Decision Making in a Complex and Uncertain Environment—the STCA Decision Network Model

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Abstract: The traditional focus on decision making in companies is on prescriptive processes to help decision makers make "rational" individual decisions. We propose an alternative framework, more appropriate to complex and uncertain environments. This framework is composed of 1) a simple "See-Think-Choose-Act" model to help decision makers to make sense of what is happening in the decision process rather than prescribe what they should do 2) the concept of "Decision Networks" that display generic network-type behaviour, and 3) the role of a "Decision Coach" who has at his or her disposal a context-dependent "Decision Toolkit" to assist an executive management team in their decision practice.

1. Introduction

Since the word "decision making" was first used in its modern sense by Chester Barnard in 1938 [1], the focus of decision making practice in companies has for the most part been predicated on being "rational" and using simple prescriptive processes. The large body of research undertaken on decision making over the last 70 years is to a large extent neglected. This is understandable, since busy executives have little time for theorising, and must get on and deliver their objectives. It is also perilous—especially in a complex and uncertain environment.

How can we enable pressured executives to take advantage of this vast and relevant body of research without distracting them from the urgent matters at hand or overwhelming them with theory?

We propose a framework that is cognitively simple, and yet enables busy executive to benefit from this research in a practical and relevant manner. The framework consists of three parts, each of which breaks new conceptual ground:

- A simple "See-Think-Choose-Act" (STCA) model to help executives make sense of the decision process in which they are involved.
- The concept of a "Decision Network" that enables executives to come to terms with the network effects of the multiple interacting decisions that are being made across the company.
- The role of a "Decision Coach" who brings to the table a context-dependent "Decision Toolkit" based on understanding of the research on decision making, but applied in a practical way.

2. The See-Think-Choose-Act Model

Figure 1 shows the basic See-Think-Choose-Act model. The purpose of the model is not to prescribe, but to describe the phases we instinctively go through when we make decisions: we **see** a problem or opportunity; we **think** through the options for action; we **choose** a course of action, and we **act** as a consequence… and then we **See** what happens as a result and take further decisions.

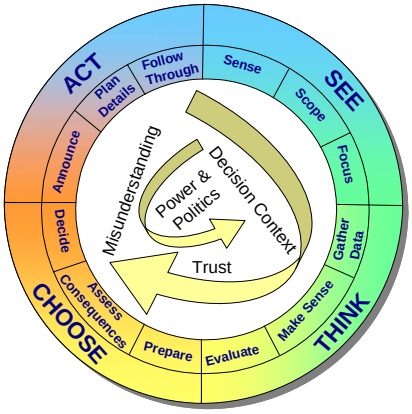

Figure 1: The Basic See-Think-Choose-Act Model

The dynamics of the decision process—such as politics, misunderstandings, confidence (or lack thereof)—mean that the decision may "navigate" back and forth between the different phases.

What is new about this model is its conceptual simplicity, and the manner in we suggest it is used—for sense-making about decisions rather than for prescribing how decisions should be made.

The STCA model can be used with executives to help them think through where they are in the process of decision, what are the dynamics, and what they should be doing to drive a decision to its conclusion—that is to say, effective action as a result of a choice, not the choice itself.

3. The Concept of Decision Networks

What is new in the concept of decision networks is the focus on the dynamics within and between decisions. Almost any individual decision, when studied carefully, is seen to be made up of a series of interacting sub-decisions. This same decision can also be seen as just one "node" in a network of decisions that constitute its environment—which itself may be a wider strategic decision.

3.2. A Network of Decisions

The example given in Figure 2 is a simplified version of part of the decision system for a programme managed by the author, called Hornblower.

The decisions made in Hornblower were about the strategy for Wholesale Voice. But these decisions could not be taken in isolation. They were influenced by decisions that had already been taken in the networks and systems organisations, and which restricted the options available. They also influenced the future strategies of the networks and systems organisations, because of the requirements of cost reduction, and VOIP readiness.

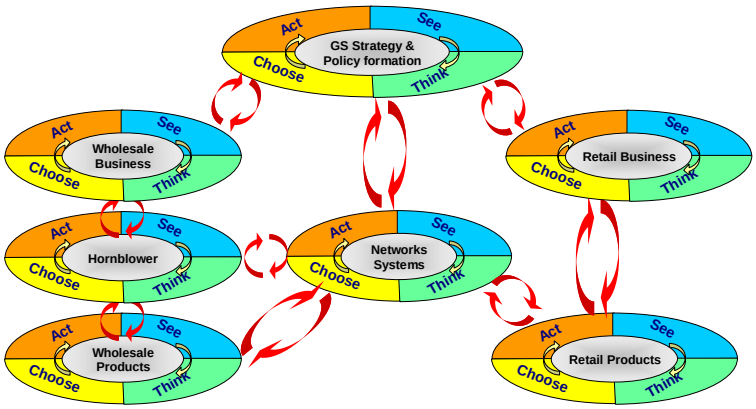

Figure 2: A part of the Wider Decision Environment

Both of these in turn were influenced by BT Global Services' policy and strategy, on budgets and minimum margins required, but also on the new strategic focus on outsourcing and service, rather than product-centred propositions. At the same time, the new Wholesale Voice strategy that emerged from the Hornblower project had the potential to influence the future formation of BT Global Services' strategy (as long as the key recommendations were provided into the BT Global Services strategic decision process *before* certain critical decisions were made).

These inter-decision dynamics also extend beyond the company, into the environment in which the company operates. BT's decision to move forward rapidly on VOIP was influenced by—and influenced—the decisions of other operators to move into the residential VOIP market.

3.3. Decision Networks and Network Theories

We suggest that insight can be gained into decision networks from different network theories that have been developed. To illustrate this hypothesis we will take one such theory: Kauffman's NK Model. Kauffman [4] developed the NK model as an explanation of emergent order in biological evolution. He demonstrates that, for N genes, and K average interconnections of a gene with other genes:

- When K=0 (each gene is independent of every other gene), there are no conflicting constraints, because there are no interconnections.
- When K=N-1 (each gene is connected to every other gene) any change to one gene affects all the other genes, and the landscape is essentially random.
- Where K is low (there are few interconnections and thus few conflicting constraints) the landscape is nonisotropic (there is a region where the highest fitness peaks generally cluster).
- As K increases, conflicting constraints increase, the landscape becomes more and more chaotic, and it becomes more and more difficult to find optimal peaks. [5]

Kauffman firmly believes that his findings apply to the environment of technological evolution.

> *Organismic evolution and coevolution, and technological evolution and coevolution, are rather similar processes of niche creation and combinatorial optimisation. While the nuts-and-bolts mechanisms underlying biological and technological evolution are obviously different, the tasks and resultant macroscopic features may be deeply similar. [6]*

Kauffman is not alone in his belief that his findings on biological coevolution apply also to technological, social and management issues. A host of management books and articles have been written in the last few years on the application of concepts of Complexity Theory to business [7].

Let us consider the hypothesis (as Kauffman and other writers imply), that the principle underlying NK Networks is universally valid for any kind of network—whether they are biological, business, telecoms, or decision networks. A corollary to this is the hypothesis that the level of interconnection between decisions affects the level of fitness of that network, and hence of the effectiveness of decision making in that context. If Kauffman's NK network is applicable to decision networks, we could expect a decision network where K is high—i.e. with a larger number of interconnections between decisions—to be in the chaotic regime. If K is very low, decisions are probably being made in isolation, in a stable regime. We can then analyse a company's, or a programme's decision landscape. If K is low, then decisions are being made in isolation—we are in silo mode and should consider increasing connectivity. If K is high, the effects of decisions made may be near-random, and we should consider reducing the number of interconnections. Whether the individual decisions are rational or not becomes a secondary matter if a high level of connectivity means that their consequences are, to all intents and purposes, random. Figure 4 illustrates the Hornblower decision network, as perceived by the programme manager. The average density of connections in the Hornblower programme is 3.825.

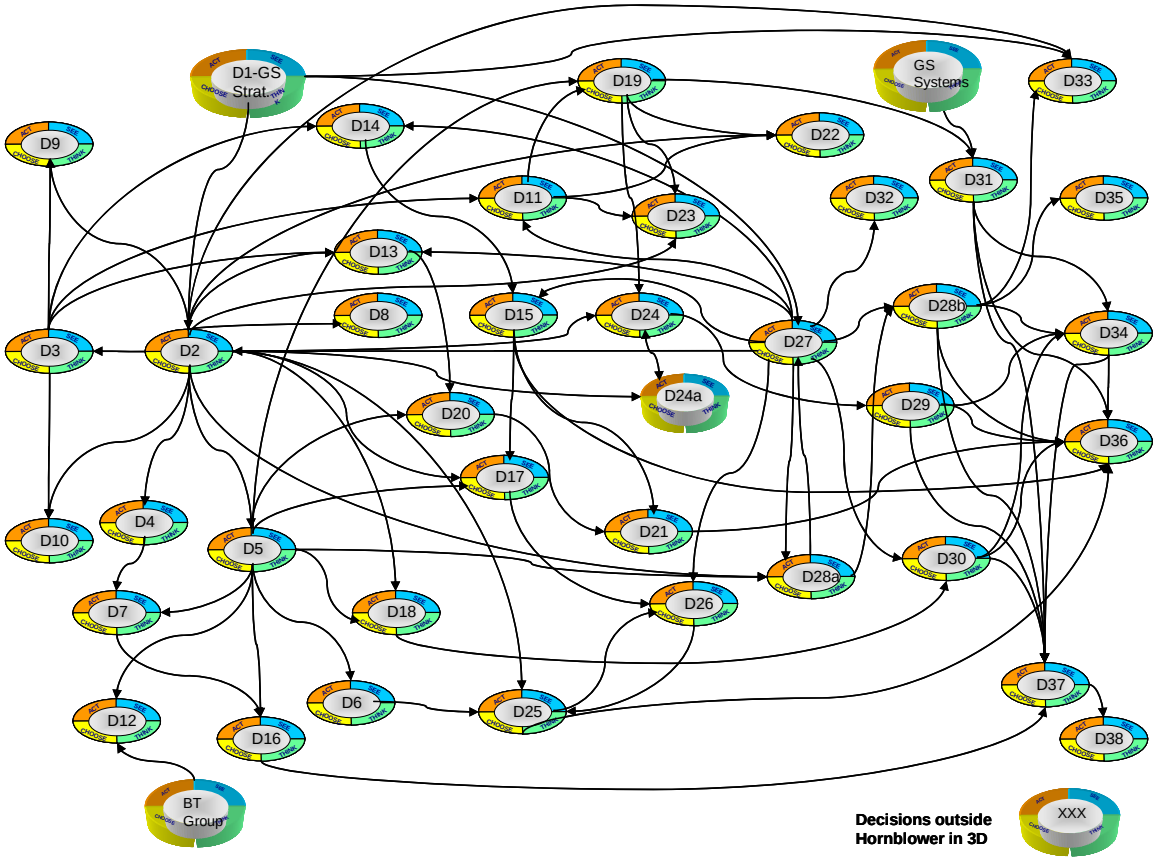

Figure 4: The decision landscape in the Hornblower programme.

Note the high number of connections for decisions 2 and 27, which suggest they are key decisions in this decision network. Note also that this analysis does not take into account the relative strength of the influences of the different decisions on each other. Kauffman notes that the mutual influences (or epistatsis) among genes are also very complex: "Trying to establish all the epistatic effects among thousands of genes is, at present, unfeasible even in one species, let alone many species". Similarly, we would suggest that gauging the exact influence of one decision on another decision—and by extension on the whole decision system—is even less feasible, since the influence of one decision on another is a subjective judgement. The level of analysis has to remain at a relatively general level, due to the fact that these details are intrinsically unknowable. However, this general level of analysis can be eminently practical. Cross, Liedtka and Weiss [8] describe three kinds of social networks that can be set up, depending on the context and results desired.

- For solving ambiguous problems they suggest a structure of permeable boundaries and decentralised decision rights that they call a Customised Response networks. In NK network terms, there should be a high density of epistatic connections.

- For solving complex problems where the components of the problems are known, but the solution is not, they suggest a structure of semi-permeable boundaries, and role-based decision rights. In NK network terms, there should be a medium density of epistatic connections.
- For solving familiar problems with known responses, there should be defined boundaries and process-based decision rights. In NK network terms, there should be a low density of epistatic connections.

The above description corresponds to Ashby's notion of requisite variety for problem solving, and can be used in setting up the governance of major programmes. If the issues are clear-cut, the boundaries of the governance structure should be clearly defined, with a focus on efficient and speedy decision making. If the issues are undefined, as in many strategic projects, care should be taken in setting up the governance structure to ensure that there is a high level of connectivity. This will mean that decision making will be slower, and more conflict-laden, but that the results generated will be more appropriate to the environment, and *in fine* be more effective.

4. The Role of Decision Coach

We cannot expect a busy and stressed executive to take the time to learn and apply the concepts of decision making in a complex and uncertain environment—such as the one outlined above. Yet for lack of using them managers often try to apply "efficient" methods to complex problems, and wonder why they do not succeed.

Senior managers generally rely on someone else to gather and then formulate the information on which they base their decisions. This person (it may be a board secretary, programme manager or an executive assistant) determines what goes on the agenda, often vets the content of presentations made, and records the decisions of executive management meetings. The focus and psychological profile of this person is ideally suited to be trained in the concepts and theory that lie behind effective decision making in complex situations.

The third pillar of the framework we are proposing is therefore to create a specific and focused role—that of a "Decision Coach". This person's key responsibility is to bring to the table the appropriate concepts and tools for decision making that the research over the last 70 years has discovered, and to do so in a practical way. The Decision Coach has at his or her disposal a context-dependent "Decision Toolkit" to assist the team in their decision practice. For example, if they are dealing with a decision that is in the "See" phase, the Decision Coach could brief them about some of the typical biases and traps [9] (such as the anchoring trap) one falls into when one first confronts a situation.

5. Conclusions

The three-part framework outlined above provides three key benefits:

- The STCA model is simple enough to engage busy executives in thinking about their decisions.
- Looking at decision making through the concept of decision networks provides a novel perspective that is of requisite variety for decision making in a complex and uncertain environment.
- The Decision Coach, armed with the knowledge of decision research over the last 70 years, uses the STCA model and the concept of Decision Networks, and provides a context-dependent Decision Toolkit to guide the executive team through their decisions without distracting them from their immediate business issues.

5. References

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