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Decision Aiding

Wisdom, decision support and paradigms of decision making

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Abstract

Many decision support tools have been developed over the last 20 years and, in general, they support what Simon termed substantive rationality. However, such tools are rarely suited to helping people tackle wicked problems, for which a form of procedural rationality is better suited. Procedurally rational approaches have appeared in both management science and computer science, examples being the soft OR approach of cognitive mapping and the design rationale based on IBIS. These approaches are reviewed and the development of *Wisdom*, a procedurally rational decision support process and accompanying tool, is discussed and evaluated.
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1. Introduction

Many decision support systems have been developed over the last 20 years. Their designers intend them to help humans make decisions in situations that range from the simple to the complex. The term 'decision support system' seems to have been popularised by Keen and Scott Morton (1978), and its abbreviation, DSS, quickly became part of the terminology of management science and of

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computer science. But how should decision support be provided and what form should DSS tools take?

As argued below, conventional DSS are very useful when used to support decision making in situations that are well defined. However, they are less useful when problematic situations are ill defined and, in particular, when there is debate about what should be done rather than how it should be done. In the latter situations, there is a need for methods and tools that support ongoing decision-making processes and that help teams of people to find their way through such messy situations. Furthermore, given the dynamic nature of decision-making teams and the long-term consequences of decisions, there is also a need for decision support systems to allow decisions to be recorded, revisited and changed. Therefore, the requirement is not simply for better support for the process of decision making but, more generally, better support for the entire decision life cycle from initial formulation, through detailed specification, to implementation and change.

In this paper, we discuss a decision support process and associated software support tool (*Wisdom*) that aims to provide extended support for decision making. The *Wisdom* tool and process were devised to support messy deliberation, so as to help people make rational choices when useful information is limited and when there may be disagreement about what should be done and why. In addition, the *Wisdom* tool allows decisions to be recorded in a structured form so that the 'decision space' can be queried, decisions discovered and the arguments made in favour and against these decisions reviewed.

The remainder of the paper discusses different paradigms for decision support and suggests that 'messy' decision making requires procedural support. Different approaches to providing this procedural support are reviewed and we discuss the advantages of adopting an integrated approach that combines cognitive and dialog mapping. We briefly describe the *Wisdom* process and tool that we have developed and discuss its use in supporting long-term decision making in a defence technology company. Finally, we discuss the effectiveness of an integrated approach and reflect on the success of the *Wisdom* approach.

2. Decision support paradigms

2.1. Substantive decision support

Substantive decision support refers to approaches that attempt to provide knowledge-based expertise to address particular decisions. As a simple example, consider the problem of designing a bridge to carry known loads. In concept, at least, we can develop a DSS that supports bridge designers by offering different design options and, within each, carries out the calculations required to proceed towards an acceptable, or even optimal, design. The DSS must include a knowledge base of possible broad design options for bridges and also known calculations of the forces that the bridge must face, given the likely loads, materials used and its structural form. This hypothetical DSS could also provide support for developing economic models of the bridge design and its operation.

Such a DSS would provide its detailed support from established knowledge held in a knowledge base and could be of great use in bridge design. However, this form of DSS is suited only to decisions in which the aims of the work are known and agreed. In the terms used by Rittel and Weber (1973), these are 'tame problems'. As Checkland (1981) puts it, this bridge design DSS would support designers who know what needs to be done and why, but who need help in deciding how it should be done.

A tame problem need not be trivial, for there are many calculations to make when designing a bridge and many decisions to be made. However, it is, essentially, a problem of engineering a solution to a known concern. Building on Ackoff (1979), Pidd (1996) discusses the ways in which people use the term 'problem' and provides a spectrum containing three points as examples.

- Puzzles: situations where it is clear what needs to be done and also, in broad terms, how it should be done. A puzzle solution can be found by applying known methods, e.g. a particular mathematical method.

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