

Human Systems Dynamics

Competencies in a Complex World

Glenda H. Eoyang

Published in:

Rothwell, W. & Sullivan, R. (eds.). (2005) *Practicing Organization Development: A Guide for Consultants*. San Francisco: John Wiley & Sons.

EMERGING THEORY AND PRACTICE

Practitioners in organization development and management are learning from the new sciences of complexity. Sometimes called chaotic, self-organizing, nonlinear, complex adaptive, or emergent, these new sciences give voice to the intuitions and experiences of persons who work competently to support change in human systems. Around the world, individuals and teams are exploring—in theory and in practice—how to apply lessons from these new sciences to their engagements with human systems.

Today their approaches are as diverse as the individuals who practice and the environments in which they work:

- An HR manager at a development bank in Saudi Arabia considers the role of Islamic principles of purposefulness, values, and intention in establishing coherence in human systems.
- A school administrator builds generative collaborative relationships to provide health services to children when challenges are increasing and funding is decreasing.
- A master facilitator brings insights about complex human dynamics to support decision making and action among teams in business, government, and nonprofit environments.
- An official of family court supports the emergence of new patterns of relationships that help kids develop into healthy and happy adults.
- An international pharmaceutical company applies human systems dynamics principles to understand and influence the use of its products by patients, caregivers, and professionals.
- An international financial services company incorporates complexity competencies into its leadership development programs.
- A consulting team in Canada integrates emergent project management with “open space technologies” to help businesses realize their shared visions in record time.

- A government official in Columbia establishes an infrastructure for community peace and justice.
- A new venture capital firm uses insights about human systems dynamics to foster collaboration among high-tech start-ups and sources of funding.
- An expert in information technology leads an effort to design and implement the next generation of Internet technologies for educators and researchers.
- Healthcare professionals, including CEOs, physicians, and nurses, use principles of complexity and human systems dynamics to improve both clinical and financial outcomes.

All of these professionals and many more around the world use the principles of complexity every day to respond to the emerging needs and dynamics of human systems. They draw from the age-old wisdom of effective leaders. They learn from the discoveries of 20th Century scholars and practitioners in organizational sciences. They derive metaphors, tools, and methods from the study of complex dynamics in physical sciences, information theory, and mathematics. They bring these various threads together into a single, emerging field of knowledge—human systems dynamics (Eoyang, 2003).

What do these students of human systems dynamics (HSD) have in common? How can you, as a professional, develop competencies to do this work? How can the OD field establish standards and developmental pathways to help others explore this exciting and innovative territory?

The answer is, “Nobody knows.” We don’t know because the field is in its infancy, and we’ve only begun to explore what’s possible. We don’t know because each of these environments and each practitioner brings unique gifts and challenges to the table. We don’t know because we are all so busy doing the work and building our own conceptual models and suites of tools that we have no time to articulate and share what we’ve learned with the larger community of practitioners. Perhaps we will never know because the field of complexity application is as complex as the systems it works within.

What we can do is to use the principles of self-organizing systems, which we’ve learned from complexity theory and practice, to reflect on ourselves as individuals and as a cohort of OD professionals. Within this context, I will try to share with you my emerging learnings about what it means to engage in the self-organizing development of myself as a practitioner, my clients’ productive systems, and this field at the intersection of the complexity and social sciences that we call human systems dynamics (HSD). Toward that end, I will explore two questions: (1) What is a complex adaptive system? and (2) What does it mean to work as a change agent in a complex adaptive system?

WHAT IS A COMPLEX ADAPTIVE SYSTEM?

Complexity is a diverse field that includes threads from mathematics, computer science, meteorology, fluid dynamics, and a host of other fields of research (Kelly, 1994). In my own work, I’ve found the concepts from one to be most applicable to behavior of human systems—complex adaptive systems (CAS). A CAS is defined as a collection of semi-autonomous agents that interact in unpredictable ways and generate system-wide patterns over time. A team is a good example of a CAS in human systems. The team members are the agents. Each comes with unique perspectives, skills, and interests. Through a variety of means (meetings, documentation, email, voice mail, informal chats), the agents interact. Over time, the team generates patterns of group behavior that can be observed in its work, the personal relationships of members, and the members’ individual growth and development. Sometimes those patterns are highly productive and sometimes they are not, but always some pattern emerges that is identifiable as the “team” behavior apart from the contributions of

individuals. This human system, and many others that meet these criteria, can be considered complex adaptive systems (Eoyang, 1997).

These complex adaptive systems demonstrate similar behaviors, regardless of the nature of the agents or the context of their engagements. Similar patterns of behavior appear in fluid dynamics, ecology, economics, and human physiology as well as human social and organizational systems (Pascale, Millemann, & Gioja, 2000). Among the characteristic behaviors are

- **Self-organization.** The pattern in the whole emerges from the internal dynamics of the system. It is not imposed from some objective outside influence. Organizational culture, for example, emerges from the complex interactions of the people within the system, not from a management edict that defines “what it’s like around here.”
- **Sensitive dependence on initial conditions.** A very small change can generate enormous effects. Sometimes this is called the “butterfly effect.” The metaphor derives from the flap of a single butterfly wing that can change systemic patterns in parts of the system that are remote in space or in time. Rumors are wonderful examples of the butterfly effect in organizations. A comment overheard at the water fountain can mushroom into a crisis of confidence or action.
- **Dynamism.** A CAS is always in motion. A single snapshot of the agents at any point in time is insufficient to represent the system’s emerging existence. Even when a CAS appears to be in a stable state, its internal interactions continue to emerge over time. A locked-in bureaucratic environment maintains its stability because the individual people and processes generate action that discourages deviation and reinforces compliance.
- **Nonlinear causality.** In these highly interdependent systems, one thing causes and is simultaneously caused by another thing. A causes B at the same time that A is caused by B. Trust is a good example of nonlinear causality in human systems dynamics. You behave in such a way that I trust you, and I trust you because you behave in such a way. This causal circle makes it quite difficult to see which comes first, the behavior or the trust.
- **Fractal structures.** Similar patterns are repeated at various levels and parts of the complex system. The repetition gives coherence to the whole, like the geometrical patterns of fractals or biological patterns of broccoli when the part is a miniature version of the whole. Lived organizational values provide such scaled patterns in human systems. Competitive individuals exist in competitive teams. Competitive teams emerge in competitive corporations. Competitive corporations thrive in competitive industries and economies. Because of this replicated structure, different levels of organizing (individual, dyad, team, organization, and community) exhibit similar patterns and can be affected by similar interventions.
- **Path dependency.** Each complex system is unique. It has a complex combination of current patterns that emerged from a unique history. For each system, the future will emerge out of the complex dynamics of the current moment. In this way, history is of major significance in the dynamics of human systems. Patterns of the present will be understood in terms of, although they were not predetermined by, the dynamics of the past. For example, an organization may craft a thrilling vision, but its ability to make the vision a reality lies in its current capacity and its patterns of performance that have emerged in the past.

These characteristics of complex adaptive systems are obvious in the organizations with which I work. Every organization and each project exhibits these patterns of behavior. When I ignore them, my expectations may be clear and my plan may be certain, but the system’s behavior will deny me every time. In some circumstances, I may avoid attending to these patterns for a short period of time or with a small subsection of an organization, but ultimately my best-laid plans will be ineffective because the interactions of the whole are much more powerful than my well-planned interventions.

On the other hand, when I acknowledge these natural dynamics, explore them, and work in concert with them, my path is unpredictable, but the outcomes are usually productive and satisfying to my client and me.

WHAT DOES IT MEAN TO WORK AS A CHANGE AGENT IN A COMPLEX ADAPTIVE SYSTEM?

In Chapter One, a change agent was defined as “a person who attempts to alter some aspect of an organization or an environment.” As a responsible professional, what is my role as a change agent in a system where outcomes have more to do with the internal dynamics of the system than with anything I might assess, implement, or evaluate?

It does not mean selecting one tool or approach and using it with all my clients. It does not mean that I can call a single event an intervention. It does not mean that I (or leaders or anyone else) know what’s right for a system today and tomorrow. It does not mean that I can make useful, detailed, long-range plans. It does not mean that I can promise specific outcomes to clients within specific time frames. It does not mean that I can reach a level of professional competence and stop learning and growing. It does not mean that there’s a set sequence of developmental stages that are predictable and controllable. It does not mean that I can help a client system transform without also being transformed.

It does mean that I will participate as a self-organizing agent in the emerging dynamics of a complex environment in which my clients live and work (Olson & Eoyang, 2001). To do this work effectively, I must be able to think about, talk about, and act within self-organizing dynamics of human systems. I must be conscious of the conditions that affect self-organizing processes and work with others to shape those conditions over time. I must be a learner. As a learner I am responsible for the complex self-organizing dynamics of myself as a professional. As I learn and engage with others, I also accept responsibility to help shape the conditions for emergent patterns for larger human systems of which I am a part.

My research in theory and practice has shown that there are three conditions that shape the speed, path, and results of self-organizing processes (Eoyang, 2001). It is significant that I say these conditions “shape.” They do not determine the dynamics because many other factors also intervene. These three conditions do, however, influence what happens as the internal dynamics of the system form their dynamical patterns. This model for the condition for self-organizing is called the CDE Model, and it emerged from my own exploration of the theory and practice of human systems dynamics. It reflects the conditions that are necessary and sufficient to influence the speed, path, and outcomes of self-organizing systems. Although these conditions pertain in any CAS, they take on different manifestations depending on the context. For example, when I plan a party, I have to have a place (container) to hold the action, a diverse group of guests who bring interesting personalities and experiences (differences), and opportunities for the guests to interact (exchange) in meaningful ways. In the current context of competencies for OD practitioners, we can see these same conditions in the categories outlined by Christopher Worley, Roland Sullivan, and William J. Rothwell elsewhere in this volume. They call them categories of OD competence—being, knowing, and doing.

Being the Container

The first category (being) defines the “self” that is self-organizing. It establishes the identity of the system and distinguishes what is “inside” from what is “outside.” In the CDE Model, it is known as the container (C) for the system. In the work of the OD practitioner, the functional container is the consciousness of the self—who and what one is. In the language of Chapter Five, this is “being.” To

work in emergent systems successfully, the OD practitioner uses competencies of being to establish for him- or herself a coherent whole. Through the complex dynamics of the system, the individual is reflected in the greater whole and makes it possible for the whole system to reflect this individual's coherence. The self-organizing pattern depends on the ability of the OD practitioner to be present and complete in the moment of engagement.

In my own journey, I am continually reminded that my personal presence is a powerful influence on the system, whether I intend it or not. If I'm distracted or unprepared or over- or under-dependent on the people and situations around me, I am incapable of serving my clients to good effect. My "being" forms a foundation for the other competencies that make me an effective agent of change. The approach to existence that I find most helpful, and the one that I observe most often in fully competent colleagues, is simple: I am a learner. This means that I take a stance of inquiry and curiosity and see myself as one who is engaged in the productive processes of inquiry and learning. Competencies related to being can be represented by a very large number of observable traits, many of which are embedded in the lists of general OD competencies that appear elsewhere in this volume. Some that are substantially relevant to practice human systems dynamics include the capacity to be:

- Curious about how complex human systems work and why they work as they do;
- Humble about the capacity for a client system to organize itself and one's capacity to understand complex processes either in general or in particular;
- Generous with one's self and others as personal praxis emerges over time; and
- Comfortable with ambiguity, uncertainty, and lack of control.

Knowing the Differences That Make a Difference

The second condition for self-organizing in human systems establishes the necessary creative tension by articulating differences (D) within the whole that are significant. They constitute (or should constitute) the emerging pattern for the whole system. Significant differences are represented in "knowing" competencies. An effective CAS consultant must be able to recognize, name, and help others see the differences that make a difference to the productive work of the whole. He or she must know enough about human systems dynamics, the work of the client, and the capacities of engaged individuals to be able to focus attention on the differences that can generate the most effective system-wide patterns.

Because I am a learner, I continually expand my own knowledge about relevant differences that affect my emerging personal praxis in the field. I need to know about what other scientists and mathematicians in the field of complexity are learning, even though the field of complex dynamics is advancing at an incredible rate. When I entered the field in the late 1980s, I could stay abreast of much of the diverse activity in the field. Now, the information explosion is so great that I must pick and choose information about the differences that are most relevant to me. In addition to my own reading, I also stay connected to a network of other learners who share their findings with me. Such shared learning allows my repertoire of complexity models and significant distinctions to continue to expand.

Knowledge about the field is important, but I also have to explore emerging differences that affect my clients' situations. At a first encounter with a client and at each subsequent step, I learn the differences that make a difference in helping them move from their current patterns to new and more desirable ones. Knowing the relevant differences helps me support self-organizing of productive - system-wide patterns. Many of the broad categories of knowledge that are relevant to OD in general are focused on discerning and influencing significant differences. Some of those most closely related to HSD work include the following:

- Fractals (Briggs & Peat, 1989);
- Self-organizing processes (Prigogine & Stengers, 1988);
- Boundaries (Eoyang, 1997);
- Scaling (Talbot, 1992);
- Emergence (Johnson, 2001);
- Sensitive dependence on initial conditions (Zimmerman, Lindberg, & Plsek, 2001);
- Bifurcation path to chaos (Briggs & Peat, 1989);
- Self-organized criticality (Bak, 1996);
- Scale-free networks and power law (Barabasi, 2002);
- Computer simulation models (genetic algorithms, cellular automata, agent-based models) (Casti, 1997);
- Catastrophe theory (Guastello, 1995);
- Simple rules (Olson & Eoyang, 2001);
- Biological models of co-evolution and complexity (Cohen & Stewart, 1994);
- Time series modeling and attractor reconstruction (Poole, Van de Ven, Dooley, & Holmes, 2000); and
- Fitness landscapes and fitness parameters (Kauffman, 1995).

Additionally, there are options for using the concepts of complexity in HSD applications. Many practitioners and researchers have developed tools and techniques to support change agents; information is available to support new explorations and experiments; and learning networks are emerging to support shared learning (www.hsdinstitute.org).

Doing the Work to Build Transforming Exchanges

Container (being) and differences (knowing) are only two of the three conditions for self-organizing competence of the HSD professional. The third, and final, condition connects parts of the emerging system together in relationships that have the capacity to transform both the participating agent and the emerging patterns of the whole. We call these change-driving connections “transforming exchanges” (E). For the OD practitioner the primary exchange—that without which nothing happens—is captured in the competencies of “doing.” It is when we act that we build the possibility for new patterns to be generated in the self-organizing dynamics of our own and our clients’ systems.

The ability to establish transforming exchanges is the most obvious of the OD practitioner’s competencies. We all know that a qualified OD practitioner must be able to establish meaningful connections with clients, colleagues, and sponsors. We have long lists of interventions that help client communities establish transforming exchanges among themselves and with us. Some of the most common include large group technologies, training, coaching, meeting design and management, team building, inter-team contracting, experiential exercises, dialogue, online and print communications. Of course, all of these are important. No practitioner can be successful without some competencies in one or more of these modalities. On the other hand, the outstanding practitioners I know do not claim to be equally qualified in all of them. They know what they do well, and they know when they need help. They do not try to act beyond their competencies, but they bring in colleagues with complementary areas of expertise. In short, they learn about the client’s needs, they do what they do well, they learn to do new things, and they depend on others to do what they cannot. These doing competencies are outlined for general OD in other parts of this book. Specific ones related to HSD include the following:

- Recognize and describe patterns of emerging dynamics;
- Use a variety of tools and techniques to influence self-organizing processes and to choose among them to fit with the clients' needs and constraints;
- Respect the client system's historical patterns and emerging dynamics as critical to future possibilities;
- Recognize patterns that appear across scales (individual, dyad, team, division, organization, industry, community) and work at multiple scales as necessary to facilitate the self-organizing processes;
- Describe complex human systems dynamics in ways that are meaningful to clients and colleagues; and
- Ask probing questions and listen to and interpret the answers received.

THE LEARNING CONTINUES

The three conditions that constitute the CDE Model (container, difference, and exchange) work together as a complex adaptive system. The three sets of competencies that shape these conditions for OD practitioners (being, knowing, and doing) interact in complex ways to generate self-organized patterns of competence. Each of the competencies influences and is influenced by the others. Identity shapes and is shaped by what one knows and does. Knowledge derives from the interactions of being in a place and time and acting in the local context. Effective action emerges in a place and time when the conscious consultant brings his or her knowledge into real-time decision making and action taking. The process of learning captures the complex dynamics of simultaneously being, knowing, and doing.

In summary, I think of the complexity-based OD practitioner fundamentally as a learner. My consciousness of myself as a learner establishes who I am in this work and provides a container for the self-organizing processes for myself and my clients. My curiosity about critical distinctions in the work articulates my identity as a learner with regard to the things I know about complexity and my clients' circumstances and forms the differences that make a difference to move my practice forward. Finally, when and what I do is driven by my ongoing learning about what I can do well and about how to do new things to help my clients reap the real-world benefits of their self-organizing processes.

The competent practitioner of human systems dynamics never exists in a single state. He or she is constantly participating in dynamical processes of learning and growing and changing. A list of competencies for professionals in HSD has to be based on fundamentally dynamic assumptions. There is no finite set of competencies that represent the field because the list continues to move - forward. There is no one who embodies the perfect HSD practitioner because each of us should be working perpetually toward perfection. As with other self-organizing systems, the goal is to move continually toward a state that makes the most productive and effective use of the opportunities and resources at hand. We must be good learners.

I believe that the list of competencies for a practitioner in the complexities of HSD will never be complete, so the preceding list is not intended to be exhaustive. Also, I believe that it is perfectly possible to be an effective practitioner in HSD with a subset of these competencies, so the competencies on this list are not necessarily required. In my opinion, the only competency that is both sufficient and necessary in HSD is a commitment to continuous learning about theory and practice in the field. With that said, I hope that the list of HSD competencies outlined here will provide some insight and guidance for practitioners who are looking for ways to shape their own HSD learning journeys and those of others.

Many other competencies can (and I assume will) be added to this list. It is certainly not definitive, but it reflects my current understanding of the fundamental competencies that distinguish among those who only know how to talk about human systems dynamics and those who are able to use their knowledge to work effectively in organizations. My fervent hope and reason for sharing this perspective on human systems dynamics is that others will join the journey. The more each of us learns, the more we will all learn, and our competencies as individuals and as professionals will continue to evolve.

References

- Bak, P. (1996). *How nature works: The science of self-organized criticality*. New York: Copernicus.
- Barabasi, A. (2002). *Linked: The new science of networks*. Cambridge, MA: Perseus Publishing.
- Briggs, J., & Peat, F.D. (1989). *Turbulent mirror: An illustrated guide to chaos theory and the science of wholeness*. New York: Harper & Row.
- Casti, J. (1997). *Would-be worlds: How simulation is changing the frontiers of science*. New York: John Wiley & Sons.
- Cohen, J., & Stewart, I. (1994). *The collapse of chaos: Discovering simplicity in a complex world*. New York: Penguin Books.
- Eoyang, G. (1997). *Coping with chaos: Seven simple tools*. Laramie, WY: Lagumo.
- Eoyang, G. (2001). *Conditions for self-organizing in human systems*. Unpublished doctoral dissertation. Cincinnati, OH: The Union Institute and University.
- Eoyang, G. (Ed.). (2003). *Voices from the field: An introduction to human systems dynamics*. Circle Pines, MN: HSD Institute Press.
- Guastello, S. (1995). *Chaos, catastrophe, and human affairs: Applications of nonlinear dynamics to work, organizations, and social evolution*. Mahwah, NJ: Lawrence Erlbaum.
- Johnson, S. (2001). *Emergence: The connected lives of ants, brains, cities, and software*. New York: Charles Scribner's.
- Kauffman, S. (1995). *At home in the universe*. New York: Oxford University Press.
- Kelly, K. (1994). *Out of control*. Reading, MA: Addison-Wesley.
- Olson, E., & Eoyang, G. (2001). *Facilitating organization change: Lessons from complexity science*. San Francisco: Pfeiffer.
- Pascale, R., Millemann, M., & Gioja, L. (2000). *Surfing the edge of chaos: The laws of nature and the new laws of business*. New York: Crown Business.
- Poole, M.S., Van de Ven, A., Dooley, K., & Holmes, M. (2000). *Organizational change and innovation processes: Theory and methods for research*. Oxford, England: Oxford University Press.
- Prigogine, I., & Stengers, I. (1988). *Order out of chaos*. New York: Bantam.
- Talbot, M. (1992). *The holographic universe*. New York: Perennial.
- Zimmerman, B., Lindberg, C., & Plsek, P. (2001). *Edgework: Insights from complexity science for health care leaders*. Irving, TX: VHA, Inc.