Opinion Makers Section

Cynefin: repeatability, science and values

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1. Introduction

Several years back David Snowden visited Manchester Business School and gave a seminar on knowledge management. At this he described his conceptual framework, *Cynefin*, which, among other things, offers a categorisation of decision contexts (Snowden 2002). At first I thought this said little if anything more than many other ways of categorising decisions, such as the strategy pyramid stemming from Simon (1960) and beyond Simon back to the prehistory of military theory: *viz.* strategic, tactical and operational (see Figure 3 below). However, a colleague, Carmen Niculae, had more insight and working with her and others, I have since come to realise its power in articulating discussions of decision making and decision support.

In this little note, I want to explore the ideas underlying Cynefin and their import for thinking about values and how these enter into decision making in different contexts. There is nothing dramatic in anything I shall say. Many of you – most? all? – will have reached similar conclusions, but I have enjoyed thinking through these ideas and perhaps David Snowden will take this as a small apology for my initial dismissal of his ideas.

2. Cynefin

So what is Cynefin? It comes from the Welsh for 'habitat', or at least that is its narrow translation. But Snowden (2002) indicates that it also contains connotations of acquaintance and familiarity, going on to quote Kyffin Williams, a Welsh artist: "(Cynefin) describes that relationship – the place of your birth and of your upbringing, the environment in which you live and to which you are naturally acclimatised." The embodiment of such ideas as familiarity makes Cynefin clearly relevant to knowledge management. Nonaka's concept of *Ba* serves a similar purpose: a place for interactions around knowledge creation, management and use (Nonaka 1991; 1999; Nonaka and Toyama 2003). Snowden distinguishes Cynefin from Ba on the grounds that the Welsh word contains associations with community and shared history, but the fineness of this distinction need not concern us too much (for further discussion, see Nordberg 2006 and the references therein). What will concern us is how Cynefin relates to decision making and support; how it suggests the forms that decision analysis might take in different contexts; and how it relates to our self knowledge of our values – and values, it must be remembered, should be the driving force of our decision making (Keeney 1992).

Snowden's Cynefin model roughly divides decision contexts into four spaces: see

Figure 1. In the *known space*, or the Realm of Scientific Knowledge, The relationships between cause and effect are well understood. All systems and behaviours can be fully modelled. The consequences of any course of action can be predicted with near certainty. In such contexts, decision making tends to take the form of recognising patterns and responding to them with well rehearsed actions. Klein (1993) discusses such situations as recognition primed decision making; Snowden describes decision making in these cases as CATEGORISE AND RESPOND.
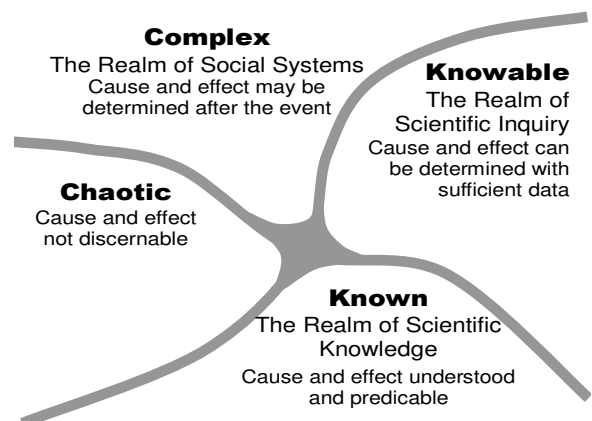

Figure 1: Cynefin

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In the *knowable space*, the Realm of Scientific Inquiry, cause and effect relationships are generally understood, but for any specific decision there is a need to gather and analyse further data before the consequences of any course of action can be predicted with any certainty. Decision analysis and support will include the fitting and use of models to forecast the potential outcomes of actions with appropriate levels of uncertainty. This is the realm in which the standard methods of decision analysis as found in, say, Clemen and Reilly (1996) apply. Snowden characterises decision making in this space as SENSE AND RESPOND.

In the *complex space*, often called the Realm of Social Systems though such complexity can arise in environmental, biological and other contexts, decision making situations involve many interacting causes and effects. Knowledge is at best qualitative: there are simply too many potential interactions to disentangle particular causes and effects. There are no precise quantitative models to predict system behaviours such as in the known and knowable spaces. Decision analysis is still possible, but its style will be broader, with less emphasis on details. Decision support will be more focused on exploring judgement and issues, and on developing broad strategies that are flexible enough to accommodate changes as the situation evolves. Analysis may begin and, perhaps, end with much more informal qualitative models, sometimes known under the general heading of soft modelling, soft OR or problem structuring methods (Franco *et al.* 2006; 2007; Mingers and Rosenhead 2004; Pidd 2004; Rosenhead and Mingers 2001). If quantitative models are used, then they are simple, perhaps linear multi-attribute value models (Belton and Stewart 2002). Snowden suggests that in these circumstances decision making will be more of the form: PROBE, SENSE, AND RESPOND.

Finally, in the chaotic space, situations involve events and behaviours beyond our current experience and there are no obvious candidates for cause and effect. Decision making cannot be based upon analysis because there are no concepts of how separate entities and predict their interactions. Decision makers will need to take probing actions and see what happens, until they can make some sort of sense of the situation, gradually drawing the context back into one of the other spaces. Snowden suggests that such decision making can be characterised as ACT, SENSE AND RESPOND. More prosaically, we might say 'trial and error' or even 'poke it and see what happens!'

The boundaries between the four spaces should not be taken as hard; nor, for that matter should the distinctions between strategic, tactical and operational in the strategy pyramid. The interpretation is much softer with recognition that there are no clear cut boundaries and, say, some contexts in the knowable space may well have a minority of characteristics more appropriate to the complex space.

Snowden uses the ideas of Cynefin to discuss other issues such as organisational culture and leadership, and, of course, knowledge management (Snowden 2002;

Snowden and Boone 2007). There is distinction within knowledge management between *explicit knowledge* – i.e., knowledge with can be encoded – and *tacit knowledge* – the skills, expertise, values and so that we cannot articulate, at least currently, other than by showing them in our behaviours (Polyani 1962). Nonaka's (1991; 1999) socialisation, externalisation, combination and internalisation (SECI) cycle suggests how these different forms of knowledge are shared across communities: see **Error! Reference source not found.**. Within Cynefin one would expect tacit knowledge to dominate in the complex and chaotic spaces, while explicit knowledge dominates in the known and knowable spaces. This in turn suggests that knowledge management relies more on socialisation in the complex and chaotic spaces whereas one uses combination in the known and knowable spaces. Indeed, the use of the term scientific knowledge in the known space suggests the archetypal example of explicit knowledge: a scientific model or theory.

3. Cynefin and Decision Making

What does Cynefin bring to discussions of decision making? Quite a lot, it seems to me. While I do not claim that any of the following could not be – indeed, has not been – discussed without the framework that Cynefin brings, it does seem to facilitate those discussions well. To give three examples:

- The strategy pyramid with its trichotomy of decision contexts has always seemed to me to miss one layer of decision making at its base: namely, recognition primed or instinctive decision making (French *et al.* 2008). Much decision making within organisations relates to the conduct of its work. To achieve its ends it – or its members – must *do* something and that doing inevitably involves decision making. Many such decisions are taken in a recognition primed fashion, often unconsciously, i.e. their context is the known space of Cynefin.

- Decision making in the complex and chaotic spaces on the left hand side of Cynefin will be based more on judgement, tacit knowledge and exploration. Thus the primary activity in deliberation will be the socialisation and sharing of tacit knowledge. Whereas in the known or knowable spaces, decision making will be based more on explicit knowledge and the use of decision models and data will be much more common. This suggests that decision support systems will be data- or model-based if they are applicable in the known or knowable spaces, whereas in the complex or chaotic spaces effective decision support will need to focus their efforts much more on collaboration: see Figure 4 (Niculae *et al.* 2004).
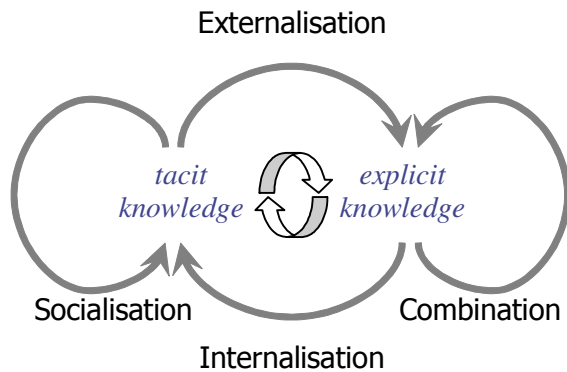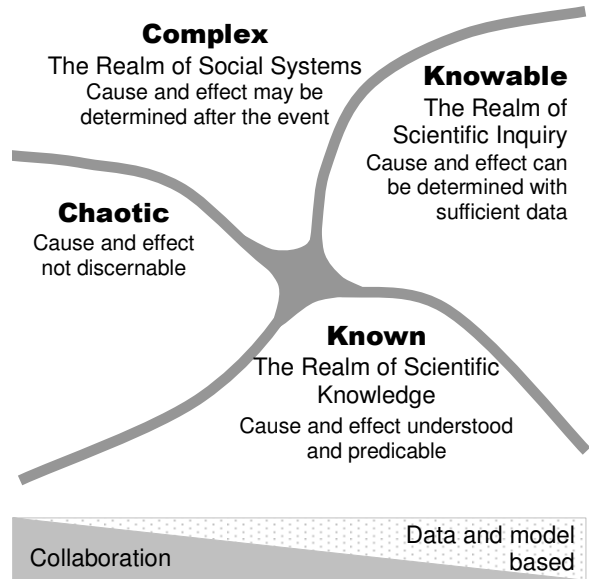
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Externalisation

tacit knowledge — *explicit knowledge*

Socialisation   **Combination**

Internalisation

Figure 2: Nonaka's SECI cycle

Complex
The Realm of Social Systems
Cause and effect may be
determined after the event

Knowable
The Realm of
Scientific Inquiry
Cause and effect can
be determined with
sufficient data

Chaotic
Cause and effect
not discernable

Known
The Realm of Scientific
Knowledge
Cause and effect understood
and predicable

Collaboration   Data and model based

Figure 4: The functional emphases of decision support systems in the different spaces

Strategic
Tactical
Operational
Instinctive
(recognition primed)

Complex

Knowable

Strategic   Tactical
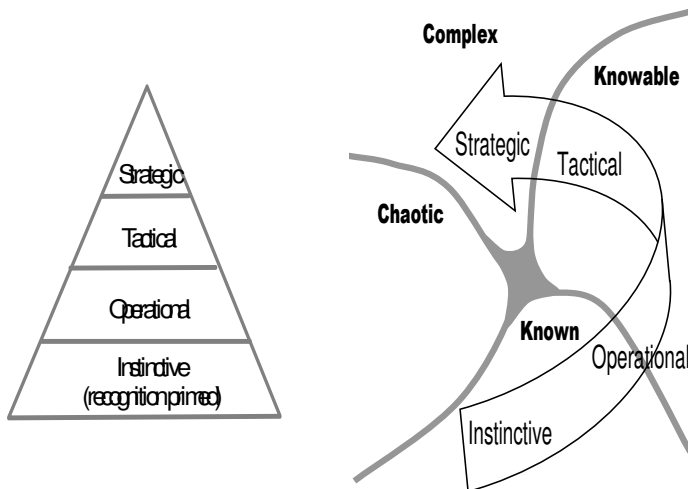
Chaotic

Known   Operational

Instinctive

Figure 3:   Relationship between the perspective offered by the strategy pyramid and Cynefin

- Carmen Niculae and I have explored the use of Cynefin in describing the handling of emergencies (French and Niculae 2005). We found that we could articulate the dynamics of an emergency intuitively using Cynefin and, in particular illustrate situations in which the authorities thought that they were handing an event in the known or knowable domains, whereas associated socio-political-economic issues were pulling the emergency into the complex domain. This dislocation between the authorities' perception of the situation and reality can and has led to the mishandling of emergencies.

4. Repeatability and Science

Note that contexts which fall into the known and knowable spaces are necessarily repeatable or commonly occurring in some sense; otherwise we would not have developed sufficient understanding to infer and test scientific theories and hence build predictive models. Contexts in the complex and certainly in the chaotic spaces tend to be novel. Repeatability lies at the heart of the *Scientific Method*: scientific knowledge is that which is based upon observations in repeatable circumstances. One can only verify scientific theories if they can be tested again and again in identical circumstances and shown to explain and predict behaviours of systems: i.e. as Cynefin suggests, cause and effect can be understood and predicted. Given this, it is not surprising that as statistical methodologies developed during the late 19th and first half of the 20th century that *frequentist* statistics dominated: i.e. approaches based upon conceptions of probability which have repeatability at their heart. Moreover, the primary goal of such statistical methods was to formalise the processes of estimation of parameters and confirmation or refutation of hypotheses. Bayesian statistics, based upon the formalisation of judgement and the ability to extend learning towards the analysis of unique, unrepeatable circumstances, grew up in the second half of the 20th century (Barnett 1999; French and Rios Insua 2000; French and Smith 1997).

A consideration of Cynefin suggests that statistical analyses focused on estimation and confirmation should be confined to situations in the known or knowable spaces. In the complex space there is likely to be and in the chaotic space certain to be 'insufficient repeatability'

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to conduct such analyses. In the later spaces, one is likely to lean more to using exploratory data analysis (Tukey 1977), modern data mining (Klosgen and Zytkow 2002; Korb and Nicholson 2004) and perhaps Bayesian methods which can combine judgement and limited data to learn and explore trends and patterns without needing to go the whole hog of full estimation and confirmation. So I am continually concerned by the prevalence of statistical hypothesis testing in articles in *Management Science*, *Academy of Management Journal* and other social science journals: do the authors and editors really not understand the complexity of the spaces that they are studying? Of course, I am not saying that *all* such analyses are inappropriate. Far from it: however I would be surprised if *all* were appropriate.

5. Repeatability and Values

Repeatability does not just lie at the heart of Science: it has helped us think through and form many of our values – but far from all. It has always concerned me that some decision analysts have sought to measure preferences, whereas I have always sought to help decision makers think through, evolve and articulate their preferences. I have always seen value and utility elicitation as a constructive, reflective process not simply measurement. Cynefin has given me new insights into this distinction.

In the case of the known and knowable spaces, familiarity with similar circumstances means that decision makers will have explored and thought through their values: their judgements will be well rehearsed. They will know what they want to achieve in any particular decision simply because they 'have been there before'. Thus they have preferences that can be measured. Such is not the case in the complex or chaotic spaces. Novel issues require decision makers to reflect upon what they want to achieve (see also Slovic 1995). The methods of value focused thinking and the exploration, evolution and elicitation of values, weights and utilities (French *et al.* 2008; Keeney 1992; Keeney and Raiffa 1976) will lie at the heart of decision analyses in the complex space. As decision analysts we will need to work with our clients to help them deliberate on what their values are or – perhaps it would be better to say – to help them contextualise their fundamental values to the circumstances that they face.

If our background relates to work on decision making in the known or knowable spaces, perhaps because we have tended to work in artificial intelligence, expert systems, recognition primed decision making and some of the more operational areas of OR, it is perhaps not surprising then that we think of preferences as predetermined, waiting to be measured. But the more we work in the complex and chaotic spaces the more we find that preferences are not predetermined and so we see the process before us as one of helping the decision makers form them. What Cynefin does is provide a rough and ready indicator of the sorts of approach we should take in supporting decisions and whether we might expect the decision makers *a priori* to be clear on their preferences.

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