

Practical Lessons in Leadership, Failure, and Complexity Theory

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I was first introduced to the Santa Fe Institute in the early 1990s, when my in-laws moved to that beautiful city, and suggested that I stop in to browse their working papers when we visited with their grandchildren. Since then, complex adaptive systems and network theory, and their application to practical problems of investing and organizational leadership have continued to fascinate me, in the best sense of that word.

I first began to write about these issues in the mid-1990s. My growing understanding of them greatly contributed to the papers I wrote in March, 2000 and May, 2007 that gave advance warning to readers of *The Index Investor* of the market calamities which later occurred. Indeed, I concluded more than a decade ago that complex adaptive systems and network theory, along with advances in neuroscience, formed a very solid basis for a new way of thinking about financial markets and investing. Since then, this perspective has slowly edged into more mainstream thinking, and certainly into the increasing number of evolutionary algorithms that dominate daily trading volume in the markets for many financial instruments and derivatives.

However, complex adaptive systems and network theory also have important implications for our understanding of organizations, and their success and failure over time. When I was a consultant, I found that my ability to directly apply these insights in client engagements was relatively limited. At a “coarse grained” level, they certainly helped to refine my intuition about the range of behavior that could be expected from complex adaptive systems like organizations and industries. And as Dietrich Dorner (author of [The Logic of Failure](#)) might note, that in itself is critical. However, it wasn’t until I became a corporate executive that I really had

the chance to apply these theories. This brief note summarizes two important practical lessons I've learned.

The first is that the NKCS framework, and the balance between internal and external levels of connectivity it describes, provides some excellent “coarse grained” metrics for monitoring the overall functioning of an organization. The starting point for thinking about these indicators is the dynamics of a complex adaptive system. Broadly, such a system exists in one of three states: a chaotic state (where external connectivity, CS, is greater than internal connectivity, NK), an excessively stable state (where NK is greater than CS), and a state in the region between the two (NK about equal to CS), where the system is maximally robust and adaptive. A slightly different way of looking at this is to say that an organization's evolutionary processes (i.e., the sequence of variation, selection, and retention that operate at many different levels of the organization) function best when internal and external connectivity are in balance. When internal connectivity is greater than external, variation is typically limited and selection and retention processes tend to favor incremental improvement (e.g., exploitation or “hill climbing” search). In contrast, when external connectivity is greater than internal, there is often a very high degree of variation, which is only weakly disciplined by consistent selection and retention processes, which tend to favor “home run” or “moon shot” initiatives (i.e., exploration or “long jump” search).

Obviously, threats to organizational survival are higher in both the chaotic and excessively stable states, where the system is either over or under-reacting to changes in its external environment. This theoretical view gives rise to some very practical system level early warning indicators, including rising numbers of “fire drills” generally, and, more specifically, rising levels of operational “near misses” and errors of commission (which in my experience are indicators of approaching the chaotic state), and rising levels of strategic surprise, and errors of omission (which are indicators associated with the excessively stable state). On balance, I have found that the relative importance of these indicators changes

over time, with “near misses” more important when a company is young, and strategic surprise more important as it matures.

The second practical lesson I’ve learned is about how the level of “adaptive tension” interacts with the balance between internal and external connectivity. Adaptive tension itself is a broad concept. In theory, if an organization’s performance metrics have been aligned with the selection criteria in its environment, adaptive tension refers to, at minimum, the relationship between the actual level of performance and the minimum required to survive for another period of time. In practice, it refers to an organization’s performance versus its goals, as well as the (often implicit) goal of the minimum performance required to survive. In addition, since the environment itself, and therefore the selection criteria are evolving over time, there is also a dynamic aspect to the concept of adaptive tension – e.g., how an organization’s performance changes over time, in comparison to that of other organizations.

However, there are often more root causes of the level of adaptive tension you feel in an organization than performance gaps. One of the most obvious and powerful is the extent to which its capital structure is leveraged, including positive leverage (net debt) and negative leverage (net cash). This is a subset of the larger issue of the aggregate degree of risk inherent in the organization’s strategy, as proxied by the uncertainty of the assumptions upon which it is based, and the degree of imbalance between the ends it pursues and the ways it proposes to use available means to achieve them. The greater the imbalance between these three strategy inputs, the greater the risk. A final source of adaptive tension in an organization is the perception of the top management team. Do they tend to be over-optimistic, overconfident, and very selective in the information they attend to? Can they handle bad news? Can they productively manage conflict? Do they throw people under the bus or take responsibility when performance falls short? There is always a higher degree of adaptive

tension when an organization believes the top team won't handle it well if the original plan falls short and needs to be adapted on the fly.

In practice, I've found that there can be a non-linear interaction between connectivity and adaptive tension. When the latter is relatively low, internal connectivity tends to be greater than external connectivity. In this environment, exploitation – incremental improvement initiatives – tends to predominate. The net result is that low adaptive tension and excessive stability often cause an organization to change more slowly than its competitive environment, and failing to survive for long as an independent entity.

Paradoxically, the opposite combination often produces the same result. When adaptive tension is high, it is usually the case that incremental improvements won't be sufficient to meet an organization's objectives. This causes an increased focus on exploration and "big win" initiatives, which in turn also causes a significant increase in external connections. Unfortunately, "big win" initiatives are much harder to successfully execute than incremental improvement. Moreover, when external connectivity is greater than internal connectivity, there is often a profusion of uncoordinated "big win" initiatives that at minimum are in competition and often in conflict with one another. For these reasons, the combination of high adaptive tension and an imbalance in favor of external connectivity is often deadly.

On the other hand, organizations can usually survive, if not always succeed, when their degrees of adaptive tension and connectivity imbalance roughly offset each other – e.g., low adaptive tension with relatively greater external connectivity, and high adaptive tension with relatively greater internal connectivity. As always, there is a mix of adaptive tension and connectivity that maximizes adaptability and the chances of both survival and superior performance. However, as organizations are disequilibrium systems, this optimal point in my experience is rarely achieved, and seldom sustained, as evidenced

by the power law distribution of corporations ordered by their ages (only 33% of US companies survive as independent entities for ten years or more).

As I said at the outset, the final lesson I've learned is that, at best, an understanding of complex adaptive systems and network theory can provide a manager with a "coarse grained" understanding of the organizational dynamics that surround him or her. On the other hand, I've also found that, per Dorner, this is much better than no insight at all, and usually superior to the mental models being used by your peers. Of course, that raises the obvious question of how to improve a team's mental model. While I have a strong preference for simulation training, that is a much longer story for another day.

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