the decision-maker create vivid mental pictures of what it might be like. The idea is to link the scenarios to different decision alternatives as typical examples of what might happen, and thereby elicit relevant emotions.

There are reports of applications that use weighting and aim at presenting scenarios in a structured and vivid way, even though there is no explicit reference to elicitation of emotion. One example is Belton and Ackermann (1997) who used problem-structuring models in combination with multi-attribute evaluation with a program called VISA to develop an action plan for a hospital trust. Both beliefs and feelings are explicitly mentioned in the paper. Another example, perhaps a bit anecdotal, is Wenstøp and Carlsen (1998) who used two decision panels, one local and one national, to evaluate a hydropower project. To make the consequences vivid, the panels were shown two videos of the landscape taken from a helicopter. The first showed the pristine landscape. An artist had edited the second, which showed what it would look like after development, with reduced waterfalls and dams, etc. The subsequent trade-off process was checked for consistency, and it turned out that the local panel – headed by the mayor – performed with significantly higher consistency than the national panel, which naturally had less strong emotional attachment to the area.

The MCDA literature is otherwise rife with reports that compare different weight measurement methods (Wang and Yang, 1998), (Zapatero *et al.*, 1997). Typical evaluation criteria are consistency, ease of use, confidence in the process and confidence in the results. None of the papers appears to consider the most important issue: whether the participants attached feelings to the scenarios. This needs more emphasis.

Conclusion

According to Wilson (1998), *consilience* is “the jumping together of knowledge by the linking of facts and fact-based theory across disciplines to create a common groundwork of explanation”. If we apply this term to the normative science of decision making as well, this paper has argued for the consilience of the fields of ethics, neuro-physiology and decision sciences.

The main picture is simple: Decision-making involves two different arenas that are separated by Hume’s gulf, namely beliefs and values. Beliefs about facts are obtained through perception and reasoning, while values must be felt. Rationality requires that both beliefs and values be well founded, and values cannot be well founded without emotion. Thus, rational decision-making – or *emotional rationality* – requires elicitation of emotions. Several authors report about efforts to make consequences more vivid, and this is certainly a step in the right direction, which deserves more emphasis.

The picture is made more complicated by the presence of different decision-making mindsets. The paper argues that MCDA cannot handle virtues well, although questions involving virtues are usually very emotional. Therefore, proper MCDA requires a careful separation of virtues and ends, and then focus on the ends in the subsequent analysis. The key function of emotions is to attach feelings to scenarios involving end values. Without emotions, these values will not be enacted, and decisions become arbitrary. If that happens, we tend to fall back on a logic of appropriateness, emphasising virtues, without taking into account what really matters – how it would be to live with the future consequences.

Open questions

Although this paper has argued that MCDA cannot handle virtues in a comfortable way, this important issue should be considered further. The question comes for instance up as rights issues in environmental management. It also comes up with regard to corporate core values; can they – should they – be incorporated in MCDA?

The main issue, though, is how the rationality of MCDA applications can be improved through elicitation of reliable emotions with sufficient stability over time to be counted on.

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