AI: Path to a New Attractor

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September 20, 2001

The field of Appreciative Inquiry holds the "new sciences" as one of its fundamental principles. The applications of the new sciences of chaos and complexity to organizational research and action can take a variety of forms from the most poetic metaphor to the most tightly argued quantitative analysis. A wide variety of descriptive models fall within this range of understanding and application of these sciences to the practice of Appreciative Inquiry. One particular aspect of chaos theory--strange attractors--holds particular promise for researchers and practitioners who seek to understand the mechanism by which Appreciative Inquiry leads to organizational transformation. The purpose of this paper is to investigate how strange attractors and their manipulation can enlighten the theoretical and practical work of Appreciative Inquiry.

What Is a Strange Attractor?

Complex systems have been investigated in many different disciplines including meteorology, ecology, economics, fluid dynamics, and pure mathematics. Each discipline applies its unique set of vocabulary, tools, and techniques to describe the processes and outcomes of a class of systems that share a set of generic behaviors. Though the list of identifying characteristics varies by discipline and the underlying medium of the system, some behaviors are commonly recognized in all. They include:

- Sensitive dependence on initial conditions (butterfly effect). This describes the tendency of a system to shift its macro behaviors based on small changes in initial conditions. Any small difference in initial state, which may even be unobservable, can have massive effects on the outcomes of system behavior at a later point in time. The effect of this characteristic is that behavior of the system as a whole and individual parts of the system is not predictable over long periods of time.
- System-wide, emergent patterns. Complex systems comprise multiple parts (agents) that interact with each other to establish emergent patterns for the system as a whole.
- Self-similarity across scales. As the patterns develop in the system, they are reproduced in various ways at various levels of scale.

Scholars and practitioners in each of the interested disciplines have used the tools and techniques at their disposal to build models that seek to describe and/or quantify how these characteristics are made evident in system behaviors over time. One particular model, which emerged from the work of pure mathematics and mechanical engineering, involves the use of attractors and attractor regimes.

An attractor is a pattern that emerges over time in a deterministic chaotic system. In this technical sense of the term, *chaotic* is quite different from *random*. A deterministic chaotic system is one in which a short list of deterministic rules, exercised by individual agents in the system, leads to system-wide behavior that appears to be random, but in fact, demonstrates complex and highly structured patterns. The system is "determined" by a few variables (minimum number three) in quantifiable, nonlinear relationships to each other, but the overall behavior of the system appears to be random. Not all complex or complex adaptive systems are technically chaotic. If the system is chaotic, however, its behavior evinces the pattern of a strange attractor.

A strange attractor is only one of the four types of attractors that shape the behavior of dynamical systems: random attractor, point attractor, periodic attractor, strange attractor.

A random attractor produces system behavior that is truly random--no discernible pattern of behavior is discernible at all. There is some disagreement in the field about whether or not the random can truly be considered an attractor because no pattern emerges from the system over time. However, the concept is

helpful to build a complete classification system for attractors describing the possible behaviors of dynamical systems. Some systems in motion have no coherent, observable patterned behaviors. These are classified as random attractor regimes.

A point attractor is the emergent pattern of system behavior in which all parts of the system tend toward a single point. The motion of a marble in a round-bottomed bowl is a classic example of a point attractor. No matter where the marble starts its path, the speed or direction of its initial movement, the marble eventually ends up at the bottom, center point of the bowl. Human systems examples of point attractors include retirement, exit doors at quitting time, effective mission/vision statements, and water coolers. All of these objects or concepts intend or describe patterns of system-wide behavior that end in a specific location or outcome, regardless of the starting point or initial conditions of any active agent.

A periodic attractor describes the behavior of a system that oscillates over time. At predictable periods of time, the system returns to a previous state, then repeats the cycle again. Examples of periodic attractors in human systems include seasonal sales volumes in the swimsuit industry and financial reporting or budgeting cycles.

A strange attractor, which characterizes a deterministic chaotic system, describes a pattern of behavior that has clear bounds (the system will not move outside of the attractor), but within the bounds the behavior of the system is infinitely varied and unpredictable. Observed in real time, the behavior of the system appears to be random--it does not follow a sequential developmental process. Across time, however, the discrete behaviors of the system accumulate into patterns that are highly structured. The behavior never repeats itself, so the possibilities for behavior are infinite. However, some clusters of behaviors are more closely related to others, and the related clusters can be recognized and delineated as patterns in mathematically determined phase space. The patterns of strange attractors are fractal--the same structures appear at various levels of scale, but they are not predictable. Even when you know what the strange attractor of a system is , you cannot predict where on the pattern the next system behavior will fall.

Applications of Strange Attractors to Human System Behavior

Quantitative research has articulated the strange attractors that shape a variety of dynamical human systems, including conversations (Eoyang and Stewart), accident rates (Guastello), economics (Kiel). Such quantitative analysis requires that the systems incorporate a small number of deterministic variables (dimensions). If the dimensionality of the system is too high (the commonly-used limit is eight variables), the system is considered to be random because the pattern cannot be discerned by current manipulative practices and analytical algorithms.

Qualitatively, however, the strange attractor has been used as a metaphor to describe highly complex, but patterned behavior in human systems. Whenever the behavior of the system is bounded, includes infinite freedom within the bounds, and generates coherent patterns over time, the human system can be metaphorically described as a strange attractor regime. Examples of human system aspects that fit this qualitative description include organizational culture, patterns of professional practice, or the behaviors of firms within a given industry. In each case, individual agents work within accepted boundaries in accord with patterns of behavior that are supported by the rest of the system in complex and nonlinear ways.

Working in the metaphorical realm, it is seductive to think of the attractor as a reified object, which shapes the behavior of the system agents. Any agent in the system is forced by multiple system influences into individual patterns of behavior that match those of other agents and the system as a whole. This approach can be helpful when the purpose of the description is to articulate the current system patterns and to constrain the behavior of individuals to conform to the existing patterns, however, complex.

Such a view, however, can be counter-productive when the purpose of the description is to change existing patterns on an organizational or individual level of action. If the desire is to change the attractor, then one must deconstruct the current and investigate ways to establish new attractors to shape new patterns of behavior.

Changing System Attractors

The literature does not currently include any systematic study of attractors and shifting attractor regimes in human systems. The following analysis is based on a practitioner's experience in human systems change and an understanding of attractors as they appear in physical and mathematical systems, so it should be seen as speculative and heuristic. The hope is that it will be useful as a foundation for further study into the theoretical and practical applications of the new sciences to human systems dynamics.

Three different strategies can be used to shift from one strange attractor to another in the system. Each approach has benefits and risks in application to real system environments, and they can be implemented simultaneously in the same system.

First, the existing attractor can be disrupted, opening the possibility for new patterns to emerge. This approach has shaped the organizational theory and interventions generally characterized by the "boundary-less" organization. Wheatley supports this approach in Leadership and the New Sciences. The principle is one of disruption. Agents are forced out of their habitual patterns and, individually or in small groups, build new relationships and behaviors that are more productive or adaptive. The strength of this approach is that it respects the autonomy of individual agents, opens the potential for creative new solutions, and increases the amount of information that is accessible to individuals or small groups. The risks of the approach are obvious, however. As the old attractor is disrupted, some agents in the system will feel threatened and insecure. As a result, they become even more attached to the patterns of the past. This behavior has been labeled "resistance." Another risk is that the new self-organizing patterns may not improve on the old. The path and outcomes of the new self-organizing process are unknowable. The system may be just as likely to establish a more destructive pattern than the previous one. Finally, the psychological toll of transition may be too great for the individuals, and the lost time and wasted resources of the transition may put the organization at risk.

Second, a new attractor regime can be imagined and the behavior of individual system agents reinforced to establish new system-wide patterns. This is the approach of vision-based change initiatives. The process defines the preferred future, identifies gaps between that future and the present, and builds plans to move from the one to the other. This has been a popular organizational change process in the past. It builds a common mental model among leaders about the future of the organization, it provides a hopeful environment to support the change, and it allows for strategic direction and intentional action. The drawback of this approach is that the gaps identified are frequently not those that are essential to the new attractor regime. Rather, they are based on the current patterns, so, without intending to, they reinforce the behaviors of the past rather than those of the preferred future.

Third, the existing attractor can be examined to find specific instances of behavior, however rare, that would characterize both the old and new attractor regimes. Then those specific behaviors can be reinforced and connected in new ways to encourage building a new pattern. The benefits of this approach include the security of carrying some of the behaviors of the past into the future, strengthening the confidence of individual agents in the system, and providing some continuity in the course of the change. The drawback to this approach is that it requires thoughtful sorting of current behaviors to identify which should be amplified and which damped. Also, expectations must be clearly communicated to help individuals see how the specific behaviors from the past should be kept, while the patterns of behavior are expected to change. This is a difficult and ambiguous message to send to staff, and may serve to result in some of the psychological and resource confusion of the first approach--blowing apart the existing attractor.

Applications to Appreciative Inquiry

Appreciative Inquiry techniques, as outlined in Watkins' book, implement the third of these approaches to shift attractors. The five generic processes operationalize the idea of shifting an attractor by using points within the existing attractor as seeds for a new pattern.

Choose the positive as focus of inquiry. This process examines the existing attractor patterns to recognize points that can serve as seeds for the new.

Inquire into life-giving forces. This articulates possible attractor regimes that can be encouraged in future. It begins to tie together the positive points into coherent wholes in ways that people can see and understand them.

Locate themes that appear in the stories and select topics for further inquiry. This pulls the emergent patterns out of the stories. These clear and concise patterns become the foundation for the emerging attractor.

Create shared images for a preferred future. This articulates the future attractor, which includes the points and patterns emergent from earlier steps. This becomes, then the new story that will constrain and shape the agents' behaviors as they move into the new attractor regime.

Find innovative ways to create that future. This is the process of identifying reinforcing loops to inform and constrain individual and group behavior into the new, intended attractor.

Conclusion

Attractors are one of the most powerful, but least understood, aspects of human systems as complex adaptive. As qualitative metaphors, they help groups think globally about organizational change. Appreciative Inquiry is a technique that implicitly shifts the attractors of a system into new domains of experience and understanding.