

Mexican Waves by Simon Caulkin

NEXT week, London hosts a business conference with a difference. Many of the speakers at the high-powered 'Complexity and Strategy - the Intelligent Organization', are not business-men but some of the most eminent scientists in the world, including a Nobel prizewinner in particle physics. Nor is the audience an academic one: the £2,500 booking fee sees to that.

So what do distinguished professors of theoretical physics, computer science, philosophy and theoretical statistics have to say about business, and why will some of the UK's most senior managers be listening to them?

The answers are a) quite a lot, since b) the keynote speakers come largely from the Santa Fe Institute in New Mexico, the intellectual powerhouse behind the emerging theories of complexity which over the last decade have sent tremors through and beyond the traditional physical sciences. Santa Fe researchers, plus an avant-garde of practitioners and companies represented at the conference, are beginning to talk about the implications of applying insights from complexity to business and management.

A cross between a think-tank and a university, with a constantly changing membership, the Santa Fe Institute was set up in the mid-1980s by a small group of scientists who shared a belief that the certainties of a linear Newtonian science were coming apart, and that a broader approach was needed.

Their perception was that the 'loss of innocence' in discipline after discipline - mathematics with Turing and Godel in the 1930s, physics with chaos theory in the 1970s, not to mention logic, language and philosophy - was not only coincidental, it might be explicable in common terms: in terms, that is, of the self-organizing, emergent behavior of difficult-to-model systems such as ecologies, economies and indeed life itself, which have done so much to destabilize the conventional sciences.

Fundamentally, the science of complexity is about understanding the drive of such systems, composed of many interacting agents, to form patterns at ever higher levels of complexity. The mind is an adaptive system, so are human societies and segments of them (an 'underclass' for example), so is the Internet. The theory of one of the most important of such systems, economics, has been a prime part of the Santa Fe program from the start, and in the long term it is in economics that some of its most profound implications may be felt.

Complexity theory challenges the heart of conventional economics by substituting increasing for diminishing returns and multiple (or no) fixed points of equilibrium compared with the single optimum outcome demanded by the neoclassical model. Multiple equilibria and increasing returns are extremely unwelcome in the increasingly analytical and mathematical world of conventional economics. As Joseph Schumpeter chided in 1954: 'Without any possibility of, or proving the existence of [a] uniquely determined equilibrium - or at all events, of a small number of possible equilibria - at however high a level of abstraction, a field of phenomena is really a chaos that is not under analytical control.' JR Hicks

in 1939 considered that under such a model 'the threatened wreckage is the greater part of economic theory' ..

Not surprisingly, there is still fierce resistance in the profession to increasing-returns economics. As Mitchell Waldrop notes in his book on the Santa Fe experience, by calling into question the existence of the single optimum outcome, it attacks the US 'state religion' of free-market capitalism based on the primacy of individual choice. Nevertheless, it is remarkable that pragmatic companies have no such scruples, admitting that the new model provides a much more satisfying fit to empirical reality than the old one.

Banking group Citicorp, for instance, which provides two speakers for the London conference, supplied important initial backing for the Santa Fe economics program. As a result of this work, it now claims to be deriving 'hard operational performance improvements', from a better understanding of the behavior of customers and of the spread of technology- something conventional economics mostly ignores.

Citicorp's senior technology officer, Colin Crook, declines to elaborate: results are so positive that 'we sure as hell don't want to talk about [the details],' he declares.

Meanwhile, insurance companies are using complexity and chaos theories in the analysis of risk, and Santa Fe itself has spun a venture-capital funded start-up devoted to predicting 'islands of stability' in trading environments. At least one major manufacturer is using the insights it has gained to figure out how to handle rapid changes on its assembly lines, and consultancy Coopers & Lybrand has developed a sophisticated business simulation game to deal with rapidly-changing strategy issues.

Many people believe that complexity will be the next hot thing in consultancy - which of course holds its own perils. Crook cautions: 'This is non-trivial stuff. What we're talking about is a real restructuring of thinking about how the world works and the way to handle it. A lot of conventional organizations just won't get it.'

Conference organizer Mike McMaster, managing director of consultancy the Knowledge Based Development Group, is one of a very few people using concepts of complexity to develop principles of structure and organizational design. It is, he admits, hard to explain, since the language or metaphors to describe the complex intelligent organization have yet to be developed (that is part of what this conference and its counterpart held last month in San Francisco is about). McMaster's work is founded on the insight that complexity is usually derived from components and basic laws that are quite simple. For instance, take a construction site building an offshore oil platform (an actual example). Together with a team of staff, McMaster distilled the operations of the yard to four key principles - the first stipulating that no part or assembly would be accepted on site unless it was complete and 100 per cent functional itself, the second describing accountability, and so on.

Counter-intuitively, the aim of this exercise was not to compress a complex operation into simplicity but the reverse; to allow the rich interplay of the four principles to generate a naturally complex organization in which information flows can self-organize, unconstrained by rigid rules and structures. Sounds daft? Well, says McMaster, the client isn't quarreling with the results: yard productivity doubled, and the company is now considering applying the principles to the whole organization. Slowly, others are beginning to follow.

Easy it ain't, McMaster admits. But revolutions can't be expected to be. At least management has less cherished baggage to discard than economics - or to put it another way, it's not as if competing models were striking either for intellectual elegance or consistent empirical success.

For management, too, there's no escaping Albert Einstein's dictum: 'The significant problems we face cannot be solved at the same level of thinking we were at when we created them.'

'Complexity, M. Mitchell Waldrop (Fenguin 1994)

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