**HUMAN SYSTEMS
DYNAMICS INSTITUTE**

Human Systems Dynamics:
A Paradigm for the 21st Century

Glenda Eoyang, Ph.D.
2013

Prologue

Human systems dynamics (HSD) begins with a particular worldview and engenders models, methods, demonstrations, and practical applications to help people perceive, understand, and influence change in social systems at all scales. The purpose of this essay is to describe this view as clearly as possible and to explain how it shapes and informs our theory and practice of pattern-informed adaptive action.

In the statements below, our understanding of the dynamical nature of human reality is presented through the praxis we teach in the field of human systems dynamics. Understanding this HSD worldview is in no way required to use HSD models and methods. The intent of this statement is to make explicit a coherent foundation for those who wish to expand the field of HSD or to compare HSD with other approaches to social interaction, including other ones derived from complexity science.

In the following pages we explore basic functions of Adaptive Action: **What** is the nature of an emerging reality? **So what** does it mean to know in such an emerging reality? **So what** is change in the complex world of human experience? **Now what** can we do in the present to influence our emerging future? We close with a brief introduction to the short list of simple rules that shape patterns of the community of scholar/practitioners who comprise the HSD Associate Network.

What is the nature of an emerging reality?

We assume a mechanism for being, acting, and being acted upon that is different than the long-held atomistic or mystical views. Those views originated among the ancients and continue to shape science and thought into the 21st century. They both assume a strict distinction between the physical and the metaphysical realms in which space contains objects, and those objects have persistent qualities (extension, mass-energy, position). Atomistic worldviews hold that change occurs when one or another of those qualities is altered by some external force over time. Mystical, non-physical worldviews, on the other hand, focus on being, existence, subjective experience, or emotional or spiritual engagement. Change in the metaphysical domain occurs when subjective

Nothing is intractable.

experience shifts. This shift is often referred to as a change in consciousness. Both perspectives, atomism and mysticism, traditionally depend on the distinction between the material and the non-material domains.

Many people, from a variety of disciplines, have denied this split between "mind" and "body," and yet it persists as a fundamental assumption within and across most Western thought and action.

Human systems dynamics emerges from the assumption that physical and non-physical realities are manifestations of the same dynamics in different contexts. The two influence each other, and their complex interactions shape human meaning making and action taking. Observations from the old atomistic paradigm continue to be relevant. Solid objects obey the laws of Newton and Einstein.

Waves are waves and particles are particles in systems that are constrained by bounded, low dimension, and linear conditions. Systems without physical limitations are observed through subjective emotional and spiritual means. Experiences such as spiritual conversion or mother's love are still innately incomprehensible. Fuzzily bounded, high dimension, non-linear systems occupy the space between the certainty of physics and the poetry of metaphysics. They require pattern-based language, models, and methods that function outside of the strictly rational constraints of the physical reality, but within the realm of the reasonable. For example, a social system plagued by domestic abuse has indistinct boundaries, many relevant variables, and self-referential causality. In such a situation, neither the traditional assumptions of mystical blind faith nor of absolute atomistic causality are helpful. HSD embraces both of these as well as an array of somewhat constrained patterns that lie in between the extremes.

At the same time, in HSD the metaphysical realm is both sustained and transformed. We still experience deeply personal tensions and transformations from the traditional unbounded, high dimension, and nonlinear worlds beyond physical reality. These tensions, however, are made accessible to conscious examination and shared understanding through the same pattern-based language that gives access to dynamics of physical systems. For example, we observe that while conflict among neighbors remains a subjective, emotional, and social phenomenon, the pattern language of HSD can capture many different facets of the situation. We use the same methods to observe, understand, and influence emotional, social, physical, political, and aesthetic patterns. In this way, HSD provides the means to build shared meaning and action that transcend traditional disciplinary and methodological boundaries.

From a traditional worldview, different models and methods explain the behavior of physical, conceptual, and social systems as if they were separated. The HSD paradigm recognizes the same patterns and dynamics crossing these various contexts and diverse media. We are not the first to embrace such an understanding. Physical scientists such as Bohm and Goethe described physical and biological realities that were fluid and generative as if they were metaphysical. Mathematicians, such a Wolfram and

Nothing is intractable.

Mandelbrot, explored open, high dimension, nonlinear domains with the same mathematics they used to describe physical reality. Social scientists, such as Weick, Piaget, Dewey, and many others, acknowledged emergent phenomena in human experience as complex interdependencies of physical, conceptual, and social conditions. Contemporary social scientists and practitioners also draw metaphors from physical sciences to explore applications of complex adaptive systems to human systems of psychology, teamwork, organization development, and management. We believe that all of these scholars address the same phenomena of emergence and generative action that we strive to observe and influence through human systems dynamics. One key difference is that HSD strives to inform wise action directly through a collection of simple, accessible, and intuitively obvious models and methods.

So what does it mean to know in such an emerging reality?

We acknowledge that there are many elegant and powerful descriptions of what it means to know. Each has its purpose and context. In HSD, we define knowing in terms of pattern recognition, so that we can ultimately prepare for pattern understanding and influence in human systems at all scales.

Reality, including things and our experiences of things, involves many differences that make a difference. We can say, then, that reality has unknown and potentially an unbounded number of **dimensions**. One thing can be red, round, cold, big, heavy, mine, plastic, ugly, useful, and so on. Each of these can be considered to be a defining dimension of the thing itself. Interestingly human beings tend to focus on a small number of dimensions at any given time. Those are the ones we consider to be relevant to a particular purpose or perspective—the differences that make a difference. For a two-year-old, "mine" can be the most relevant dimension; while an artist will focus on "round" or "red;" and a physical therapist cares most about "big and heavy." Notice here that we do not distinguish between differences in physical traits and metaphysical ones. They are all simply different dimensions in the same way that mass, time, and distance are a familiar set of dimensions for physical quantities.

We are aware of dimensions of reality through our perceptions of external senses and our abilities to focus, remember, and imagine. Using these capacities, we recognize patterns—similarities, differences, and connections—among various dimensions. (e.g., This group is friendly and happy while that one is quiet and thoughtful.) We can also recognize differences within the same dimension when we talk about having more or less of a single characteristic. (e.g., This group is more friendly, and that one is less friendly.) We acknowledge a collection of differences, similarities, and connections as a *pattern*, and we come to an understanding of patterns across space and/or time. The pattern perceived by the two-year old is different than the pattern observed by the physical therapist, though they may be looking at the same object. They focus on different differences, they are drawn by different similarities, and they inquire about

different connections, so the patterns they comprehend are distinct. They value different similarities, differences, and connections; so they perceive different patterns; so they know different things about the same object or situation.

We can also compare and contrast patterns with each other and make meaning of the patterns formed by relationships among patterns across space and/or time. When we do this, we are aware of patterns at different scales. For example, at the same time that the red ball constitutes a pattern, it may also participate in a pattern of a collection of many-colored balls. The collection of balls may participate in a pattern of toys, and toys in the collection of objects our two-year old can name. Notice, again, that the patterns, like the dimensions, make no significant distinction between physical and non-physical substrata.

Often we think of scales as indications of the levels of organization. Individuals in a team constitute a pattern of similarities (e.g., membership, commitment, location, etc.), differences (e.g., expertise, height, hair color, etc.), and connections (e.g., shared stories, meeting times, agendas, measures, etc.). A collection of teams constitutes a pattern at a different scale, as we focus on more generalized similarities, differences, and connections. We might also recognize lower scales in a system as the personality of each individual represents a different confluence of similarities, differences, and connections; and his or her physical appearance represents another confluence. In this way, a single system manifests as patterns at many different, though interdependent, scales simultaneously.

Some scales are defined as higher because they include multiple patterns within. Others are lower scales because they are included within larger patterns. Any given pattern is simultaneously higher than some and lower than other scales. The scale of a particular pattern is determined by the observer, based on relevance to purpose and fit with other perceived patterns. From the perspective of the team member, a single team is a higher scale. From the perspective of the manager with many teams, the single team is a lower scale. The team is the same, but its level of scale depends on from what vantage point it is known.

In addition to patterns being nested within and around each other, they also can be massively entangled. We can talk about simple scale relationships as a child in a classroom; classroom in a building; building in a district; district in a community. Certainly patterns like this are powerful, but they are not the most interesting or challenging relationships in human systems. More interesting patterns come from the interactions among and overlaps between patterns. For example, that same child is also a member of a faith community, a family, a scout troop, and a neighborhood gang. Each of these patterns influences and is influenced by the child, so that system-wide emergent dynamics may or may not be coherent, but they are certainly complex and unpredictable.

Nothing is intractable.

In spite of its attention to point of view and subjective experience, HSD is not a constructivist perspective. We believe that perception is engagement with a real object that persists outside of anyone's knowing. There is something out there to be perceived. While it may be known in many different ways, it is also possible to be mistaken because the object of attention has an existence independent of the knower. This expectation of a knowable external reality is essential to the pragmatic applications of HSD's Adaptive Action. When we ask WHAT? we observe patterns of a persistent and external reality. When we ask SO WHAT? we consider our observations in and through context and intention. When we ask NOW WHAT? we assume that an action will influence the patterns of external reality in ways that we cannot predict or control. The real system responds in real, observable ways to actions we take to influence it.

When we are aware of a system's relevant similarities, differences, and connections, we know the pattern of the system, regardless of its content or context. It does not matter if the system is a hurricane, a bicycle, an idea, a family, a story, or a love affair. From the perspective of HSD, knowing the similarities, differences, and connections is knowing the pattern; and knowing the pattern is knowing the thing.

So what is change in the complex world of human experience?

Systems change when their pattern-defining conditions (similarities, differences, and connections) are not coherent. In a given pattern, the differences, similarities, and connections may not be in balance. One of the conditions might be significantly more or less constrained than the others, so the pattern of the whole becomes distorted. For example, if there are:

► Too many differences, the connections may be strained, and the similarities may be difficult to discern. This phenomenon emerges when a community group comes together and each person brings his or her own concerns to the table.

► Too few differences, the similarities and connections become redundant or irrelevant. When a group has been together for a long time, they begin to lose differentiation, and their meetings become repetitive.

► Too many similarities, the differences are difficult to recognize, and the connection may be constraining. Over time, a group may converge on a single perspective of shared culture and become intolerant or impatient with different views.

► Too few similarities, the differences don't fit together, and the connections are hard to sustain. When a group cannot find points of agreement, they find it difficult to continue with shared work.

► Too tight connections, and the differences push against the pattern as the similarities are amplified. A group that has a rigid agenda and ritualized interactions will appear to be strong, but different opinions may not be accepted and divergent personalities will leave the group.

► Too loose connections, and the differences and similarities are not perceived as context for each other. When a group loses clear connections or regular communications, they lose track of the similarities that brought them together or the differences that enhance their work.

When the conditions (similarities, differences, and connections) are balanced, the pattern is coherent, and tensions are at a minimum. When the conditions that influence the pattern are not balanced, tensions accumulate within it. These tensions will be physical ones, if the pattern is manifested materially. They will be emotional if the differences are relevant to human feelings or perceptions. Social tensions emerge when the dimensions of interest describe social patterns. Whatever the underlying substrata, mismatched conditions will generate tension within the pattern.

When tension develops, if the components are free to shift, the similarities, differences, and connections that constitute the pattern change spontaneously to adjust to the tension. If one or more of the components is constrained from movement, then the tension will continue to accumulate until it can no longer be sustained by the other conditions, and an adjustment occurs somewhere in the pattern to release the tension.

Resolution of tension within a pattern at one scale has the potential to increase or decrease tension in patterns that are interconnected with it at the same or different scales. This release of tension may include patterns that are in scales immediately higher or lower or both higher and lower. As we mentioned above, various scales of a system are not simply nested, they are massively entangled. For this reason a change in conditions for one pattern can affect changes in conditions for many other patterns (either nested or massively entangled) simultaneously. In this way, a release of tension in one pattern will tend to shift conditions (similarities, differences, and connections) and so change tension in other patterns, which in turn will move to resolve tension and/or build it elsewhere. Examples of such change dynamics are many. A political party may have enormous differences within, but as long as the similar identities and means of communication are robust, the party retains its coherence. If the leader of the party experiences a shift in personal pattern, and that shift is large enough, it can release tension and cause a change in him. His change may be sufficient to shift similarities, differences, or connections across the entire community and cause a major structural transformation of the party as a whole. These same inter-scale dynamics are observable in individual learning, personal relationships, team dynamics, community development, national policy, economic markets, and world peace.

This accumulation and release of tension applies to all kinds of change in physical and metaphysical contexts, it also applies to the kind of conceptual pattern formation that influences meaning making or other kinds of learning. (Piaget captures the phenomena of tension accumulation and release in his developmental learning theories of assimilation and accommodation.) When both knowing and change depend on tension and resolution of tension between and among patterns at multiple scales, any system has the capacity to be open, high dimension, and nonlinear. In other words, learning and change meet the criteria of complex adaptive systems, and they will exhibit complex, nonlinear behavior. Change, when seen as arising from this causal mechanism, has a variety of counter-intuitive characteristics. Change in these systems is:

Not teleological. It is driven from conditions in a given moment, not from some intention or future goal (except in so far as that intention or future goal contributes to a tension in the here and now). We say, therefore, that change is ***emergent***. For example, if we consider the process of breaking a habit, we would say that the change happens because the person confronts the compulsion at each moment, not because he or she imagines a future without the behavior.

Not predictable. The number, variability, and interdependence among tensions in a system result in paths of possibility that are too numerous to track and too similar to distinguish, except over short spans of time or within local boundaries. This phenomenon of stability and predominant similarity is often referred to as symmetry, and the movement is described as a result of asymmetry or symmetry breaking conditions. We say, therefore, that change is ***sensitive to initial conditions***. For example, the process of breaking a habit varies not just person to person but from experience to experience and time to time for the same person. The path of change is never exactly predictable or replicable except within very narrow boundaries. Any apparently random thing can break the symmetry and influence the system to interrupt or reinforce the past behavior patterns.

Not always observable from outside of the system. The accumulation of tension, which ultimately leads to change, may generate no externally observable evidence until it reaches a critical point. From within the system, however, indications of rising or reducing tension may be observed or otherwise discerned at lower (or higher) scales before other scales reach critical points of transformation. We say, therefore, that change in human systems exhibits ***self-organized criticality***. An observable change in habitual behavior at one scale depends on an unpredictable and large number of internal transformations which cannot be observed except from an alternate scale. A peer group of addicts may appear to tip into new behaviors without warning, but closer and multi-scale investigation will reveal a history of accumulating tensions either among the members of the group or in their shared surroundings.

Driven from the top down and from bottom up. Scales above and below or otherwise massively entangled are equally capable of influencing tension (and therefore change) at any given level. We say, therefore, that change is **heterarchical**. A change

Nothing is intractable.

in habitual behavior can involve both a rational (top-down) influence as well as contextual (bottom-up) influences. Neither a will to quit nor individual behavioral cues will set sufficient conditions for a major change in behavior. Together, the heterarchical conditions are set to initiate and/or sustain change.

While every system has the potential for heterarchy, self-organized criticality, sensitivity to initial conditions, and emergence, not all systems exhibit these qualities all of the time. When systems are more strongly bounded, dimensions are relatively few in number, and causality is simple enough to appear linear, then traditional expectations hold. The system becomes predictable, and Newtonian explanations are sufficient. On the other hand, when systems are totally unbounded, active dimensions are innumerable, and causality is completely nonlinear, then clear, predictable patterns disappear. Any action is as likely to lead to desired outcomes as any other. Historically, mysticism was considered a reasonable approach in such unpredictable times. Snowden refers to this situation as "chaos" and points out that any action that perturbs a chaotic system can help it move into the more tractable regimes of what he calls complex, complicated, or simple. Regardless of whether the systemic conditions make the future predictable or unpredictable, responsible humans strive to understand and interact intentionally, and their intentional actions influence all the patterns (both the physical and metaphysical) that constitute their environments. The purpose of HSD is to improve the capacity of people to act intentionally by making the patterns and their dynamics explicit.

From an HSD perspective, this accumulation and release of tensions across multiple scales is how change happens in all systems—physical, metaphysical, social, cognitive, spiritual, aesthetic, chemical, physiological, and so on. Tensions can accumulate between or within any scale of human interaction. For example intrapersonal doubts, interpersonal conflict, organizational power structures, or patterns at many other levels can influence social interactions at every other scale. Tensions also accumulate within a single dimension or between or among multiple dimensions. For example, different levels of power can instigate tensions and change in a group, and mismatches between levels of expertise and tenure can also generate tension for change. Tensions among dimensions manifest as tensions within and among patterns. At critical points, the conditions of the patterns (between, among, or within) are not able to sustain the accumulated tensions, and shifts result in reconfigurations of similarities, differences, or connections in many related patterns simultaneously. The result is what we call self-organizing change.

Now what can we do in the present to influence our emerging future?

Another hallmark of HSD is its commitment to praxis—practice informed theory and theory-informed practice. Because we understand both the process of change and the process of knowing to result from accumulation and release of tension in patterns, a

Nothing is intractable.

whole range of questions about perceiving, making meaning, and influencing change in the real world emerge.

In a world of pattern-based evolution as described by HSD, the answer to "why" is always the same—tensions accumulating and resolving. Tension and its release are the purpose for change, the mechanism of change, the substance of change, and its motivation. When one clearly perceives the differences in a system, the tensions that emerge from those differences and the similarities and connections that hold the tensions until release, then one can understand a wide range of meanings and imagine diverse options for action. One is free to observe with minimal bias and to act with optimal intent.

In a pattern- and tension-driven reality, one can never be certain of certainty. The system must be artificially and intentionally bounded to uphold any semblance of stability or predictability. And even then, the illusion will be temporary. Because system bounding consumes energy, it is impossible to sustain a single system boundary indefinitely. Tremendous investment is required to maintain predictability, regardless of the contexts or substance of the system involved. As a result, any given certainty has a lifetime that is always indeterminate and relatively short.

In the absence of certainty, inquiry becomes the only path toward learning and real change. A cycle of Adaptive Action (What? So what? Now what?) shapes the iterative process of observing, deciding, and acting that connects the knower/actor with the known.

 What is the current pattern? **So what** are the tensions within this pattern and between this and others at the same or different scales? **Now what** can/should we do to shift conditions and change the patterns? As soon as any action is taken, new patterns emerge with new and accumulating tensions, and the Adaptive Action process begins its next iteration.

In addition to dissolving the boundary between physical and metaphysical patterns, the way that HSD thinks about patterns and Adaptive Action dissolves the boundary between observer and observed. Any observation is extracted from the reality of the thing itself—its differences, similarities, and connections. One subjective view is not different from, it is a subset of the nature of the object, as well as a function of the history of the observer and the present conditions of the moment.

The same pattern dynamics are relevant in a wide array of human experiences and interactions, including mental and linguistic constructs, well-being, and social rituals. As meaning emerges for us, it is embedded and embodied in our experience of the flux of tension and release as order becomes organized and recognizable as pattern. At that point, the patterns we hold to be true shift into some meaning-making pattern that is a better fit with current state of memory, perception, and social expectation. In the same way, statements or explanations will hold until they become sufficiently inconsistent and the tension grows strong enough to necessitate a shift. Experience and memory of

Nothing is intractable.

experience establish similarities, differences, and connections recognized as either patterns of harmony and health or dissonance and illness. Rituals, too, function to hold and release community-wide tensions that emerge from, but cannot be resolved at, the scale of personal experience and identity.

The HSD pattern-based model of knowledge and change has far-reaching consequences for how one observes, makes decisions, and acts to influence emerging patterns in both the physical and metaphysical worlds that fill and surround us. While ethics and actions of the past can be reinterpreted from the HSD perspective, it also releases a variety of constraints and creates the potential to consider knowing and action in a system that is open, subject to high dimension interactions, recursive and nonlinear.

Individuals know in this way, but one of the implications of pattern-based knowing is that it is also a social experience. Tensions among members of a group become key conditions that influence the emergence and resolution of tensions within. If a learner (or a group of learners) is in isolation, he or she will reach a state of stasis in which all internal tensions have come to equilibrium, and no new stimulating sources of tension are accessible. Learning will stop, and adaptation will cease. For this reason, the community of HSD practitioners is critical our ongoing learning and adaptive action.

Now what conditions support a community of learning and action?

Understanding the nature of change is not an end in itself. We strive, in HSD, to understand emergent phenomena and to engage with each other, our clients, and our communities in ethical and effective ways. We consider the implications that this pattern-based worldview has for action. We also recognize the importance of community for learning in which individuals benefit from tensions accumulating and releasing as other individuals and groups learn, adapt, and co-evolve. It is critical, therefore, that HSD support a community of learning that is at once diverse, dynamic, adaptive, and coherent.

Complex adaptive systems provide an understanding, through a short list of simple rules, for establishing coherent action among diverse agents without over-constraining the players. The short list of simple rules of the Human Systems Dynamics Institute promotes action that is intentional. The rules also acknowledge the nature of change in a complex adaptive system that we discussed earlier: a context of emergence, sensitivity to initial conditions, self-organized criticality, and heterarchy.

The short list of simple rules for the HSD Institute is:

Teach and learn in every interaction. This rule shapes an HSD pattern of perpetual and profound inquiry. When the environment is characterized by similarities, differences, and connections within and across many, massively entangled scales, no one can be certain of certainty. The engagement of teaching and learning—of inquiry—establishes a

relationship in which the knower contributes to both the accumulation and the release of tension between self and other, and potentially in other patterns as well. In this way he or she participates in and influences the conditions that determine physical, social, cognitive, emotional, physiological, artistic, and a myriad of other patterns.

Search for the true and the useful. This rule encourages a pattern in which theory and practice play significant, dynamic, and interdependent roles. Knowledge that is only coherent with generalized patterns of truth, may not be relevant in specific patterns of perception and action. On the other hand, action that fits with the specific patterns of use may not be consonant with the generalized patterns of knowledge. When truth and use are considered as equivalent and complementary players, the tensions between theory and practice constantly accumulate and release, leading to adaptation in both thought and action at the same, or nearly the same, instant.

Attend to the whole, the part, and the greater whole. This rule allows HSD practitioners to engage with change patterns at multiple scales. Given that tensions accumulate and release across scales, it is possible to intervene in a pattern at one level and influence patterns at many other and quite distant levels. By focusing attention on three (of the infinite number of possible) scales, one can imagine results of intervention, even though they cannot be predicted.

 For these reasons, we identify a focal scale or unit of analysis that is central to the work, and monitor influences from and influences on the scale immediately above and below.

Give and get value for value. This rule establishes connections that are fluid to encourage flexibility of the pattern over time and adaptation for individuals and groups within the whole. Such a rule supports a sustainable system because resources (physical or metaphysical) are not accumulated unduly in any one part of the pattern. Individuals in their interactions are encouraged to both receive and distribute differences that are perceived as value and participate in coherent network-wide patterns.

Share your HSD story. This rule connects the HSD pattern with the other patterns that shape knowing and action in the world. If we truly believe that difference gives the energy for change, then we must expect ourselves to connect across the HSD/Non-HSD difference in ways that establish a pattern of the whole. Not only does this extend the influence of the HSD pattern, but it also ensures that the HSD pattern continues to be influence by others through living and learning engagement. This rule also acknowledges that there is not one, single, immovable HSD story. The pattern of HSD adapts into coherence with each teller's already-existing patterns. Patterns of HSD co-evolve along with the experiences of all who hold them.

Engage in joyful practice. This rule reinforces the sense that the energy driving the system is generated from tensions and release of tensions from within the pattern, not imposed from outside. It acknowledges the power of patterns in the emotional content and experience of individuals and groups. We embrace the joy of individual and

collective praxis in the increasing richness and coherence of patterns we are able to perceive and influence, individually and collectively.

Epilogue

Human systems dynamics practitioners embrace a variety of methods and models to engage with and support systemic change. Each of those models and methods is designed to reveal patterns of tensions across differences, similarities, and connections; suggest insights and understandings about how to shift patterns; and facilitate effective action. Some practitioners are more and some are less aware of the concepts of pattern-driven nature that underlie HSD theory and practice that we described here. Some Associates are satisfied simply understanding and practicing the models and methods of HSD. For others, this articulation of the nature of the HSD paradigm will contribute to coherence for them, for the field as a whole, and for colleagues who stand outside the HSD worldview. In the spirit of this new view of reality, we look forward to the conversations that will accumulate and release the tensions held in this articulation of the emerging patterns of human systems dynamics.

Nothing is intractable.