SCENARIO & STRATEGY PLANNING

DEVELOPING FUTURE VISIONS FOR TODAY'S CORPORATE ENVIRONMENT

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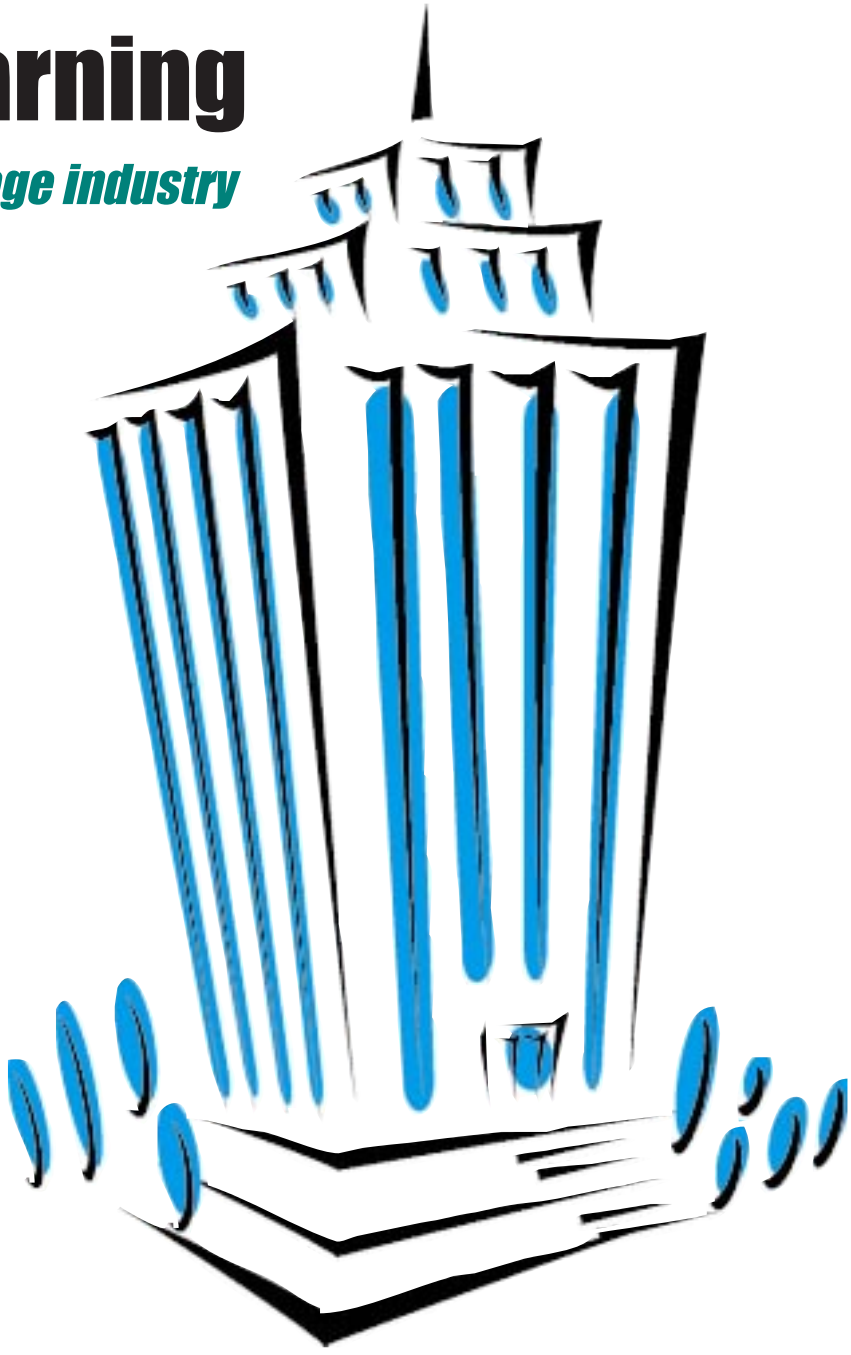
# Scenario learning

## *in the architectural heritage industry*



# Inside:



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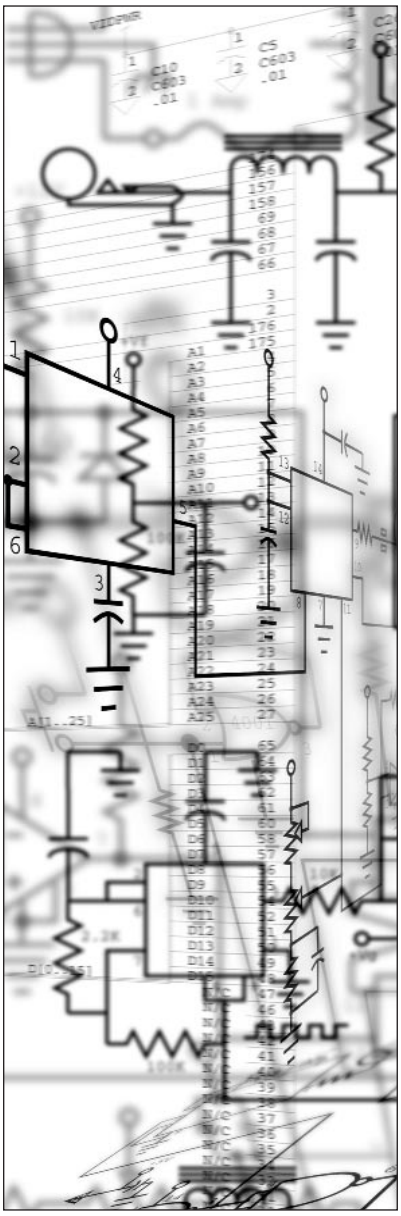
# Order from chaos *part three*

*Zeisler Associates*

In the final chapter of this three-part series, Steven Zeisler and Dyer Harris continue their exploration of the relationship between Complex Adaptive Systems and strategic planning, and suggest ways in which businesses can encourage and benefit from an Edge of Chaos internal environment.



Parts One and Two of this series presented the notion of organisations as Complex Adaptive Systems (CAS) and discussed the resulting implications on Strategic Planning.

We posited that at least three central characteristics of CAS have a direct bearing on Strategic Planning. These are:

- Complex Adaptive Systems have limited predictability. Not *no* predictability, just limited
- Weak signals, often hidden in the surrounding noise, are the true harbingers of what might be
- The most prolific breeding ground for innovation in CAS is an area known as 'Bounded Instability', often referred to as the 'Edge of Chaos'.

The first article summarised the theoretical bases of CAS and demonstrated how classical planning approaches frequently contribute to an enterprise's inability to detect weak signals and how this failure can negatively impact the enterprise.

In the second article we elaborated on weak signals in the business environment – how they might appear and how an enterprise can increase its ability to detect and incorporate weak signals into its planning and doing.

In this article we will expand on the third characteristic and its implications. We will address the desirability for an organisation to encourage an Edge of Chaos internal environment. We will suggest ways to sustain it, and we will reveal ways to leverage it for business or organisational advantage. This position may seem juxtaposed to the discussion of the first characteristics. There we said that strategic planners should have a continual awareness of the potential for surprises from 'weak signals' and plan the flexibility for timely reaction. Here we will assert that planners should go beyond mere watchfulness and, within the context of the enterprise's goals, actively encourage creation and amplification of weak signals from within their organisational structure. Indeed, several books and articles[1,2,3] have already appeared strongly espousing this approach.

## The Edge of Chaos

A model for thinking about the third characteristic, one well substantiated in the physical and biological sciences, is illustrated in *figure 1*. Each CAS is viewed as a continuum, ranging on the right hand as purely deterministic ('Three poor quarters and you are redundant.') to total randomness on the left side (Brownian motion, or the outcome of a national lottery). The range between the two extremes is a mixture of order and chaos, with order dominating toward the right, and randomness toward the left.

In physics, solid substances usually have an ordered crystalline atom-

ic structure, and when melting occurs there is a transition to disordered liquid. In biology, total order is consistent with homeostasis, or death. The time trace of a healthy heartbeat is demonstrably chaotic, and it has recently been shown that a perfectly regular electrocardiograph is a precursor to serious cardiac illness[4]. Conversely, fibrillation is randomness. And if the stock markets were purely deterministic, where would all the fun be had?

However, the continuum is not quite linear. There is an area, albeit ill defined, that is popularly called the Edge of Chaos[5]. Interestingly, it appears that CAS trend toward this region. This is not a violation of the Second Law of Thermodynamics, which is often recalled as saying that all things trend toward randomness, and in the end we decay and die. The critical difference is that a true CAS, regardless of the system, is receiving energy from the outside, thwarting the continuing decay notion.

One of the strongest arguments for this behaviour is biological, and is espoused by Dr. Stuart Kauffman[6], founder and chief technology officer of The Bios Group, and an external professor at the Santa Fe Institute. Kauffman asserts that any sufficiently complex molecular system, in an energy providing environment, will evolve and self-adapt into a reproductive living system, and not decay and die. His thesis is that one would expect life anywhere in the universe that such conditions exist, not just singularly here on earth. While his arguments are no doubt distressing to certain mindsets, they are quite persuasive, and he demonstrates his concepts with simpler, passive systems and computer models.

In *figure 2*, we symbolically show the Edge of Chaos region with a dotted line. We have found it useful to add a time dimension to this continuum model, which will vary according to the system, and we imagine time progressing along the vertical line shown. We then suggest that the state of a CAS will oscillate around this line as needed over the passage of time, from a somewhat chaotic state to a more orderly one, and back again. Too far in either direction and the system is exposed to the perils of 'fire or ice', but oscillating within the edge of chaos maintains the nourishing melange of innovation and adaptation. Kauffman views such variation as the way nature experiments with different combinations of molecules to produce a viable species, and in this way connects with Darwinian hypotheses.

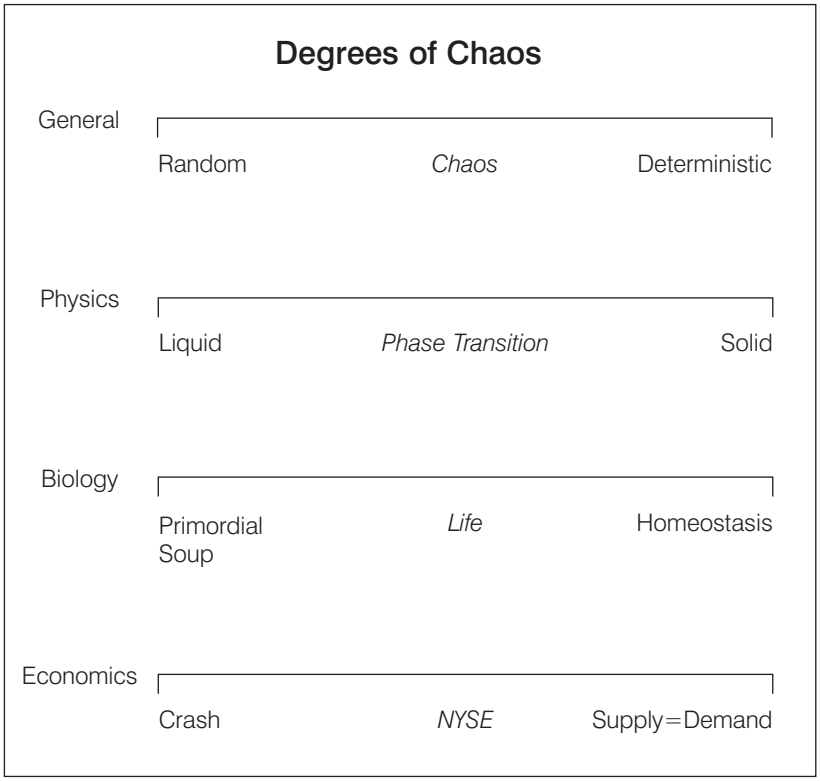



***Figure 1*** **Chaos and Order can co-exist in a system if it is considered a continuum between extremes**

## Extrapolation to business processes

Now let us consider how well this model fits business processes.

How does the research and development process work? Technical people are taught to be methodical, to hypothesise, test, plan experiments to prove, and so on. In our experience, what really happens is that laboratorians follow their instincts under the general guidelines of a business objective, and that the best breakthroughs come by surprise, not prescription. Researchers typically function on the left side of the edge, in the near-chaotic region. Upon having a truly unique idea or discovery, they will turn their energy toward developing and understanding the science, thereby shifting their state towards more orderly development, on the right edge.

In the DuPont pantheon, for example, the discoveries and refinements of Nylon(r) (more accurately the art of polymerisation and extrusion of fibers), Teflon(r) and Kevlar(r) happened in much the same way. Richard Branson's forays to find and develop the diverse businesses that make up the Virgin Group can also be seen in this light. So can Nicolas Hayek's breakthroughs and adaptations with the Swatch watch.

Given proof of principle, and indication of potential commercial value, the firm may further bring order to the process by refining product parameters through customer focus groups and further still by defining the manufacturing process. Certainly, quality manufacture demands increased determinism, and properly so. But the work is not done. The product is introduced into the marketplace, a notably chaotic place, and the response can again be unexpected. Competition will respond, customers may accept or reject the product to varying degrees, or more interestingly, see a different application than that originally envisioned. Computers were first seen as scientific tools, but to Thomas Watson's IBM of the 1950s, most main frame sales turned out to be for financial and commercial purposes. The desktop computer? A tool for techies to avoid mainframe charges quickly became a household appliance for games, personal record keeping, electronic correspondence, and online shopping.

How long – and to what volume – was laundry bleach used by clever homemakers to clean and disinfect kitchen sinks and toilet bowls before it was recreated and marketed for just that purpose by manufacturers?

We have found the model in *figure 2* a very enriching tool for examining the state of an organisation. In a staff meeting, one can map various components – projects, departments, or processes – directly on the chart, and discuss whether the component is where it ought to be. In one such meeting, the finance department was, to the astonishment of the executive team, deemed to be quite far to the left. We cannot say if there were payroll issues looming, or if this in fact was a good thing. But we have found the conversations that develop to be very enlightening and revealing.

Weak signals that ultimately emerge as breakthroughs in products, businesses, services, processes and solutions are most frequently found along this path on the edge of chaos. As individuals and the enterprise meander on this edge, sometimes closer to order and structure, sometimes nearer chaos and the undefined, leadership has the tasks of not dampening this weak signal detection process and not killing the ideas that emerge from it. And strategic planners must ensure that the organisation has the capabilities for leading, sustaining and watchful monitoring of the journey within the edge.

The famous example of the 3M Post-it(r) may further clarify our Edge of Chaos model[7]. The journey of this innovation can be plotted along a time axis as shown in *figure 3*.

The original adhesive was discovered as a result of an experiment by 3M scientist Spencer Silver that disregarded his own experience, the scientific community's prevailing wisdom and published reports that 'proved' there was no point in conducting what was an irrational experiment. When Silver did so, the resulting reaction departed dramatically from what theory predicted, and a new adhesive was born. This was clearly an activity taking place amidst (intellectual) chaos.

However, this early formulation was hardly practical or workable. Movement across the edge to deterministic tasks was required. It was continuous refinements by 3M scientists Henry Courtney and Roger Merrill that overcame the glue's tendency to migrate from one surface to another and significantly improved the glue's ability to work on a wide variety of substrates.

Yet, for five years Silver tried unsuccessfully to arouse support within the company until Arthur Fry's famous epiphany (a weak signal – the fluttering of slips of paper as they fell from his choir hymnal) conjured up a relevant use for the glue significantly different than Silver's original application idea.

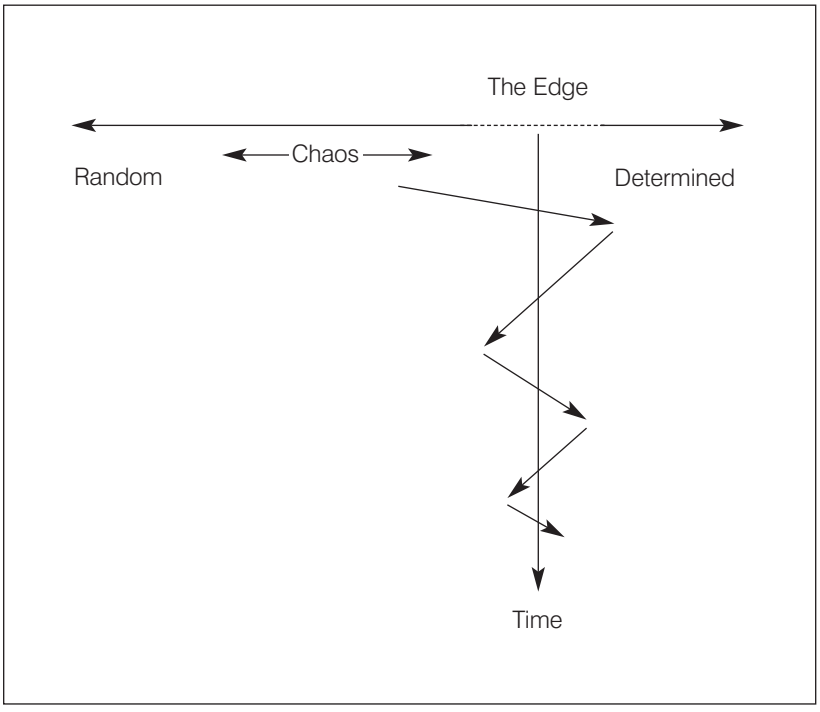



***Figure 2*** **Complex Adaptive Systems gravitate from extremes toward a region called the Edge of Chaos and oscillate about this region over time**

Fry connected an unfulfilled need with the glue and created a potential, practical application for it.

But detailed marketing analysis revealed a dismal future for the somewhat sticky pads of paper. It wasn't until 3M executives went directly to the end users in person that the product took off. Geoffrey Nicholson and Joseph Ramey heard a weak signal that said the Post-it was something individuals had to use and experiment with to discover value for it. And the commercial success the Post-it has since realised had begun.

## Sustaining life on the Edge of Chaos

Most experts and business analysts attribute 3M's success with the Post-it to its deeper, historic traditions that value direct contact with the marketplace, and tolerate both determined independence of employees and relatively small products. Either by happenstance or insight, 3M had built an organisation capable of steering an alternating path within the Edge of Chaos to success.

We can derive from this specific example some elements of organisational planning that helped create an environment that sustained and encouraged this wandering along the edge. Among these elements are:

- 3M's divisional structure that did not give rise to a central 'killing zone', thus allowing individuals and small groups to overcome resistance
- The company's tradition of internal selling that encouraged anyone to take an idea from division to division in an attempt to muster support
- 3M's famous '15% Rule' that entitled a wide range of individuals to devote 15% of their efforts on 'pet projects'
- Longstanding policy that required each division to generate a significant portion of its revenues from products five years old and younger
- 3M emphasis on the continuous improvement of its product range
- Open-ended R & D teams as the preferred mechanism to explore new areas of business and technology.

Whether consciously planned or not, 3M's environment over time nurtures innovation, and its business results over the past 45 years are evidence of this[8].

Strategic planners must design an organisation that is capable of anticipating marketplace shifts and dealing with volatility, uncertainty and surprise. They must define the systems, processes and mechanisms that foster the climate and culture[9] for sustaining an Edge of Chaos environment.

The following five dimensions of climate are extracted from the work of Dr. Göran Ekvall[10], professor emeritus of Organisational Psychology at the University of Lund in Sweden. We have found these to be most powerful at enabling an organisation to flourish within the edge of chaos:

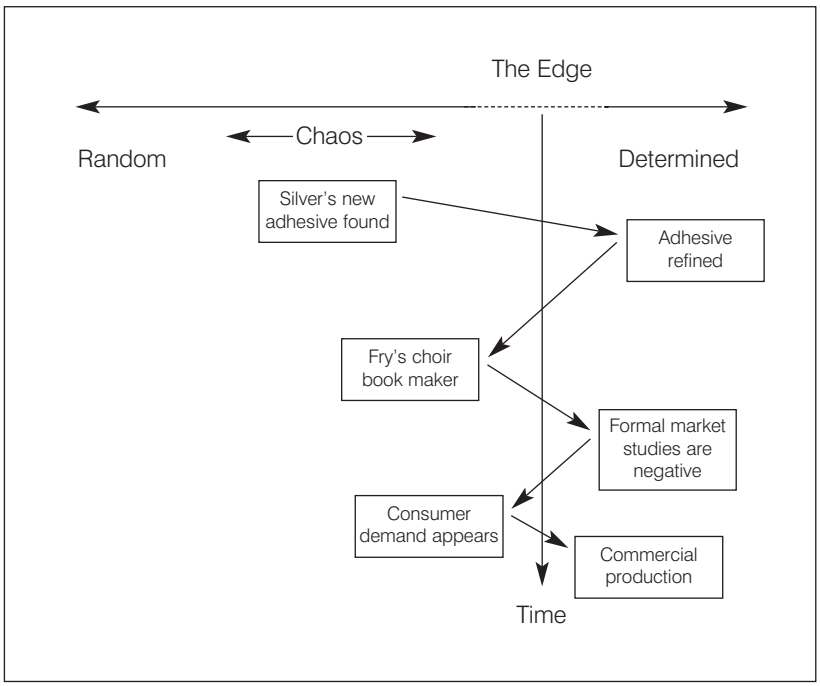
- Challenge: The level of involvement that exists for members of an enterprise in carrying out their roles and responsibilities
- Freedom: The degree of independence exercised by individuals within the bounds and context of the organisation's goals and mission
- Idea time: The amount of time individuals devote to scanning horizons, detecting weak signals, creating ideas and acting on them
- Risk-taking: The level of tolerance for uncertainty and ambiguous outcomes, and the willingness to try the unproven and new
- Idea support: The degree to which ideas are solicited and treated; while not every idea can be carried out, every idea can receive a fair hearing.

Because these dimensions describe a range of levels, they can be used as a framework to determine when and where to move closer to or further away from randomness or order, based on the context of the organisation's purpose. We leave it to the reader to connect the 3M list of organisational elements to these five dimensions. *Figure 4* describes additional mechanisms and tools used by other organisations to stimulate these dimensions.

## Final thoughts: Leveraging weak signals

The enormous variety and diversity of business situations defies reduction of our thoughts to lists of rules or magic bullets; one cannot prescribe a course when dealing with Complex Adaptive Systems. But we have, through examples in the three articles, described the kinds of things organisations, strategists and leaders must consider.

***Figure 3***
**The Post-it™ trail through the Edge of Chaos**




Our concept of an enterprise capable of leveraging the weak signals and thriving in the Edge of Chaos comes down to this: that the organisation have a Belief that such signals will surely appear out of seeming chaos, and a Mindset to examine them and react quickly. Perhaps through a final metaphor we can illustrate this approach.

In yacht racing, the goal is to sail a prescribed course as rapidly as possible, and win. But knowing the mechanics of boat handling is not enough. The boat is subject to the vagaries of wind, the complexities of current, and the sudden movements of other competing boats. These are factors over which the sailor has no control, and thereby add elements of chaos to the race.

At the starting signal, the skipper will have considered the currents, studied the wind patterns on the water, and determined a course to the windward mark that takes advantage of perceived favourable wind and currents. But the experienced crew believes that these factors can change rapidly, for better or worse, and has the mindset to change course. A darkening of the water's surface on the other side of the course may portend an unfavourable wind shift requiring one to tack immediately, or to respond if another boat's course interferes. All hands stand by to react rapidly in their assigned roles, and the winning boat is the one whose tactician – the on-board strategist – reads the signals best, whose skipper calculates the options, and whose crew reacts quickly and correctly.

Especially in large companies, success in the Edge of Chaos is not about the availability of resources to be deployed; it's about this mindset. The organisation and its leaders, like the crew and skipper of a racing yacht, must have the will to quickly act on new signals and deploy resources. It is a leadership attitude – a belief – that given the climate that sustains the edge of chaos environment, innovation will emerge. To paraphrase Stuart Kauffman, complex situations on the edge of chaos, given enough energy, will produce the most sustainable processes and products.

Surprises happen. Things come out of the blindside. Organisations must have the flexibility and dexterity to detect weak signals early and respond to the unexpected – because the unexpected will happen. As, deep down, all of us know.

References

1. Briggs and Peat, *The Seven Lessons of Chaos: Timeless Wisdom from the Science of Chaos,* (Harper Collins, 1999)
2. Kelly and Allison, *The Complexity Advantage,* (McGraw-Hill, 1998)
3. Kauffman et al, *Optimal Organization Size in a Stochastic Environment with Externalities,* (The Santa Fe Institute, 1999)
4. Stewart, I., *Does God Play Dice?,* Basil Blackwell, Ltd., (Oxford, 1989)

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| **CHALLENGE**: | W. L. Gore & Associates, Inc. limits the size of individual sites to 200 persons. The belief is that larger sites lose purposefulness and direct involvement in achieving the company's goals and outcomes. |
| **FREEDOM**: | Granite Rock Company's 'Short Pay Policy' in which all invoices to customers state, in effect, 'if something on this invoice does not meet your expectations, don't pay for it'. The independence granted customers to make this decision propels employees to ensure customer expectations are clearly understood and met. |
| **IDEA TIME**: | Ford Motor Company's 'Quantum Idea Project'. As part of the corporate leadership curriculum, new business leader trainees identify and develop a significant new idea for transforming the company. |
| **RISK-TAKING**: | The CEO of AGI, Inc. rewards the employee who asks the toughest question of him during monthly meetings. This approach promotes a 'nothing is sacred/questions are good' attitude and increases the tolerance for testing new thoughts. |
| **IDEA SUPPORT**: | Alternate Idea Channels that allow new ideas to bypass an organisation's 'auto-immune systems' and find resources and support in a non-traditional environment. For instance, Eveready Battery Company's 'Idea Page'. |

***Figure 4***
**Corporate mechanisms to stimulate climate dimensions**

5. Waldrop, M. Mitchell, *Complexity: The Emerging Science at the Edge of Order and Chaos*, (Simon & Schuster, 1992)

6. Kauffman, S., *At Home in the Universe*, (Oxford, 1995)

7. For a detailed account of this invention, we recommend *Breakthroughs: How the Vision and Drive of Innovators in Sixteen Companies Created Commercial Breakthroughs That Swept the World*, by P. Ranganath Nayak and John M. Ketteringham, (Rawson Associates, 1986)

8. Since 1956, "3M's sales and earnings have increased more than 40-fold" and "cumulative stock returns 36% in excess of the market". *Harvard Business Review*, (July-August '99)

9. Climate is a concept first put forth by Lewin, Lippitt and White in the 1930's. It can be described as the collective perceptions, attitudes, feelings and emotional atmosphere that influence individuals' behaviour and organisational processes such as problem-solving, decision-making, communicating. Within an organisation, climate can vary between divisions, functions and even work groups.

The concept of culture can be distinguished from climate in that it is composed of the long-standing and deep-seated traditions, values and core beliefs of an organisation. Culture is typically shared across an organisation and significantly slower to change than climate.

10. Ekvall, G. and Tångeberg-Andersson, Y. "Working Climate and Creativity", *Journal of Creative Behavior*, 20 (3) (1986)

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