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CHAPTER 2: HOW WE THINK ABOUT ORGANIZATIONS: A COMPLEXITY PERSPECTIVE

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The way we think about organizational change makes a big difference in the way we approach the work and, ultimately, how successful we are. In Part 1, we offer the foundations of a new way of thinking that we call Relationship-centered Administration. It integrates a variety of theories and perspectives including complexity science, positive psychology, Relationship Centered Care, authentic presence and others.

This chapter compares two ways of thinking about organizations. The first is a mechanistic perspective that has been around for a hundred years and is still the basis for most managerial thinking and action. We contend that it is psychologically unsophisticated and creates expectations of control that are unrealistic and get us into trouble. The newer perspective is based on principles of complexity – the spontaneous emergence and evolution (self-organization) of patterns that occurs everywhere in nature.[1] It weans us off our unrealistic expectations of control and focuses our attention instead on the continuous, unpredictable pattern-making of human interaction.

With this complexity perspective on organizations as a foundation, the following 3 chapters of Part 1 further develop the concept of Relationship-centered Administration adding principles of individual and group behavior change, relationship process and personal presence and authenticity. This new theory is better suited to the world of human interaction than a theory about machines. It will show us that to change big patterns of organizational culture and behavior we have to start with the small patterns of how we are working together in each moment. It will lead us to be more mindful of and intentional about how we relate to others and the patterns we are creating with our every act. And it will show us that our capacity to be authentically present and to value the differences of others is the ultimate source of organizational creativity and resourcefulness.

Before we begin to build the theory of Relationship-centered Administration, it would be helpful to reflect for a moment on theories in general and how it is that they exert such a powerful influence on our day-to-day lives.

NOTICING THEORIES IN ACTION

A theory is not a truth; it is a story we invent to explain how and why things happen and to help us figure out what to do. It may be formal or informal; expressed in the dense language of scientific prose or the imaginative and ambiguous language of mythology. It may be rigorously tested and refined by researchers or invented on-the-spot by people who are working on a task. And it may be transmitted in any number of ways: by means of an oral folk-tradition, a scholarly book or a set of operating instructions.

Theories do their work by helping us focus our attention. In the midst of any given activity, there are an infinite number of internal and external stimuli that impinge on us and are available for our attention – everything that we can see, hear, touch, smell or taste; every emotional sensation; every memory and thought that could potentially come into awareness. There are also an infinite number of actions we could take. Theories help us by filtering our perceptions, sorting out what deserves attention and what to ignore, and reducing to a manageable number the choices of action we should consider. Without them we would be overwhelmed and paralyzed.

Here's an example of theories at work. Imagine that we're sitting before a hearth enjoying a fire that has burned low and is in need of rejuvenation. If our theory of fire is "in order to burn, a fire needs wood" we'll look for more wood and won't pay any attention to the dishes, bottles or light bulbs that are within view. If our theory describes the essential roles of fuel, oxygen and concentrated heat, we'll pay attention not only to the wood, but also to the space between the logs and the proximity of the coals to the new logs we're hoping to ignite. The second theory directs our attention to important observations (air and heat) and potential actions (spread the logs just a little, pile up the coals) that we would miss using the first theory; under its guidance we are more likely to successfully rekindle the fire. This example shows us how theories help us by focusing attention, filtering perceptions, and guiding action.

But theories can also get in our way and limit us. They may be incomplete and fail to direct our attention to important observations, as we saw in the first fire building example. Theories can also be self-fulfilling and self-reinforcing. By focusing our attention, they determine what we perceive. Our perceptions then constitute the body of data from which we create an interpretation – a story we tell ourselves about what's happening around us. That story then shapes our expectations, intentions and behaviors. In a circular fashion, our stories and expectations can then go back and influence how we focus our attention. (We know from many studies of expectancy bias, the Hawthorne effect, how powerfully expectations shape perceptions.) Thus a theory can perpetuate itself by making it harder for us to perceive data that are inconsistent with it and might prove it wrong.

Another example may be helpful here.[2] Suppose I am giving a talk and you are in the audience. As my talk proceeds, I notice that you are nodding off to sleep intermittently. From that data, I form an interpretation, a theory about you, namely, that you are not interested in my ideas. At the end of my talk, when you ask me a question, the story I've started to tell myself about you leads me to expect that you will be dismissive of what I'm about to say, so I respond in a somewhat hostile and arrogant fashion, which not surprisingly elicits a hostile response from you. I see this and think, "Aha! I knew you were against me!" and from that moment on I will be on the lookout for further evidence of your hostility, so much so that I could easily miss cues that you are actually very interested in what I'm saying. Now the truth might be that you were so interested in my talk that you attended even though your 14-month-old kept you up all night, and you felt badly that you couldn't stay awake. But when I respond brusquely to your question, you might think, "What a jerk! Why did I bother coming to this talk?" My erroneous theory about your sleeping set in motion a self-fulfilling and self-reinforcing pattern of hostility.

Our theories tend to operate subliminally. We often forget that they are theories; we forget that we are seeing selectively filtered information and presume that we are simply seeing "reality." (This was the case when I mistook my theory about your falling asleep as a fact; I started to climb a Ladder of Inference.[3]) So it's important for us pause from time to time to think about how we think, and to pay attention to how we pay attention. Often this will reveal limiting

assumptions that we have been making and allow new ways of thinking and acting to emerge. In this spirit, then, let's proceed to examine how we think about organizations.

MODERN MANAGEMENT THEORY: AN ORGANIZATION IS A MACHINE

Current management practice has its origins in a theory called Scientific Management that was published by Frederick Taylor a hundred years ago.[4] It invites us to look at an organization as a machine. A machine is designed with a specific purpose in mind, each part moving precisely and reliably to serve its function in the larger process of turning the "input" into the desired "output." A machine can be fully specified in a blueprint which is the end-product of a design process. If the design is sound and the blueprint and operating instructions are faithfully executed, the machine will fulfill the designer's exact intentions. If a machine does not perform as expected, the engineers try to improve its performance by either correcting errors in how the blueprint was executed or by "going back to the drawing board" to come up with a better design.

The machine metaphor leads us to view an organization as a group of workers carrying out their assigned tasks exactly as instructed, precisely and without variation, to achieve the desired outcomes (objects manufactured, services provided, revenue generated, etc.). The organization's blueprints include its mission statement, bylaws, organizational chart, budget, strategic plan, and policy and procedure manuals. When something about the organization needs to change, the managers sequester themselves someplace and return with a new blueprint for everyone to follow.

The machine metaphor for managing organizations has been remarkably successful in the evolution of industrialization and mass production. But there are at least three major problems in using it as a framework for management and leading change.[5] The first is that it creates expectations of control that are unrealistic and cause anxiety. Machines are supposed do exactly what we want them to do. They obey the logic of linear causality: A causes B; if you know A you can predict B; if you can control A you can control B. Everything should be subject to prediction and control.[6] When unexpected things happen or things don't go according to plan, someone must be at fault. Either the plan wasn't good enough or the employees did not execute it properly. This generates anxiety and defensiveness; nobody likes to be at fault. It makes people reluctant to talk about errors and waste. A considerable amount of attention and activity gets diverted towards self-justification and self-protection and away from doing the work at hand. And anxiety actually alters brain function, rendering people less capable of thinking creatively (*see* Interpersonal Neurobiology in Chapter 3).

The second problem with the machine model is that it puts all the responsibility for designing and operating the machine on the engineer. Machine parts don't think or come up with new ideas. It's the engineer's job to do that. So when we view an organization as a machine we assume that it's the manager who is supposed to be creating the plans. In so doing, we fail to avail ourselves of a vast resource – the creativity of the workers – and we diminish their motivation (*see* Self Determination Theory in chapter 3). In healthcare, where the opportunities for standardization are limited, most care plans must be individualized and cannot be specified in generic plans or treatment guidelines. The front line staff members, who are in closest contact with patients and families, must exercise considerable independent judgment, which is incompatible with the machine model.

The third problem is that the machine model is not psychologically sophisticated. By predisposing us to see people as machine parts, it leads us to approach organizational change as

if it is a purely technical matter – getting the design right – without attending to all the human dimensions of change such as fears, losses, and changes of identity and loyalties.[7]

To summarize, traditional management theory focuses attention on the manager's intended outcomes and the creation of blueprints. It likens the manager to an engineer, and thus fosters expectations of control and responsibility. This way of thinking can be very useful; it has given rise to technological breakthroughs and analytic methods such as process mapping and statistical process control that can lead to substantial improvements in quality and efficiency in processes for which standardization is desirable. However, standardization is neither desirable nor possible in most circumstances given the enormous amount of individualization and shared decision making needed in the activities of a healthcare organization. And unlike machine parts, human beings are not amenable to having their behavior designed and specified by others. Thus the machine metaphor is ill-suited to most management tasks and to the work of organizational change.

RELATIONSHIP-CENTERED ADMINISTRATION: AN ORGANIZATION IS A CONVERSATION

A very different image lies at the heart of Relationship-centered Administration: the organization as conversation.[8] Not just a metaphor, this is actually the case. An organization is a conversation before it is anything else: it begins with people talking together about something they would like to do that is beyond their capacity to do as individuals. At some point, their shared idea gains sufficient coherence – there is sufficient similarity in what each of the individuals is understanding – that they can begin to coordinate their actions effectively. That's when the organization begins to function. As the themes in the conversation change, so will the more tangible aspects of an organization: buildings get torn down; organizational charts are modified; budgets are revised; people are hired, fired, promoted and so forth. The organizational conversation is at the core of everything.

We can perceive a healthcare organization as a gigantic complicated conversation involving its staff, patients (and their families), payers, regulators, neighbors, competitors, and anyone else who interacts with or is affected by it. Within this gigantic conversation, there are, of course, myriad sub-conversations. Some are formal and ongoing, such as regularly recurring board meetings. Others are informal and sporadic, such as chance conversations at the water-cooler or in the hallway. They may be face to face or in virtual space, and they may be in the language of spoken or written words or of symbolic gestures. The conversations may between individuals or in the private space of each person's thinking. All these sub-conversations are weaving through each other simultaneously, infecting each other with ideas and emotions rather like the spread of an epidemic.

Thinking of an organization as a conversation rather than a machine leads us to approach the work of organizational change in a very different way. We understand that we can influence but not control what goes on, and that we do so by the way in which we ourselves participate.

CURIOUS PROPERTIES OF CONVERSATIONS

There are several curious and important properties of conversations that are relevant to our understanding of organizations and organizational change. Conversations are comprised of two types of patterns – patterns of meaning (themes) and patterns of relating (how people interact). Important patterns of meaning in an organizational conversation include the organization's identity (its mission, vision and values), its intellectual capital (knowledge about

how to do the work) and its strategy (a plan for how to succeed). The patterns of relating in an organization are its culture: for instance, what people say or don't say, how people behave at meetings, the way decisions are made, and all the dynamics of power and authority.

Unlike a material object that is static – once you create it, it remains just as it is – patterns of meaning and patterns of relating are ephemeral; they must be recreated moment by moment or they cease to be. If we say that an organization has a friendly culture, it means that people keep on interacting in a friendly way from one moment to another. To say that we have some bit of knowledge – say, knowing how to remove an inflamed appendix – means that we keep thinking about it in the same way from one time to the next. These patterns of meaning and patterns of relating are continuously under creation. The patterns being created in any one moment tend to carry forward those that were created the moment before, but that's not immutable. New patterns can be created at any time.

Patterns of meaning and patterns of relating are self-organizing. They can form spontaneously, evolve, or perpetuate themselves, all without anyone's intentional direction or control. At first glance, this may seem puzzling, but self-organizing patterns of meaning and relating are actually very common experiences.

For instance, think of a time when you were a newcomer in an existing group of people. Without necessarily being conscious of it, you probably paid close attention to how the other people were acting so you could figure out how to fit in. This powerful, highly developed social dynamic has its basis in brain chemistry. Brain levels of opioids – naturally occurring molecules similar in structure and effect to opiate drugs like morphine – increase or decrease based on how much interpersonal connection or attachment we are experiencing at the moment.[9] In a situation of low attachment, the drop in brain opioid levels causes anxiety and other distress similar to drug withdrawal. To avoid this unpleasant state, we have a strong tendency to try to fit in with the others around us.

So there you were observing the others and gradually taking on their behaviors; you began to participate in their patterns of relating. At a subsequent meeting of that group, another person joined the group and that person looked to you to see what behaviors were expected. As people kept joining and leaving the group over the course of time, the group's composition might have changed completely – none of the original people were still present – yet the patterns of behavior continued. No one directed, planned or controlled this process; it was self-organizing. This same dynamic can apply to patterns of meaning such as a personal story, an organizational identity, or the identity of a people or culture – beliefs, practices, even patterns of conflict can propagate themselves across many generations.

Self-organization can produce change as well as stability. For instance, think of a time when you were talking with some friends or colleagues, and someone made a chance remark that sparked a new thought for you. You described your new thought and then someone else took it further, and that stimulated you or a third person to add something more, and on it grew to become a major new idea or plan. This new idea emerged spontaneously in the course of the back-and-forth interactions of the conversation. It was not the result of anyone's intentional planning, direction or control. No one announced, "In this conversation today we are going to create a transformative new idea." It just happened, a new self-organizing pattern of meaning.

We can see similar self-organization in patterns of relating when children spontaneously make up a game, or when a social order starts to emerge within a group of people who have never been together before. Patterns of power, leadership, and inclusion-exclusion inevitably and

necessarily arise when new groups form, sometimes influenced by people's intentions but not subject to their direction or control.[10]

COMPLEXITY PRINCIPLES AND THEIR IMPLICATIONS FOR ACTION

The self-organization of new patterns in conversations is an example of a principle from complexity science (the study of self-organizing processes) known as Critical Dependence on Initial Conditions, or more popularly, the "Butterfly Effect." It describes how immeasurably small differences or disturbances that are present at the beginning of an interaction can be enough to drastically change the outcome. In the course of back-and-forth interactions, those tiny differences can become amplified rapidly into large differences or even into transformative new patterns. For example, the tiny air currents associated with the beating of a butterfly's wings can affect nearby air currents, creating a larger disturbance that then affects an even wider circle of adjacent air currents. The pattern keeps growing and spreading, ultimately resulting in a tornado half way around the world.[11]

A second and closely related principle is the Inverse Power Law, known more popularly as the "Sand Pile Model." Imagine that we're at the beach, dropping grains of sand on top of a sand pile. What happens when each grain lands will depend on characteristics of the grain and how it's falling and on the structure of the sand pile. Most grains will stick where they land and will cause no disturbance. Occasionally a grain will dislodge a few other grains and they all will tumble down a bit. And once in a great while, the way that one grain lands and the structure of sand pile will combine to result in an avalanche. (The mathematical term for this is a "catastrophe.") The name "Inverse Power Law" refers to the mathematical relationship between the size of the disturbance and its frequency. Minimal disturbances happen nearly all the time. Catastrophes occur rarely. Even so, they are not aberrant; they are a normal and expected part of the system.

Returning to the sand pile, we can never know in advance what the effect of any one grain of sand will be. We cannot accurately predict the avalanches. No matter how precisely we can measure a sand grain's mass and momentum, air movements and the sand pile's structure, even smaller differences can cascade to radically alter the outcome. The best we can do is to learn to recognize the conditions that make catastrophes more likely (for instance, when a lot of sand has accumulated and the slope of the sand pile is getting steep) and try to modify those conditions (spreading out the sand to decrease its slope), but we cannot predict or control individual events.

The Butterfly Effect and Sand Pile Model show why the machine model's goal of control is impossible. Unpredictability is built in to every complex system, including organizations. When we hold ourselves and others to impossible expectations of control, we are actually instigating patterns of anxiety and frustration that can grow and spread, impairing organizational function. An excessive effort to control can actually make things go farther out of control. But the fact that we can't be in control doesn't mean we're helpless. There a lots of things we can do. We just have to go about our work differently, and with different expectations. Let's see how.

Emergent Design

One thing we can do is to adopt a mindset of emergent design. Rather than planning a long series of steps in advance and getting anxious when things start to go off course, we can just plan one step at a time and pause after each one to notice what's happened and only then plan the next step. The plan emerges as we go. Planning is necessary to decide upon each step, but no

sooner is that step taken than something unexpected happens that calls for a change in subsequent steps. When our attention is focused too narrowly on our original plan, we may fail to notice other circumstances or opportunities that are arising. So we hold our plans lightly; we think of them not as finished blueprints to be followed exactly but as transitory descriptions of what we happen to be thinking right now about the future and how to prepare for it.

Unlike the machine model in which "not knowing" is seen as a deficiency, the organization-as-conversation perspective shows us that "not knowing" can be a virtue. Without the burden of having to have the answers (or to pretend we do for the sake of appearances), we can be more curious and less anxious. We can observe and experiment more and we don't have to feel threatened when things don't go as expected. And we have more realistic expectations about how change happens: we know from the Sand Pile Model that we may have to cause a large number of disturbances – drop many grains of sand – before we get a response.

Chapter 8 offers an outstanding example of emergent design. It describes the development of a comprehensive program for the care of people living with HIV/AIDS in Eldoret, Kenya. There was no grand plan. Instead, efforts to address an initial need – antibiotics to treat the AIDS virus – led to the recognition of another need – adequate nutrition without which the antiviral treatment doesn't work. Finding a sustainable solution to nutritional needs of patients, in turn, led to the establishment of farms, which then led to the introduction of new methods of sustainable farming and the teaching of these methods to HIV-infected individuals so they could earn a livelihood. In this manner of making-it-up-as-you-go, a remarkable program emerged.

Reflecting on Pattern-making and Acting Differently

Another thing we can do is to shift our attention from the future and how we want it to be to the present and what we are doing right here, right now. We can notice what patterns we are creating in the way we are behaving together. For the patterns that seem undesirable, we can ask questions like, "What am I doing – how am I participating – that contributes to the propagation of this pattern?" (it could be something as simple as not speaking up) and, "What can I do differently that might disrupt this pattern and start a new one?" We can also ask ourselves what we can do to reinforce desirable patterns to help them grow and spread. Even as we take these actions, we recognize that we can't know in advance what effects our actions will have. We just make our best guess and see what happens. We hope that as we start to act differently it might invite someone else to do so, and then another in a spreading wave of change. Every large pattern in human activity – in economics, politics, fashion, science, everywhere! – started as a small local disturbance that then amplified and spread. There is nowhere else to start a change process but with what we are doing here and now.

We can also invite others to join us in reflecting on our pattern-making in the moment, trying to start an epidemic of mindfulness. Chapter 13 describes such an epidemic in a very large institution, the Indiana University School of Medicine, that wanted to change its culture so it could do a better job of teaching professionalism. The heart of the initiative, and the key to its success, was engaging an ever-widening circle of individuals and committees in reflecting on the values they were exhibiting in their everyday behavior and the extent to which those values were the ones they wished to pass on to their medical students. They discovered countless ways in which their long standing habits of organizational behavior were reinforcing values of impersonal hierarchical control, exactly the opposite of what they intended. They were able to stop doing these things and invent more relational ways to accomplish the same tasks, and as a

result the culture began to change. Reflecting collectively on "what are we doing together right here, right now" was the key.

Identifying and Modifying Constraints

Even as complexity science shows us the impossibility of linear cause-and-effect relationships and weans us off our false hope of complete control, it offers us an alternative way to try to influence situations. It tells us that self-organization requires the simultaneous presence of order and disorder, of freedom and constraint. So as we are trying to understand emerging patterns of thinking and behavior, we can think about what constraints are shaping them and how those constraints might be modified. Some constraints on behavior are unalterable, like the need for oxygen. (Whatever patterns of relating might emerge, they will necessarily allow for the participants to continue breathing!) But other constraints are more flexible, and as they change, behaviors might change: for example, financial incentives, regulatory requirements, or themes of identity (points of pride).

Chapter 6 describes the start-up of Clarian West Medical Center, a hospital in Avon, Indiana with a founding vision of being a sanctuary of healing. Its leaders hired staff members based not only on their technical competence but also on their relationship skills and attitudes. This was a powerful constraint that influenced the kind of people who worked there and how they related to each other. (Imagine the patterns that might have ensued had they established a different constraint, say, who will work for the least amount of pay!)

We cannot design and control the behavior of others. Their behavior in each moment emerges spontaneously. Instead we can try to understand the constraints that influence these self-organizing patterns and to introduce constraints that make it more likely that desirable patterns will emerge.

Fostering (or Inhibiting) Innovation

A fourth kind of action follows from our understanding of how new patterns emerge in conversation. We saw earlier how a serendipitous comment – a small spark of difference – could initiate an amplifying cascade that gives rise to a transformative new idea. A group's capacity to innovate, to produce new ideas, depends upon two key factors: diversity and responsiveness. We can try to enhance these factors if we want new ideas to emerge, and to inhibit them if we don't.

Differences within a group are the seed crystals for creativity. The more difference and diversity there is with regard to work roles, personal experiences, demographics, and so on, and the more willing people are to express their differences, the greater the opportunity for serendipitous sparks to happen. But differences alone are not enough. The people in the group also have to be responsive, that is, open to hearing and being changed by each other's differences. If people are holding rigidly to their own perspectives and plans, or are not even listening to each other, the richest sparks of diversity won't have an opportunity to seed and grow.

The implication for us as leaders is that if we want innovation, we can invite people into responsive conversations in which we call forth differences and help people feel comfortable expressing them (s*ee* Appendices 1 and 2 for specific methods).

In overseeing the design of a new science building at University College of Dublin, the project leaders wanted to engage the faculty in the design process and not impose a new solution in a top-down manner (*see* Chapter 11). At the same time, they wanted to encourage the faculty to let go of their traditional views of teaching and reconceptualize both the learning process and

the new kind of instructional space that would support it. They convened conversations and used a variety of creative formats to get everyone involved. Though initially unruly, the conversation ultimately produced a coherent and exciting new vision that surprised everyone.

Sometimes we do *not* want new patterns to emerge. There are situations in which the safety of patients and/or staff members calls for high reliability, carrying out well-established procedures precisely and without variation. In these circumstances checklists, protocols and highly structured formats for communication inhibit the expression of diversity and responsiveness to prevent new patterns from emerging. In aviation, cockpit conversation is severely restricted during takeoff and approach, times when it is most critical for the pilots to be focused on following specified procedures and emergent new patterns are undesirable.

The task for leaders is to distinguish between situations with known solutions in which people need to follow orders faithfully and those without known solutions, which require the creative engagement of everyone doing the work. Heifetz has named these situations "technical" and "adaptive" challenges, respectively, and has observed that one of the most common errors in management is to treat adaptive challenges as if they are technical – that is, leaders attempt to provide solutions (blueprints, from the machine metaphor) instead of engaging the team in creating them (fostering conversation).[7]

SUMMARY AND CONCLUSIONS

We've now had a chance to compare two very different perspectives on organizations. When we look at an organization as a machine, it leads us to think of leaders as engineers, planning and operating the organization with great precision and control, and to see workers as machine parts who are supposed to perform their work consistently and do just what they're told. From our exploration of self-organization in human interaction, we know that this degree of control is impossible. So these unrealistic expectations of control result in anxiety, blame and defensiveness, which distract attention and energy away from doing the work.

In contrast to this static view of an organization as an object upon which we can act, we've considered an alternative view – the organization as conversation. It's a more dynamic view, more focused on process. It shows us how we are creating the organization anew in each moment by what we are saying about it and how we are relating to each other as we carry out its work. In this view, there is still a role for planning, but we hold the plans lightly, remaining curious, flexible and responsive to what is emerging around us.

An important task for leaders is to participate mindfully in the organizational conversation and encourage others to do likewise. This involves reflecting on what we are doing together, what ideas and culture we are creating or perpetuating in each moment, and when new patterns are needed, to live them, to create a disturbance in the existing pattern in the hope that others will join in. We can also try to notice and modify constraints that influence self-organizing patterns of behavior.

There are circumscribed situations in which solutions are known and control and consistency are desirable, if not essential. In these situations we seek to inhibit the expression of diversity and responsiveness, the key factors that favor the emergence of new patterns. But in most situations, where solutions are not known and innovation and adaptability are desirable, we try to foster these factors.

The organization-as-conversation perspective and its underlying principles from complexity science expand the focus of our attention beyond our goals and plans to also

encompass the self-organizing pattern-making that is taking place in the here and now. The next chapter, which describes several theories from positive psychology, involves another shift in attention, from focusing exclusively on problems and problem-solving to also notice successes so we can enhance the human capabilities and other enabling factors that make them possible.

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[1] The complexity perspective that we use throughout this book derives from a new theory, Complex Responsive Processes of Relating, developed by Ralph Stacey and his colleagues at the University of Hertfordshire. This theory, which is based in social constructionism, is better suited for describing human interaction than the more popular theory, Complex Adaptive Systems, which has its origins in the natural sciences and computer simulations. More information is available in Stacey R. Complex responsive process in organizations: Learning and knowledge creation. London: Routledge, 2001 and Stacey R, Griffin D, Shaw P. *Complexity and Management: Fad or Radical Challenge to Systems Thinking?* London: Routledge; 2000.

[2] Thanks to Penny Williamson for this example.

[3] A "ladder of inference" begins with an observation on which we all would agree, but then we begin to make up our own interpretations as to the meaning, significance or cause of what we have just observed, and we begin to act upon that assumption as if it's a fact. When we aren't careful to distinguish between the observation and the assumption we get caught in a self-fulfilling dynamic of expectations, behaviors and responses. From Ross R. The Ladder of inference. In Senge P, Kleiner A, Roberts C, *et al*. *The Fifth Discipline Fieldbook*. New York: Doubleday; 1994. p. 243. *See* Appendix 1 for a more extensive description of this dynamic.

[4] Taylor F. *Scientific Management*. New York: Harper Brothers; 1911.

[5] A detailed critique of classical management theories can be found in Stacey R. *Strategic management and organisational dynamics: The challenge of complexity, 3rd ed*. Harlow, England: Pearson Education, Ltd ; 2000.

[6] Predictability and control were the aspirations of classical physics, and while they have now been supplanted in physics by the unpredictable world of relativity and quantum mechanics, they continue to hold sway in modern management, and in most social sciences, for that matter. *See* Flyvbjerg B. *Making Social Science Matter.* Cambridge, England: Cambridge University Press; 2001.

[7] Heifetz R. *Leadership without Easy Answers.* Cambridge, MA: Harvard University Press; 1994.

[8] Broekstra G. An organization is a conversation. In: Grant D, Keenoy T, Swick C, editors. *Discourse and Organization*. London: Sage; 1998.

[9] Smith TS, Stevens GT, Caldwell S. The familiar and the strange: Hopfield network models for prototype-entrained attachment-mediated neurophysiology. *Social Perspectives on Emotion.*

1999;5:213-45. *See* the section on interpersonal neurobiology in Chapter 3 for a more extensive description of the relationship between interpersonal interactions and brain activity.

[10] See the groundbreaking work of Thomas S. Smith and colleagues on the self-organization of social patterns, for instance: Smith TS, Stevens GT. Hyperstructures and the biology of interpersonal dependence: Rethinking reciprocity and altruism. *Sociological Theory*. 2002;20(1):106-30.

[11] Lorenz, E. *The Essence of Chaos*. Seattle: The University of Washington Press; 1993.