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Planning the next move

INSIDE:
SCOTTISH CONSUMER COUNCIL,
ATOMIC WEAPONS ESTABLISHMENT,
ROYAL INSTITUTION OF CHARTERED SURVEYORS,
KPN TELECOM, *AND MORE*

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Order from chaos – *part one*

Zeisler Associates

In this new three-part series, Steven Zeisler and Dyer Harris will examine Complex Adaptive Systems and their relationship to strategic planning. Chapter one reveals how traditional planning approaches can frequently overlook weak signals, small events that can nevertheless lead to great change in a business environment.

An implicit tenet of strategic planning is that the future can be envisioned to a high degree of accuracy. But any of us who have developed a Five-Year-Plan, and then hung around for five years, know that the original plan is often most useful as a source of roasting material for a CEO's going away party.

The reason is that virtually all social and business organisations are Complex Adaptive Systems, popularly referred to as Chaotic. At least three central characteristics of Complex Adaptive Systems (CAS) have 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'.

In a series of three articles we will expand on each of these in turn.

This first article summarises the theoretical bases of Complex Adaptive Systems, leading to the idea that small events, epitomised by weak signals, can cause great change. We will demonstrate 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 will elaborate on weak signals in the business environment – how they might appear and how an enterprise can increase their abilities to detect and incorporate weak signals into their planning and doing.

In the concluding article we will expand on the third characteristic and its implications, including the desirability for an organisation to encourage an 'edge of chaos' internal environment, how to sustain it, and how to leverage it for business or organisational advantage.

Prediction and Complex Adaptive Systems

The first fundamental characteristic of CAS is that they have limited predictability. We will discuss here the limits of that predictability by analogy to physical systems that are also chaotic, but also discuss measures of what predictability there is.

Chaos Theory first appealed mainly to physicists and engineers trying to explain their world like it really is, not how the classical theories of Newton and others modelled them. Nineteenth century science revelled in the thought that, given the state of affairs at a given moment, the motions of the planets were determined forever more. Newton's general laws appear to describe quite well the macro-motions of dynamical systems, from aeroplanes to galaxies. Similarly, it was believed that precise weather forecasting using these equations only awaited computers whose computational speed exceeded the speed at which nature's atmospheric processes unfolded. This has turned out not to be true.

And the reason for this is not lack of information, input data, or sufficient computer speed. It is, most importantly, because of the non-linearity of the equations themselves when extrapolated forward.

A small event, such as a butterfly's wing flapping in Beijing, affects the course of weather over North America

Newton and his successors well in to the 20th Century usually 'dropped' the non-linear terms of their equations under some technical pretext and computed solutions with only the linear terms. This may suffice if the required precision in the result is not strict, or the time of validity for the solution is short. Engineers can design elevators, aeroplanes and automobiles successfully because time is either not a factor, or sufficient Factors of Safety are included to cover the unknowns.

But long-term weather forecasting has not significantly improved in the last century, and it will not anytime soon. Prof E. Lorenz of MIT, a meteorologist, was among the first to realise that the non-linearity of the equations far exceeded the ability of computer precision to compensate. The 'Butterfly Effect' is attributed to his early work, which suggested that a small event, such as a butterfly's wing flapping in Beijing, ultimately affects the course of weather over North America. Dr. Lorenz protested[1] that this was a parable and not to be taken literally. But it is a very good analogy indeed; CAS are sensitive to initial conditions and these seemingly insignificant events can produce major changes.

As a more cogent example, consider that all space-craft, manned or unmanned, carry 'thrusters' and are programmed or instructed to make periodic course corrections along their way to the moon or Mars. This need is related to the inability to make precise enough calculations of the movements of the planets involved and their gravi-

tational effect on the spacecraft motion. As we have recently witnessed, even with these corrective mechanisms the end result can be very unexpected.

Obtaining better understanding of these implications is where frontier research on Complex Adaptive Systems is today, so that complete answers are not forthcoming yet. But certain characteristics are clear; some of which can be summarised qualitatively as follows:

- The system, or data representing the system, looks disorganised and erratic. *Consider the stock exchange averages, or British Airways' earnings over time*
- The system is driven by deterministic processes. *Random chance does not propel CAS, although random events may be present, obscuring the process and hiding small changes. The explosion of Internet retail transactions may appear chaotic but it is rigorous technical work and consumer preferences that underlie and drive this process*
- The system behaviour is very sensitive to initial conditions. *Recall Lorenz's butterfly effect. Or consider the varied experiences of IBM, Apple, and Compaq in the birth and growth of the PC market*
- Forecasts of long-term behaviour are meaningless. *It will be an oak, but its eventual size and shape? Or, what will be the share price of Siemens in 3 years? 6 months?*

A popular textbook example that contains each of these fundamentals is a picture of the population history of some simple life form represented by the logistic equation[2]. Briefly, next year's generation Xi+1 is proportional to this year's Xi by Xi+1=aXi, where a represents the fraction of the existing life forms that procreates. But it is diminished by an amount proportional to how close the population is to the maximum sustainable population, b(1-Xi), where 1.0 is assumed to be the normalised maximum.

Thus Xi+1=cXi(1-Xi) where c=ab. *Figures 1, 2* and *3* show the population for a period of time for various values of the factor c. For low values the population is stable. For intermediate values, the population oscillates, and suddenly, at a value around 3.8, it begins to gyrate wildly. If one

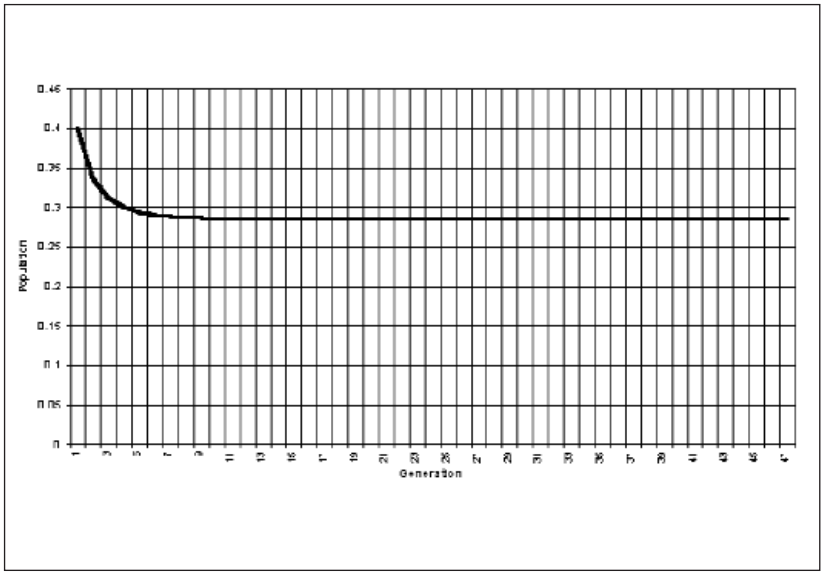

Figure 1 **This graph illustrates a stable population, where the value of factor c is low**

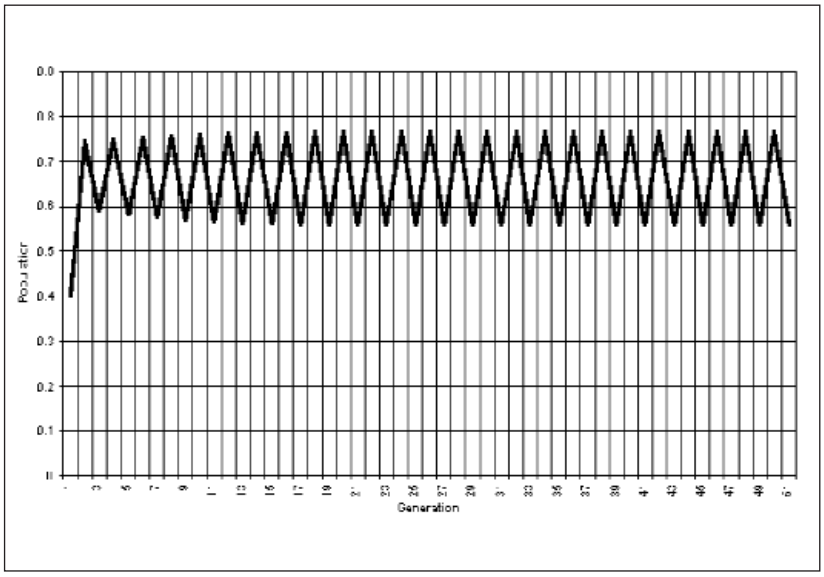

Figure 2 **This graph shows a fluctuating population, where factor c is of intermediate value**

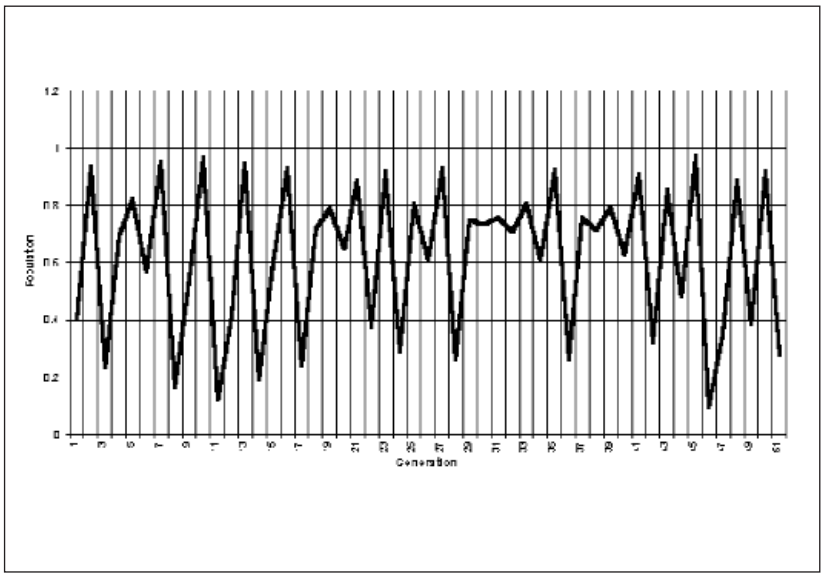

Figure 3 **With factor c at higher values, the population seesaws wildly**

examined *Figure 3* only, the system would certainly appear disorganised. Further, it is very sensitive to the initial conditions as represented by the value of c. Without knowing the underlying equation, prediction of long term behaviour is not possible. But it is driven by a deterministic process, namely the equation representing procreation and use of sustaining resources.

A body of analytical techniques has evolved that enable one to examine a time series such as *Figure 3*, and discover that within the noise there is an order, and in some cases determine what that order is. *Figure 4* shows what is called a pseudo phase space plot of *Figure 3*, obtained by a mathematical operation on the time series. The orderliness of *Figure 4* can be interpreted as evidence of underlying order in *Figure 3*.

Extrapolation to social/business systems

In the three decades since Lorenz first made his observations, CAS Theory has evolved in many directions beyond the world of physicists and biologists. Margaret Wheatley[3] was among the first to relate this way of thinking to organisations and business, and has been followed by many more[4/5]. Nearly all dynamic systems – physical, biological, organisational, or political – can be characterised as Chaotic to various degrees and there are those who are trying to discover order in apparent chaos surrounding them in business, or in politics[6]. Would that such processes could be reduced to equations, and mathematical analyses like that illustrated above made. But they cannot.

However, by following the same thought process, we believe that many processes deemed chaotic by the definitions listed above can be analysed, and signs of orderliness amidst the noise discovered. We will call these 'weak signals'. They are deemed weak not because of lack of importance, but because they are so small as to be obfuscated by other irrelevant factors. They are actually very important, because recognition may make the difference between success and failure of the enterprise. But the traditional way of thinking about business, organisations and strategy and many of the tools we use to assist us may, in fact, limit our ability to recognise and take advantage of them.

Traditional strategic frameworks, planning tools and ways of thinking about organisations are modelled along classical linear theories. They align with a clockwork notion of business and organisation, and may suffice with some effectiveness in periods of high stability or over short time frames. But classical strategic planning models and thinking ignore the non-linear nature of business cycles. Innovative reactions by competition to business moves are not considered. They enforce low tolerance for uncertainty, and they discount or ignore the 'weak signals' of Complex Adaptive Systems.

Several examples of demonstrably chaotic business systems come to mind, examples where a seemingly small event made a big change. We will briefly recall two of these, and ask what was the weak signal that was missed, or in some cases discovered by an insightful soul.

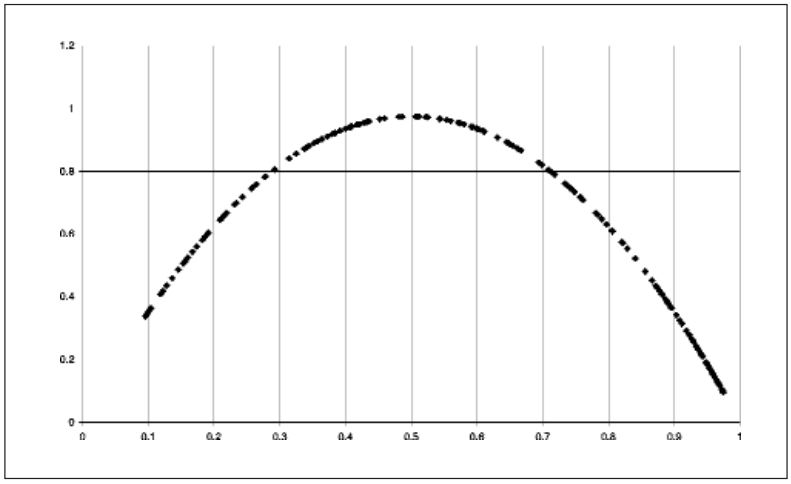

Figure 4 **A pseudo phase space plot of *Figure 3*, demonstrating underlying order**

Example one: Coffee products

In the late 1970's, a Fortune 100 Company underwent a series of strategic planning sessions. Among the tools used was a popular business portfolio matrix intended to examine strategic options. The matrix uses market share and market growth as the key indicators of strategic position. From this work, management determined that their coffee products business fell into a 'cash cow' category, typified by very low market growth and high market share. With the future of this coffee business believed to be predictable to a high certainty, management locked into the normal course of action for cash cows: Plan to exit the business, take cash from it, and make minimal or no investments.

At about the same time, however, at least one established competitor embarked on almost the opposite strategy based on its detection of different marketplace signals. And within a few years, a completely new entrant arrived with an even more distinct strategy.

The established competitor, Nestlé, was a long-standing player in the coffee products business. Its strategic framework included understanding the business by segmenting the coffee markets: High income consumers where image was central; discriminating consumers where taste was the key driver; health conscious consumers where caffeine was the issue; households where value for money was pivotal; the low end where price was most important. Through market segmentation, the company heard more subtle signs that were lost in the noise of a single broad market. Based on weaker signals, Nestlé chose an investment strategy that resulted in a range of new brands that soon earned higher margins while capturing market share.

The new entrant was a start-up called Starbucks Coffee. It entered the business with eyes and ears unrestricted by the incumbents' paradigms, business design and strategic frameworks. Starbucks detected even weaker signals as they worked to make sense of the marketplace. It detected an opportunity to tap a new consumer lifestyle that would embrace coffee as other consumers might a 'mixed drink' and that encompassed a special event and a physical setting. As a result, Starbucks established unique channels to the marketplace, created new products, cultivated an image aligned with a different kind of coffee consumer, and packaged all of this in an 'experience'. Within five years Starbucks' sales reached $160 million and soon

surpassed the profitability of larger coffee companies.

By the time the Fortune 100 company acknowledged that the future it predicted was different than the one it was experiencing and abandoned its cash cow strategy, major market share had been usurped by competition. Interestingly, at least one of the incumbents had considered an attempt to purchase Starbucks shortly after its inception but either dismissed the start-up's success as an aberration or failed to detect the weak signal that much later became a resounding trend; the café experience.

Example two: Genetically modified food industry

During the past decade, companies such as Monsanto and DuPont have invested heavily to position themselves to take advantage of what their strategic indicators demonstrated would be a burgeoning business in genetically modified foods.

Because their future seemed eminently predictable (primarily farming costs and crop-yields), these enterprises reworked their corporate strategies, restructured their organisations, shifted resource allocation, divested themselves of businesses that did not contribute to a GM focus, and invested heavily in internal research or acquisitions to rapidly establish a stronghold.

However, recent media reports indicate that major players are showing signs of overhauling their GM strategy, at least from their public persona. This change stems in part from the recent outcries widely reported in the mainstream media by an anti-GM movement in the US, the more demonstrative activities in Europe, and negative reactions by both farmers and end-users of GM products. Although these reactions have little basis yet in scientific evidence, they may be the deterministic process that is driving this CAS and therefore cannot be dismissed by GM enterprises. This state of affairs was a surprise, and presumably unpredictable. But was it?

In five years Starbucks' sales reached $160 million and soon surpassed the profitability of larger coffee companies

At this stage, while impossible to estimate potential financial and image impacts of misreading markets and implementing damage control, the important question is: "Were there anti-GM indications that the major corporations missed as they rapidly invested in GM strategies?" In other words, were there signals from the marketplace prior to and during the years the corporations were gearing up that suggested possible flaws in that strategic direction?

We believe there were a number of them that, had they been detected or seen as more than aberrations, may have led to a more flexible prognostication, and perhaps a more effective approach to this industry. A significant number of early weak signals could be found in Europe, later ones from the US and around the world. These include, but are not limited to the following:

- European sensitivity to genetic experimentation and 'purification' resulting from horrors under Hitler (1939 to present)
- The difference between approaches to food and meals by Europeans [quality and cultural 'experience'] and US [quantity, speed and 'interruption'] (1970's to present)[8]
- Anti-Americanism, big business and globalisation (1970's to present)
- The concerns in Europe over Mad Cow disease (1996 to present)

There can be any number of arguments that explain why these signals were missed – from cultural bias to optimistic thinking to seeing many of these signals as random or unrelated to GM. Nevertheless, a flow of weak signals existed for many years, and could have been detected much earlier and, if heeded, could have led to different research directions and marketing strategies. Creating a range of scenarios – including a future that consisted of increasingly adverse public reactions to GM – and then monitoring them for weak signals would have proved beneficial.

If the key to success is to figure out what is happening and then take action before others do, it is imperative that organisations improve their abilities to do so. Organisations that rely upon traditional strategic frameworks, linear thinking and long-term stability increase their chances of missing weak signals that anticipate new opportunities or shifts in the marketplace. Companies need to apply new frameworks that more closely reflect the complex adaptive systems that indeed are the organisations and businesses in which we work.

Because you can only predict as far as the next innovation, flexibility is critical. By embracing the concept of business and markets as CAS and, therefore, limited in predictability, enterprises can build flexibility into their planning processes and behaviours. And weak signals and their detection are critical elements that need to be accounted for both in planning processes and in carrying out the plan. Without finding ways to deliberately seek out weak signals and encourage learning from them, the chances for innovation and sustainable success are slim.

In the next issue, we shall elaborate on weak signals and provide insights into what an enterprise can do to actively detect and act on them.

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4. Kelly and Allison, *The Complexity Advantage*, McGraw-Hill, (1998)
5. Briggs and Peat, *The Seven Lessons of Chaos: Timeless Wisdom from the Science of Change*, Harper Collins, (1999)
6. Needless to say a large army of analysts have been attacking measures of stock market performance with these concepts for the last decade. Reference 7 is a very readable discussion of some of those at work.
7. Bass, Thomas, *The Predictors*, Henry Holt, (1999)
8. On any number of business trips to Europe over the past decade, our casual dinner conversations with French, Swiss, British, German, Italian and Austrian professionals indicated strong concern over the decline of quality at the expense of quantity in US foods as well as concerns and even fear of genetically altered foods.

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