Chapter 7.9
Decision Support Systems and Representation Levels in the Decision Spine

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INTRODUCTION: DECISION-MAKING AS PROBLEM SOLVING

Problem solving has been defined as the complex interplay of cognitive, affective, and behavioural processes with the aim to adapt to external or internal demands or challenges (Heppner & Krauskopf, 1987). In the realm of organizational decision-making, Herbert Simon (1977) describes the problem-solving process as moving through three stages: intelligence, design, and choice. In this context, design focuses on "inventing, developing and analysing possible courses of action," where the design artefact being constructed for this purpose constitutes the "representation of the problem."

While a wide range of representation means and calculi have been proposed for decision problem solving purposes, practical implementations generally involve applying one or more of these means to develop the structure of the problem within one or more frames. Typically, these are future-scenario frames, multi-attributed preference frames, and rule base-frames (Chatjoulis & Humphreys, 2007). Simon (1977) characterized decision problems according to the degree of problem-structure that was pre-established (or taken for granted as "received wisdom," or "the truth about the situation that calls for a decision") at the time participants embark on the decision problem solving process. He placed such problems on a continuum ranging from routine (programmed, structured) problems with well-specified solutions to novel, complex (unprogrammed, unstructured) with ambiguous solutions.

System thinking and soft systems methodologies (Checkland, 1999) have provided ways of looking at problem solving as an integrated whole throughout this continuum by modelling the process within a problem definition cycle, moving from the awareness that a problem exists to the moment of choice. Central to these models is the specification of a sequence of stages that the decision-making group has to follow in order to reduce uncertainly and increase structure, in transforming an ill-defined problem into a well defined one (Humphreys, 1989; Phillips, 1992). A great number of decision support systems (DSS) have been produced with the goal of providing mechanisms to help decision makers get through such sequences in processing uncertain and ambiguous decisions (Silver, 1991). The majority of these DSS are intended to support decision makers by increasing the structure of decision problem representations situated in already semi structured decision situations (Keen, 1980). However, as Meredith (2006, p. 31) points out:

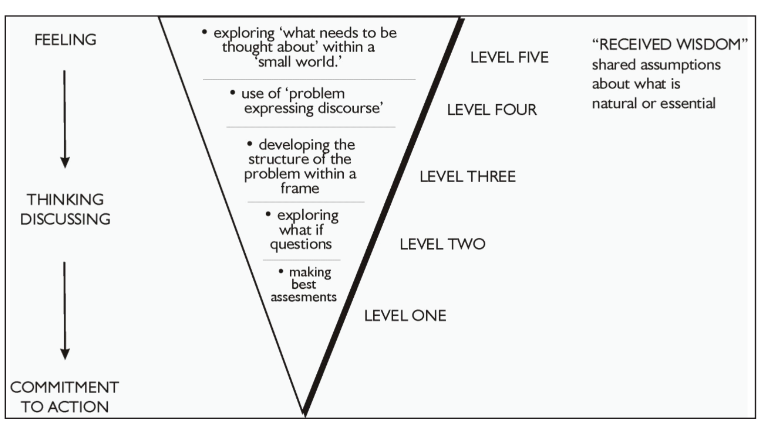
At the extremely unstructured end of the continuum sits a class of decision problems for which a pre-existing solution either does not exist or is inadequate. Such problems require creative decision-making. DSS designed to support decision makers with such a task face a dilemma: too much structure may stifle the creative process, while too little structure provides inadequate support.

In such situations, participants embarking on the decision-making process can start out at the level of feeling, without being constrained (either explicitly or implicitly) by "received wisdom" about how the decision problem is already structured. Initially, participants have complete freedom and autonomy about how to think about translating this desire into action: all imaginable courses of action are candidates for implementation (Meredith, 2006). Conventional decision support methodologies, operating within the problem solving paradigm, intend to support a group process that aims at progressively strengthening the constraints on how the problem is represented at five qualitatively distinct levels, until only one course of action is prescribed: the one which should actually be embarked upon in the *real* (Humphreys & Jones, 2007).

LEVELS OF REPRESENTATION OF DECISION PROBLEMS

Each level of problem representation is associated with a different kind of discourse concerning how to structure the constraints at that level (Humphreys, 1998). The nature of the knowledge represented at each level and the cognitive operations involved in generating these knowledge

Figure 1. Five levels of constraint setting along the decision spine



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