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Is Value Focused Thinking a Problem Structuring Method or Soft OR or what?

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There are many ways that OR practitioners plan and their efforts so as to meet the needs of clients, problem owners, and other stakeholders. This note aims to clarify the position of one specific approach– value focused thinking (Keeney, 1992) with respect to two more general terms found in the literature: problem structuring methods (e.g., Mingers & Rosenhead, 2004) and Soft OR (Forrester, 1994).

To start let's considering what OR does. It creates a mathematical model of some elements of a system or phenomenon, where the mathematical model consists of variables and functional relationships between them. Because it is mathematical, it is possible to derive the implied behaviors of the system under various assumptions. Reality is infinitely complex, but models are not, so there are infinitely many possible models of reality. Better models define useful variables and relationships, useful in the sense that:

1) we can estimate input values somehow, based on measurements or judgments about the world,
2) we can readily translate the formal implications of assumptions to guidance for real-world action
3) there is some efficiency in the calculations, i.e., the models are designed to make use of OR algorithms that apply to certain mathematical structures.

What does it mean to structure a problem? Isn't the problem just what it is? Not really. When we talk about a *problem*, we mean something more like a word problem that is solvable, as opposed to the real world *mess* (this is a term used by Powell & Baker, 2010 in their excellent Management Science textbook). So problem structuring is about figuring out a useful characterization that will tell us something about something but not everything about everything.

Problem structuring methods involve identifying issues, questions of concern, interesting observations, motivations, in order to *frame* a problem whose solution will be worth the effort (that is, it will be worth a lot and it won't take that much effort). These methods usually involve some sort of openly outward looking phase that pulls together readily available information and invites individuals to state their opinions and interpretations regarding the situation. Following this phase, some sort of problem statement must be developed – a statement of what is to be used as inputs, what are the desired outputs, what are the decisions, and what are the ranges within which it is necessary to understand the relationships between all these variables. Problem structuring ends with the connection of this definition to, perhaps, a prototype model or an initial mathematical formulation that still requires some specification and population with data (whether historical, arbitrary, subjective, or scientifically measured).

Soft OR methods aim to use some elements of OR modeling to improve decisions, without necessarily requiring that a detailed formal solution be calculated and followed. Although some specific methods are well-defined, soft OR in general does not have crisp boundaries. These methods tend to be concerned with the dynamics of group or organizational processes and how they relate to the more

mathematical side of decision making. The goal is to help the group generate insights and come closer to a decision. Typically, soft OR methods are simplified versions of some kind of formal OR method. They obtain individual judgments and partially structure them in a manner that with more work might be specified as inputs to a particular family of models (or perhaps any kind of calculated model). They also involve a deliberative process. OR tools may support the discussion by providing answers to what-if questions along the way, but the final decision is usually selected by the stakeholders in a qualitative way. *Decision conferencing* (Philips, 2007) is a well-established and well-documented approach to managing the process of bringing people together and using models constructively along the way. The models in decision conferencing are usually related to decision analysis models. Other soft OR techniques may relate to one or more other type of OR models.

Decision analysis as a set of applied tools (as opposed to formal decision theory) requires problem structuring. For example, although there are cases such as surgeries, oil drilling, and litigation where an obvious decision tree to use, it is more useful to think of decision trees as creations that represent some aspect of the ongoing stream of events in our lives and in the universe. The decision trees created are intended to capture some bounded set of choices that are to be made logically consistent with preferences and beliefs. Some aspects of decision analysis can be thought of as soft OR. For example, influence diagrams are an abstraction of the concept of decision trees that allow for representation of functional relationships. Decision analysis clients often find the process of creating the influence diagram to be of great value in understanding their situation and in communicating internally about how they ought to think about it and how to proceed. Other tools often used in applied decision analysis are can also be thought of as problem structuring methods, e.g., strategy tables are used to generate reasonable sets of alternatives, and decision hierarchies are used to classify decisions as accepted policy (not to be challenged in the current analysis), downstream (assumed to be optimized later on, but without detail in the current analysis), and strategic with regard to the current analysis.There are also parts of decision analysis that are not about problem structuring, e.g., methods for elicitation of preferences, utilities and probabilities, and methods for calculating expected utility, certainty equivalents, value of information and so on. Decision analysis is not generally considered soft OR – the calculations involved are usually simple enough (as opposed to some sorts of optimization) that they are completed and a course of action is recommended. But it often has some soft OR flavor. For example, the *dialog decision process* (see, for example, McNamee & Celona, 2008) developed and used by consulting firm SDG and its clients (the "Stanford school" of DA) involves a staged sequence of facilitated interactions between carefully identified stakeholders, decision makers, modelers and experts, where conversations alternate with analysis, culminating in commitment to a plan of action indicated by the analytic result.

<u>Value focused thinking</u> can be thought of as a method for problem structuring in at least two ways. First, it lays out all the various concerns of stakeholders and structures them into a smaller, more tractable and measurable set of variables from which it is clear how a formal utility model can then be built, assessed and calculated. Thus, VFT techniques can often be useful for structuring the values side of a problem in a standard tree-oriented decision analysis. Beyond that, VFT as laid out by Keeney is also used to generate alternatives, and thus helps to structure that aspect of the problem as well. VFT is

quite amenable to use as a soft OR tool. It is quite natural to use in a group setting in order to pull together a shared definition of qualitative issues, even without consensus about tradeoffs and other assumptions. In fact, VFT techniques would not be out of place in early phases of classical decision analysis or decision conferencing, and in the field of decision analysis, there are not really sharp divisions where one practitioner is a VFTist while another is a classical decision analyst or decision conferencer. VFT also plays a soft OR role to the extent that the quantification of tradeoffs – the identification of or agreement about the objectives the organization truly values enough to base their choices on them – may well be a useful end in itself. The insights provided by the VFT model before or after it is populated with specific value judgments often suggest courses of action in a particular situation (with or without the specific steps for generating and evaluating alternatives as in VFT-based decision analysis). Or they may clarify the mission of the organization so that decentralized actors can pursue consistent courses of action as new decision situations arise over time.

To answer the question, then. Part of the VFT approach is a sort of problem structuring method, and part of the VFT approach can be a sort of soft OR; it can be used with other OR tools as part of a larger effort, and in particular is often combined with the rest of the machinery of decision analysis.

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