

From Chaos to Complexity

Implications for Organizations

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The pressures for change in organizations have never been greater. Innovate or die is especially true, and this applies not just to technology but also to differing forms of organizational structure and processes. This requires enormous investment in cultural change by most senior managers, and gives rise to dramatic consequences when this is not done – witness IBM, for example. It is hard, however, to find any coherent model or underpinning framework to explain why these pressures have increased or to give practical guidelines for helping organizational survival and growth – at least in conventional management theory or the social sciences. In the physical sciences, however, a way of understanding these processes is emerging. Chaos theory, and now its offshoot, complexity theory, offers all those in organizations clarity and a method of enhancing the management of change. These implications have not been developed in depth yet, but they are there.

Chaos and Complexity – Managing Change

Chaos theory has led to the understanding that complex systems are, by their very nature, incapable of being predicted. It is impossible, for example, to say what the weather will be like in ten days hence. This is not because physical laws do not apply – they do. The mathematical equations for complex systems are often very simple; the problem is one of gathering data in precise enough detail. It follows that the economy, for example, is equally difficult to predict.

Scientists have now moved beyond chaos and have come up with a further elaboration – complexity theory. Complexity is defined as that zone between stability and predictability, on one side, and chaos and unpredictability, on the other. This is why the phrase, “the edge of chaos”[1], is often used to describe complexity, although on the edge of stability would apply equally well.

In the complexity zone, systems adapt and learn and grow. In stability, nothing changes. In chaos, too much changes for there to be any learning. Scientists have determined certain laws and made assumptions around this zone which can be applied specifically to organizational life.

The first major finding is to do with the thin slice of complexity sandwiched between stability and chaos. This, as has been stated, is where there

is maximum potential for growth. Those running an organization, if they want maximum learning and growth, have a very fine line to tread to maintain this. If there is too much change and freedom, then their system can tip over into chaos – witness what often happens in a revolution, for example. Too little innovation, and systems become rigid – totally predictable but able to respond only through tried and established methods. Governing an organization is therefore an art, and there needs to be constant monitoring of the system to check which way it is heading. If it is becoming too stable then change and a degree of freedom, perhaps through decentralization, needs to be introduced to push the system back to complexity. Conversely, if there is too much change and the system is threatening to melt down, restraints and disciplines must be quickly reinforced. There is therefore a logic, even an imperative, for firms to change from centralization to decentralization – even if these shifts bring complaints from those within the organization. The powers that be within the organization are simply responding appropriately to the need to keep the organization on a path of maximum potential.

Setting the Rules

Another critical finding from complexity theory is that even highly complex systems can be kept on track by just a few rules governing the interaction of their constituent units, providing they are the right rules. For example, the flight of a flock of birds,

when viewed as a whole, looks extremely complicated. However, if you build a computer simulation of the process and give the “birds” on the computer system three simple rules for each of them to obey, the computer simulation exhibits all the complicated behaviour of the flock. The simple rules are:

- (1) Follow the leader.
- (2) Move towards the centre.
- (3) Do not get closer than, say, three feet to another object.

The implications of this for organizations are considerable. It suggests that, after setting a direction as part of the leadership process, the most important thing that those in charge in an organization should do is focus on the “rules” that govern interaction between people in that organization. (“Rules” are meant to signify not just those edicts specifically written down, but all those which are informally understood and agreed, often without any conscious acknowledgement.)

Take communication – for example. Who can speak to whom? If an organization exists in which there are no rules for this, then the result will be total chaos and breakdown. Everyone will be overwhelmed by memos, phone calls and meetings with others. It has been suggested that organizations are, quite rightly, simply means of reducing and blocking open communication so that things can get done instead of just being talked about. If you can only talk to those in different departments via the heads of those departments, as some organizations insisted upon, then the result is control and stability, but little learning or change.

Leaders must look at these rules and adjust them where appropriate, not through edicts but by example and role modelling. Jack Welch, of General Electric, provides a brilliant example of this – he spent his time “walking the talk” in his efforts to change the company’s inherent bureaucracy. GE is an excellent example of an organization that has been moved from stability into complexity – the trick being to ensure that it does not slide over into chaos.

Predicting Organizational Change

Complexity theory also tells us that it is impossible to predict what will happen.

In other words, you might change the rules governing feedback from one person to another, and expect the organization to become more effective and flexible, but quite how it will do this is essentially unpredictable. This is why it is so dangerous and unprofitable, both in terms of energy and finance, to attempt top-down change. Many organizations are now attempting to change the culture of their system but think that they can control this change to achieve desired outcomes. It just will not work. This is something which complexity theory has discovered scientifically, but which philosophers like Karl Popper in their attacks on top-down planning in society have been saying for many years. Besides which empirically-based studies have also shown that major change usually comes about because of a mutant subculture which spreads within the organization and takes over because it is so patently better at dealing with the world. So, to reiterate, top-down planning does not usually work (or, if it does, it does so through pure luck).

Organizational Co-evolution

Complexity also explains the evolution of biological forms in terms of “fitness landscapes”. It suggests that there is a constant interaction between animals and their environment. If, during evolution, an animal develops better eyesight and catches its prey more easily, then the prey will be forced to develop an appropriate means of defending itself. This produces an evolutionary leap-frogging of change benefits. Fitness landscapes can be seen as the hills and valleys of change. The advancing animals develop by becoming “fitter”, i.e. by going from peak to peak.

The analogies with organizations are quite clear. If a rival develops a better technology or way of managing it has an evolutionary advantage. It is not enough for the other organizations merely to do the same, to win change. This is very much in line with suggestions that the most advanced companies have strong competitive rivals forcing innovation. However, it is not necessarily brutal competition that is the best strategy but an open, co-operative rivalry, if that does not seem to be too much of a paradox.

One of the findings from complexity theory on the rules governing interac-

tions between individuals is that neither conflict nor co-operation are necessarily strategies that should be primarily focused on for success. The one strategy that seems to work best for optimum success is reciprocity, or tit for tat. One starts off by being open and positive; if the other person is negative, one replies in like manner; if they are positive, then one responds positively. In the short term this can seem a risky strategy but, in the medium to long term, computer simulations have shown that it produces most success with co-operative alliances being built up of like-minded people.

Implications for Management

The implications of all this for those concerned with management is profound. First, it reinforces the emphasis on individual skills and understanding – especially on interpersonal skills and interactions. Complexity theory is essentially saying that one should concentrate on how X interacts with Y in the organization; change that interaction and you change the whole organisation, culture and all. Of course, part of the interactive process involves an understanding of what motivates different people and how they see the world, but it is how this is manifested in behaviour that counts.

Second, grand organizational development schemes will not work unless all the implications for the way that interaction rules have to change are taken into account (and probably not even then). So someone is needed to provide the expertise to comment on and help change these rules.

Third, the law of reciprocity is a very good basis for influencing without authority – something all managers have to do.

Finally, if things do not appear to work, managers have the ready-made excuse that it was not their fault because complexity theory does not allow solid predictions to be made.

Reference

1. Lewin, R., *Complexity – Life at the Edge of Chaos*, Dent, London, 1993.

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