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Introduction to the Special Issue: Teaching Soft O.R., Problem Structuring Methods, and Multimethodology

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The topic of this special issue needs a different sort of introduction, especially to a U.S. readership. This is because the issue is about the teaching of problem structuring methods (PSMs) and soft O.R., both topics that are not well known within the United States. In much of the rest of the world—especially in Britain but also in Europe and many other countries—these approaches are increasingly known, taught, and used. Indeed, the current President of the United Kingdom Operational Research Society says that in Britain “methodologies for problem structuring and techniques suited to help the understanding of those involved have been part of what has been taught in postgraduate O.R. courses for many years and continue to evolve” (Eglese 2011, p. 25). We discuss below possible reasons for the limited take-up so far of PSMs and soft O.R. in the United States.

We therefore need to start by setting out the generally understood meaning of the terms “problem structuring methods” and “soft O.R.” We will start with the former, which is more sharply defined. PSMs are a family of methods that developed, at first independently, out of a long drawn-out crisis of dissatisfaction with the ability of the traditional mathematical methods of O.R. to give modellers access to the more strategic problems and issues of the organisations they worked in or wished to help. C. West Churchman (1967) was one of the first to focus attention on this difficulty. In an editorial in *Management Science* in 1967 he brought Rittel’s concept of “wicked problems” to wide attention. These are “social problems which are ill formulated, where the information is confusing, where there are many clients and decision-makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing” (Churchman 1967, p. 141).

Much later, Schon (1987) called these the problems of the “swamp” (as opposed to the problems of the high ground). Strategic problems usually have a significant dose of “wickedness” in their makeup.

It gradually became clear over the 1970s and 1980s that problems of this kind presented a range of challenges to traditional O.R. Our powerful preexisting analytic methods could only begin to bite once a clear problem had been agreed upon. But there were no methods beyond generalised platitudes for reaching that agreement (see the brief introductory chapters of almost any standard text). It was worse than that, however. The general O.R. approach, since its origins in World War II, was to develop a model of relevant factors, and of their interaction, that would enable better (or even best) decisions to be made. However, in the more complex situations highlighted by Churchman (1967) and Schon (1987) and others, there is no single model to aim for. Each participant in the wicked problem (we may call them stakeholders) has his or her own partial perspective on the situation. No one perspective is the basis for the “right” model, but all of them are relevant. The question that PSMs aim to help with is: How can models based on the range of different perceptions and positions in a problematic situation help the participants in that situation to resolve what actions they might agree to take?

There is a range of methods within the PSM family. Each has its own specialised function. The most widely used are as follows.

- *Strategic Options Development and Analysis* (SODA) is a general-purpose, problem identification method that uses cognitive mapping as a modelling device. The concepts that individuals use to make sense of their problematic situation, and the causal

links thought to exist between those concepts, are elicited in individual interviews and recorded in map form. These maps are subsequently merged into a single “strategic map.” This strategic map provides the framework for facilitated discussion in a stakeholder workshop. A more rapid version known as the *oval mapping technique* operates in workshop mode throughout.

- *Soft Systems Methodology (SSM)* is a general method for system design or redesign that aims to generate debate about alternative system modifications. It adopts a systems-theoretic framework to problem situations for which there are different perceptions based on contrasting world views held by stakeholders. Exploration of these world views leads to the generation of definitions of alternative systems, each of which is expanded into the component activities that would be necessary for it to operate successfully. This generates a range of contrasting alternatives for the modification of the system that is used to generate constructive debate.

- *Strategic Choice Approach (SCA)* is a planning approach centred on the management of uncertainty and commitment, which takes place entirely in workshop format. There are four modes of analysis:

- *Shaping*: Different areas for choice are elicited from workshop members, and a subset of these areas is selected as a problem focus.

- *Designing*: Here incompatibilities between the action options for each of the decision areas within the problem focus are identified, so that feasible decision schemes can be derived.

- *Comparing*: A short list of decision schemes is agreed upon and then compared pairwise, using often nonquantitative criteria. Significant uncertainties are commonly revealed by this process.

- *Choosing*: In this mode a “progress package” is agreed upon, consisting of partial commitments to be made at this stage, explorations to be launched to reduce key uncertainties, contingency plans, and a timetable for later choices.

Other PSMs include robustness analysis and drama theory. An introduction to the PSM family can be found in [Rosenhead and Mingers \(2001\)](#), and a survey of their applications is in [Mingers and Rosenhead \(2004\)](#), the latter being in a special issue of the *European Journal of Operational Research* devoted to this subject. Specialised references to particular methods can be found in these publications.

What is common to all these methods is that the models are transparent, i.e., in common language and diagrams understandable by lay people. The models serve as the focus of engaged discussion guided (in process terms though not in content) by a facilitator. The models enable each participant to expand his or

her own perspective, understand those of other stakeholders, and thus reach mutual accommodations that permit constructive progress.

So far, we have been unpacking the term PSMs. The sister phrase, soft O.R., has a less clear meaning. At one extreme it has been used to signify any use of operational research that pays serious attention to nonquantitative factors. But more often soft O.R. has been used as a virtual synonym for PSMs. Our use of the term is nearer to the latter but does make a distinction. We take soft O.R. to include those decision-focussed model-based methods that are based on facilitated participant interaction. This is a more fuzzy-edged category. It includes, but is not limited to, PSMs. For example, arguably Ackoff’s interactive planning ([Ackoff 1979](#)) falls within its scope, as does strategic assumption surfacing and testing of [Mason and Mitroff \(1981\)](#). The concept of multimethodology ([Mingers and Gill 1997](#)), where a variety of hard or soft methods may be combined in part or in whole, encourages the development of hybrids between the better-known methods. It is also possible to use traditional “hard” models in a “soft” way, for example, by developing several different mathematical models, each reflecting different stakeholder viewpoints and assumptions.

Researchers and practitioners in soft O.R./PSMs do not consider them as a challenge to or substitute for the established mathematical methods of O.R. Soft O.R. could no more schedule an oil refinery than dynamic programming could help a group of disparate stakeholders with variable or non-existent quantitative skills to agree on what subset of their shared problematic situation they should attempt to make progress with. The approaches are complementary.

Having introduced the field of interest, and before giving an introduction to the specific papers in this issue, we would like to return briefly to the strange phenomenon mentioned in our opening paragraph, namely, the virtual absence of these methods from teaching and publication in the United States. There was discussion of this in *O.R./MS Today* ([Mingers 2009a, b](#)). Possible interlocking reasons for this strange asymmetry of development have been suggested by [Mingers \(2011\)](#) as follows:

- The editorial policy of prestigious U.S. journals tends to deter submissions of soft O.R. papers;

- The consequential absence of publications discourages researchers in these fields from even considering such journals;

- The tenure requirement for publication in prestigious U.S. journals steers young academics away from selecting these topics as their area of research concentration;

- The result is that soft O.R./PSMs are virtually invisible to the U.S. academic community.

This special issue is conceived, in part, as one way of breaking into this vicious circle.

The authors of the papers have tackled the issue of discussing the teaching of soft O.R./PSMs in very different ways. However, a common theme is the attempt to discover how the conditions for student learning can be discovered, given the particular and potentially elusive nature of the subject matter. Several of the papers describe a process of explicit trial-and-error learning by the teachers in the pursuit of this objective.

O'Brien et al. is the most extreme in this respect, as it describes a course that has evolved over a full 30-year period. This is not a course *in* “soft O.R.” Rather, it is a course that teaches those approaches that can usefully support the strategy process in organisations. These tools are predominantly “soft” in nature, although there are no PSMs among the regular fixtures in the curriculum.

The course makes extensive use of group-based learning through working together on practical exercises. This is also a common theme in other papers. **Carreras and Kaur** develop the concept of “meaningful learning,” which is a variant of the more-established concept of experiential learning. How this works in practice is shown by reference to experience in teaching a workshop in which the participants use causal mapping (the technical basis of the SODA approach) on a topic of direct relevance to their own situation as O.R. students.

Hindle considers the teaching of soft systems methodology. This presents particular difficulties, he states, because its broad application scope leads to very flexible ways in which it can be used. That SSM has also developed its own rather idiosyncratic language is also an obstacle. Here again experiential learning is the basis of the teaching approach. An example is provided of case-study material based on a realistic consultancy project, and a blueprint for a course module is included.

There is a second paper, that of **Cordoba-Pachon**, whose focus is also systems-theoretic. In this case, however, it is not a single PSM that is the subject but a group of systems-inspired approaches. The author considers two alternative modes of education in systems thinking. The abstraction mode enables students

to appreciate different systems ideas and methodologies to help them deal with complex situations. It was problems revealed by the course evaluation of teaching based on abstraction that led to the alternative of engagement-based teaching, in which students learn through involvement in “real” learning situations. Problems still remained for enough students to merit the development of teaching at two levels, novice and expert.

Finally, **Ackermann** provides a broad look across the spectrum of PSMs. She identifies a range of seven challenges confronting the PSM teacher, for example, “giving students’ confidence in not having to have the ‘right’ answer.” For each challenge, she considers a number of options as to how they might be overcome. Many (but not all) of these involve somehow getting the real world into the classroom. That is an approach that all of the papers in this special issue support.

Our hope is that those O.R. educators who feel inspired to try teaching their students some problem-structuring methods or soft O.R. will find that the papers included here give both valuable guidance and also the confidence to see that there is no one best way of doing it.

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