Chapter 4
The Systemic Process

4.1 From Novice to Expert

The perception of learning to be outlined in this chapter is based on a model set out by Dreyfus and Dreyfus in 1986. Their model assumes that learning takes place in five stages, which they call: (1) novice, (2) advanced beginner, (3) competent, (4) proficient and (5) expert (Dreyfus and Dreyfus 1988, pp. 16–51).

In the first stage, the novice learns to recognise the objective facts and features that are relevant for the particular skill to be acquired and learns rules that can determine actions based on such facts and features. Characteristic of this initial learning stage is that the rules for determining action can be applied in an unambiguous and context-free way. The two Dreyfus brothers, one a philosopher and the other an operations researcher, use the well-known example of learning to drive a motorcar. At the novice stage—we assume a car not equipped with an automatic gear—shifting the gear is an action the learner needs to become familiar with and the instructor relates it to speed. In the same way, the minimum distance to the car in front prescribed by the instructor is also related to speed. When first introduced, these rules will ignore context by not referring to traffic density, for example, or anticipated stops.

In the following stage, advanced beginner, the learner has accumulated some experience by using the rules. What happens now is that by handling issues with meaningful elements in concrete situations, which neither the instructor nor the learner can define in terms of objectively recognisable context-free features, the advanced learner starts to recognise these elements when they are present. This is done by noticing similarity with prior examples. Dreyfus and Dreyfus call the new elements "situational" to distinguish them from context-free elements. Rules for behaviour now relate to both the new situational and the context-free components. In the case of the car driver, the learner now uses both situational engine sounds as well as context-free speed to determine gear-shifting.

At stage 3, competence, what happens is that further accumulation of experience leads to an overwhelming number of context-free and situational elements in

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a real-world setting. To cope with such problems, people have to learn to adopt a hierarchical procedure of decision making to organise the situation. By first addressing a small set of the most important factors, a person's performance can both be simplified and improved. As Dreyfus and Dreyfus explain, a competent performer with a goal in mind sees a situation as a set of facts whose individual importance may depend on the presence of other facts. Given a situation with a particular constellation of facts, a certain conclusion should be drawn, a decision made, or an expectation investigated. In the car-driving example, the safe and smooth operation of the vehicle is related, for example, to the goal in mind of going quickly from A to B. The route is then chosen with attention to distance and traffic, which may result in manoeuvring the car in a way that disregards passenger comfort.

Important changes take place from the novice stage via advanced beginner to the competence stage according to Dreyfus and Dreyfus:

> *… the novice and advanced beginner recognize learned components and then apply learned rules and procedures. As a consequence, they feel little responsibility for the outcome of their acts. Assuming that they have made no mistakes, an unfortunate outcome is viewed as the result of inadequately specified elements or rules. The competent performer, on the other hand, after wrestling with the question of the choice of a plan, feels responsible for, and thus emotionally involved in, the product of his choice. While he both understands and decides in a detached manner, he finds himself intensely involved in what occurs thereafter. An outcome that is clearly successful is deeply satisfying and leaves a vivid memory of the plan chosen and of the situation as seen from the perspective of the plan. Disasters, likewise, are not easily forgotten* (Dreyfus and Dreyfus 1988, p. 26).

In many ways, stage 3, where competence is achieved, seems to describe—or more simply match—the kind of decision making that can be related to the decision support provided by successful conventional planning. The understanding and deciding in a detached manner, combined with what we might call best practice performance clearly dependent on actual involvement, are basic characteristics of good planning performance that a great number of experienced planners would probably subscribe to. Therefore, for my purpose of outlining a systemic planning practice with a broader view of planning, it is highly relevant to see how Dreyfus and Dreyfus relate and assess the competence learning level to problem-solving in general:

> *When cognitive scientists, psychologists, and others who think about thinking speak of "problem-solving", they have in mind the thought processes that characterize competence. Herbert Simon is typical of such information-processing psychologists, for his concern is to understand how we choose plans, goals, and strategies, and how situations represented as sets of facts and figures can be transformed by rule-like procedures into new sets that conform with our goals. Those psychologists have produced convincing evidence that we act as problem-solvers when confronted by puzzles or by unfamiliar situations. However, they typically go on to generalize their results too far, accepting as essentially true, without supporting this claim by any arguments or empirical evidence, that all intelligent behavior is of the problem-solving form. They thus uncritically accept the information processing assumption that intelligence consists in drawing conclusions using features and rules.* (Dreyfus and Dreyfus 1988, pp. 26–27).

Table 4.1 Overview of the five stages of skill acquisition

Skill level	Components	Perspective	Decision	Commitment
(1) Novice	Context-free	None	Analytical	Detached
(2) Advanced Beginner	Context-free and situational	None	Analytical	Detached
(3) Competent	Context-free and situational	Chosen	Analytical	Detached understanding and deciding. Involved in outcome
(4) Proficient	Context-free and situational	Experienced	Analytical	Involved understanding. Detached deciding
(5) Expert	Context-free and situational	Experienced	Intuitive	Involved

Adapted from Dreyfus and Dreyfus (1988, p. 50)

The following stage 4 in the five-stage model, proficiency, is transitional between analytic and intuitive thinking. The proficient performer is seen as deeply involved in the specific task. Because of recent events, certain features of the situation will stand out as salient and will be scrutinised in new perspectives, while others will recede into the background and be ignored. No detached choice or deliberation is seen to occur, and intervention seems to happen based on similarity with previous situations in the proficient performer's experience. The skill applied here by intuitively responding to patterns without decomposing them into component features is termed "holistic discrimination and association". Intuition is seen as a "product of deep situational involvement and holistic discrimination" (Ibid., p. 29).

The final stage 5, expertise, is seen as the stage where deliberation does not require calculative problem-solving but where critical reflection will address the expert's intuition. Typically, however, the performance of the expert will be ongoing and nonreflective, concerned with what normally works. In our car-driving example, the expert driver has become "at one with the car" and experiences the situation as "driving" and not "driving a car" (Ibid., p. 50). Table 4.1 presents an overview of the five-stage learning model.

4.2 Towards Intelligence Beyond Calculative Rationality

The major concern of Dreyfus and Dreyfus when they published their book, *Mind over Machine*, in 1986 was to discuss the potential of the various research programmes in artificial intelligence (AI). Their main point was that these could not be expected to progress beyond stage 3 about competence in their formulated five-stage learning model whereas "human intelligence" can achieve this. Human learning therefore makes possible:

> *… the progression from the analytic behavior of a detached subject, consciously decomposing his environment into recognizable elements, and following abstract rules, to involved skilled behavior based on holistic pairing of new situations with associated responses produced by successful experiences in similar situations.* (Dreyfus and Dreyfus 1988, p. 35).

With regard to rationality and intelligence, this makes room for "arationality". This is argued in the following way (Ibid., p. 36):

> *The moral of the five-stage model is: there is more to intelligence than calculative rationality. Although irrational behavior—that is, behavior contrary to logic or reason—should generally be avoided, it does not follow that behaving rationally should be regarded as the ultimate goal. A vast area exists between irrational and rational that might be called arational. The word rational, deriving from the Latin word ratio, meaning to reckon or calculate, has come to be equivalent to calculative thought and so carries with it the connotation of "combining component parts to obtain a whole"; arational behavior, then, refers to action without conscious analytic decomposition and recombination. Competent performance is rational; proficiency is transitional; experts act arationally* (Dreyfus and Dreyfus 1988, p. 35).

4.3 Arationality and Subworld

The concept of arationality deserves particular attention. If the usual rationality linked to analytical decomposition expresses the essential features of intelligent simplification thinking, does similarly arationality then express a kind of synthetic composing or in more everyday language: a kind of intelligent, holistic behaviour? And were this the case would it then be possible to benefit from this type of behaviour when dealing with a complex problem?

These questions can be answered in a confirmative way. In this respect the concept of subworld will be introduced by another quote from *Mind over Machine* written by the Dreyfus brothers in 1986. As mentioned the purpose of their book was to argue that artificial intelligence (AI) would face difficulties progressing beyond the intelligence to be associated with the learning level 3 of competence as contained in the formulated five-stage learning model. In hindsight, AI research afterwards seems not to have contradicted this statement. Their distinction between "universe" and "subworld" is set out as follows:

> *… physical ideas about the universe can be built up by modeling relatively simple and isolated systems and then making the model gradually more complex and integrating it with models of other domains. So much is possible because all the phenomena are presumably the result of the lawlike relations of a set of basic elements …*
>
> *This idea doesn't work in AI. There workers confused two domains, which we shall distinguish as universe and world. A set of interrelated facts may constitute a universe, like the physical universe, but it does not constitute a world. The latter, like the world of business, the world of theater, or the world of the physicist, is an organized body of objects, purposes, skills, and practices on the basis of which human activities have meaning or make sense. Thus one can contrast the meaningless physical universe with the meaningful world of physics. Subworlds, like the world of physics, the business world, and the theater world, make sense only against a background of common human concerns. They are local elaborations of the one commonsense world we all share. That is, subworlds are not related like isolable physical systems to larger systems they compose, but are rather, local elaborations of a whole, which they presuppose.* (Dreyfus and Dreyfus 1988, p. 76).

This contrasting view of "world" opposite the view of "universe" indicates a highly relevant issue to observe when considering how to deal with complex strategic issues. Specifically it shows the necessity of having to presuppose a kind of underlying world complexity in principle by the local elaboration which the dealing with the complex strategic decision task represents; the wording "dealing with" is deliberately chosen as "solving" is not meaningful under such a perspective. The local elaboration of the one commonsense world we all share is a situation very much different from a situation where we are engaged in a solving approach (by systematic thinking solely) as such a solving approach is characterised by concretely modelling the representative socio-technical system by establishing component-like links to the larger environment system. For the same reason the subworld concept is of great principal importance for the idea of systemic planning as described below. In brief the subworld notion emphasises that the elaboration of a complex strategic decision task must have a truly holistic orientation in its unfolding.

4.4 Unfolding the Systemic Process

The SP approach was initially developed by making use of the generic structure shown in Table 4.2. In a most simple, generic version, planning can be seen as switching between a mode where the planning environment is 'scanned' for relevant information and a mode where the information is 'assessed'. In the systemic process these two modes are perceived as being complementary: assessment will via clarified preferences enable a new, more focused scanning, and scanning will via new types of information enable a new, more detailed assessment. As the scanning and assessment modes cannot be problematised at the same time, these alternating modes are similar to systemic versus systematic perceived as being complementary. Thereby the generic SP structure in Table 4.2 is obtained as a combination of systemic versus systematic and scanning versus assessment.

Table 4.2 also indicates some methods and techniques. Presently they are only to be seen as examples to illustrate the SP structure (Leleur 2004, 2007). In the chapters to follow they will together with other relevant methods and techniques be treated with regard to their potential as part of providing decision support for strategic decision making.

SP is based on applying appropriate operations research (OR) methods and systems techniques in a kind of self-organising process that embeds conventional optimisation in a wider process of exploration and learning. The ongoing search-learn-debate process drawing on the skills, competencies and purposes for the strategic work moves on by contrasting and interpreting the different findings and insights. The process aims at converging into a satisfactory end result for the decision-makers.

Generally 'hard' OR methods can be seen to provide so-called first-order findings based on calculative rationality, whereas second-order findings (or even

Table 4.2 The SP generic structure as four interrelated modes of exploration and learning

SP generic structure	Systemic	Systematic
Scanning	Example: Critical systems heuristics	Example: Scenario analysis
Assessment	Example: Futures workshop	Example: Multi-criteria analysis and simulation

In the figure different methods are indicated to illustrate some possible method choice that can assist in the systemic process. Adapted from Leleur (2003, p. 262)

higher ones) are associated with systems techniques such as some 'soft' OR methods. The methods and techniques will be the main topic in Chap. 5.

Wrapping up a number of findings the application of systemic planning (SP) for complex strategic choices is based on having recognised that the challenge facing the strategic decision problem is related to open-ended change. This means we must abstain from relying solely on an analytical approach. Instead the SP approach consists of embedding the final decision to be taken in a process of building knowledge about the concrete decision task within a subworld that unfolds in the course of events. Therefore we need to set a team that can be expected to handle this. Generally this team will consist of analysts and decision-makers. Later on in Chap. 6 we will consider the use of decision conferences, where stakeholders of different kinds are also involved. The subworld notion as introduced above sets focus upon the importance of avoiding unintended closures when the systemic process unfolds.

The validity of applying SP on complex strategic choices by using the outlined systemic process will be returned to in the final Chap. 8. At this later stage the discussion will be underpinned by its application on a number of presented cases.

Main points and findings of this chapter

- Hubert and Stuart Dreyfus provide a convincing theory about learning as five consecutive stages leading from (1) novice via (2) advanced beginner and (3) competent towards being (4) proficient and (5) expert.
- A finding based on this theory of learning made use of in systemic planning is the importance of going from *detached understanding* to *involved understanding*. In SP the systemic process has this transformation of understanding as a major goal.
- Another finding for systemic planning from the Dreyfus five-stage model is that rationality (what has been referred to as systematic thinking) is but one type of reasonable cognitive behaviour. At stage 3 in the model, rationality gives way to what is termed arationality (which is not to be confused with irrationality not to be recommended). *Arationality* denotes a kind of intelligent, holistic behaviour that the Dreyfus brothers associate with the most developed stages of their model. They simply find that experts act arationally.
- Another finding concerns the difference between the cognitive notions subworld and universe. The latter assumes a mechanistic view where smaller systems (a

company for example) are linked into the larger system (a market segment for example) as a kind of component. The view behind the subworld is opposite to the mechanistic view as it is seen as a local elaboration of the one commonsense world we all share. In systemic planning the *subworld notion* has been adopted to indicate the collective knowledge about a complex planning problem that evolves in an SP decision conference. This is exemplified by the description in Chap. 7 where a subword unfolds around the activities to look for the best relocation site for a company headquarters. The modes of enquiry to be filled into the systemic process set out in this chapter are dealt with in the following Chap. 5.

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