Inventing Prescriptive Decision Analysis

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The problem:
What is prescriptive decision analysis?

- Widely recognized that:
  - Most classical normative theories are descriptively inadequate with no "easy fix"
  - Normative / descriptive opposition should be replaced by a "prescriptive" synthesis (e.g. W. Edwards et.al. 1992; Bell, Raiffa, Tversky 1988)

- But what are desiderata for a prescriptive methodology?

- What "integrates" behavioral and normative considerations?

- How do you recognize a good answer?

Problem has significant philosophical and methodological dimensions which are neither purely formal nor cognitive-behavioral.

Some normative and behavioral desiderata for prescriptive decision analysis:

- Some formal-normative foundation for values, uncertainties, outcomes, choices

- Allow for multiple and sui generis values

- Multiple and constructed measures needed for multiple values

- Bounded rationality implies second-order decisions about decision-making process: the normative theory should generate effective heuristics

- Should coherently address constructive aspects of decision-making processes: What are the formal correlates of constructive choice?

- Normative theory should afford robust learning without requiring perfection

The goal restated: Integrate normative theory with behavioral constraints through a constructive learning process

Methodologically, the desiderata imply a "neo-aristotelian" decision theory

Behavioral decision theory	Nicomachean Ethics
• Modern abstraction of preferences across outcomes (e.g. Savage)	• "Practical syllogism" as near equivalent in Aristotle of the logic of preference and choice E.g. MA 701a
• Multiple values and tradeoffs	• NE 1141a: "Good not a single feature…"
• Constructed measures	• NE 1137b: Need for "flexible rulers"
• Bounded rationality	• NE 1095a: "Beings with our capacities..."
• Central role for heuristics	• NE 1095a: "Precision appropriate to area…."
• Decision-making as a learned practice	• NE 1179b: On learning and decisions
• Value-focused thinking	• NE 1141b: "Stochastic arts. . ."
• Uncertainty	• Physics 1976: Luck as only relevant to choice.

If Pascal created the first modern decision-theoretic argument, then Aristotle was the first behavioral decision theorist.
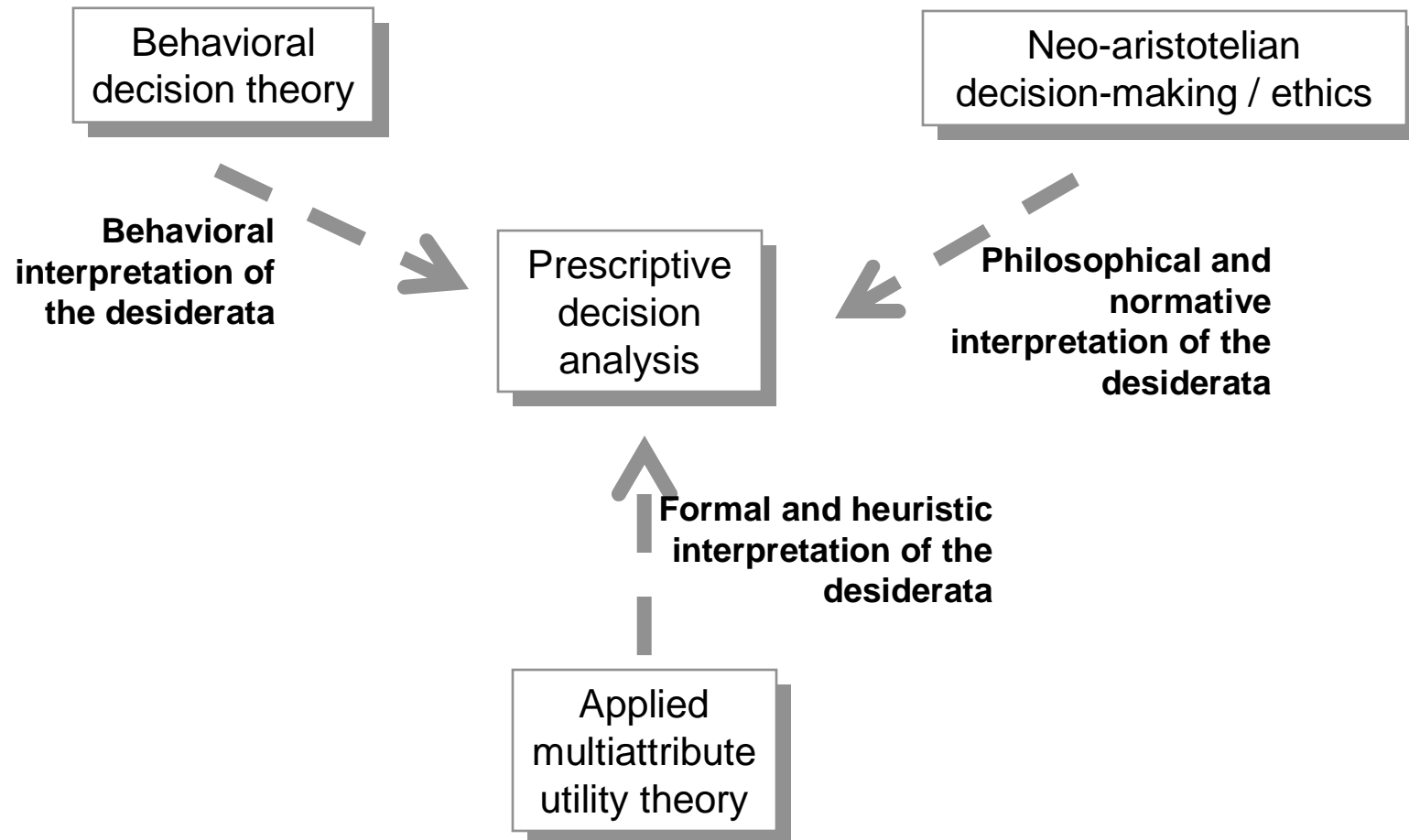
But, *applied* multiattribute utility theory also largely realizes the desiderata

- *"Applied" means the formalism plus a constructive process using heuristics based in the formalism*
  - Construction of values and development of a value hierarchy
  - Construction of measurement criteria and utility functions
  - Formulation of tradeoffs, conclusions, and learning

- *Relationship between mua and constructive processes understood*
  - Gregory et.al. 1993, on constructed values and mua

- *Logical role of constructive process identified in the formalism*
  - Redefinition of value hierarchies
  - Redefinition of measurement scales and associated utility functions
  - Arrow's Theorem on impossibility of aggregating values

So: Applied multiattribute utility theory is an excellent example of a prescriptive theory, and is strongly "neo-aristotelian" as well.

Characterizing "prescriptive decision analysis"

Behavioral decision theory →(Behavioral interpretation of the desiderata)→ **Prescriptive decision analysis**

Neo-aristotelian decision-making / ethics →(Philosophical and normative interpretation of the desiderata)→ **Prescriptive decision analysis**

Applied multiattribute utility theory →(Formal and heuristic interpretation of the desiderata)→ **Prescriptive decision analysis**

Applications (1)

- Nussbaum and Sen (eds.) *The Quality of Life* 1993
    - Practical neo-aristotelian, mostly social-economic characterization of quality of life
    - Has unrecognized behavioral/mua consequences and simplifications
    - Some incorrect ideas about multiple values and their proxies

- United Nations 1996 *Human Development Report*
    - Capability metrics are mua-style constructed measures
    - Possible confounding of value tradeoffs with econometric measures

- *Therefore: Another bridge between behavioral and economic theory*
    - Fischhoff 1991 et.al on contingent valuation and constructed values
    - In this case, more "methodological harmony"

Applications (2)

- NAS *Understanding Risk* 1996 and others on the analysis of values in environmental policy, stakeholder roles, etc.

  – Interdisciplinary, behavioral, and prescriptive approach to environmental risk a methodological inevitability

- Applied mutiattribute utility theory as the "formal logic" of neo-aristotelian ethics and behavioral decision theory

  – Behaviorally-oriented, multiple-valued "utility" has effectively negated and superceded classical utilitarianism and "utility"