Understanding change in organizations in a far-from-equilibrium world*

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Abstract
This paper addresses the issue of change in organizations in the new conditions of the contemporary world. We argue that linear theories and models still dominant in organizational sciences are inadequate to understand different modalities of change today. We deploy Prigogine's concept of far-from-equilibrium dynamics, Heisenberg's Uncertainty Principle, and Zadeh's fuzzy logic, to develop more complex and adequate ideas of change in organizations. We show the value of these ideas for organization studies and theories of the "postmodern" world, illustrating their explanatory power by analyzing aspects of the success and failure of Enron, as a case study of organizational change in a chaotic world.

Introduction
Change and chaos occupy a paradoxical place in discourses about organizations. Business people and the media they consume talk enthusiastically of change and continual "revolutions" managed by successful businesses, change as challenge and opportunity for those who can live with chaos (Hodge & Coronado, 2005). Tom Peters' 1980s bestseller on the theme, Thriving on Chaos, celebrated a new rate of change, seeing "chaos per se as the source of market advantage, not as a problem to be got around" (1987: xii). Yet some writers argue that organization sciences tend to see and emphasize stability in organizations (e.g., Orlikowski, 1996; Tsoukas & Chia, 2002). It is this tension we seek to explore. We shall claim that the scale and complexity of the changes facing business and organizations today are even greater than in the popular hype, yet in spite of the best efforts of some recent writers, organization sciences are still systemically ill equipped to provide models for understanding change and chaos. Change has always been a feature of the world of business, but the scale and scope of change today have reached a qualitatively new level, requiring a new theoretical framework. That framework, we argue, must look for models and concepts in two areas: from chaos theory on the one hand, and theories of postmodernity on the other.

Invisible change in organization sciences
In business discourse, “change” is the dragon slain by each heroic incoming CEO, or yoked to his triumphant chariot. Yet organization science as science finds change a difficult concept to grasp and theorize, whether to understand or critique this hyperbole. This is substantially because it draws its models and criteria mainly from the most influential and prestigious form of science, classical (Newtonian, linear) science. In an important article on which we draw substantially in this section, Tsoukas and Chia (2002) explore the surprising invisibility of change in understanding apparently unproblematic forms of change. They quote the philosopher of science, Henri Bergson (1946: 131), on this paradox:

The point is that usually we look at change but we do not see it. We speak of change but we do not think about it. We say that change exists, that everything changes, that change is the very law of things... In order to think change and see it, there is a whole veil of prejudices to brush aside, some of them artificial, created by philosophical speculation, the others natural to common sense.

For Bergson, a pervasive mindset makes it difficult to see and describe change as change, whether “evolution” or “revolution.” Tsoukas and Chia focus on problems they see in Lewin’s influential three-step model of change (1975): unfreezing—moving—refreezing. In this model, movement and change occur, necessary and important, but hedged between two stages characterized as stable and immobilized; like blocks of ice, in Lewin's strong metaphor.

Tsoukas and Chia deepen their argument by drawing on William James. James noted an intrinsic difficulty, that concepts to describe change and everything else are discontinuous, whereas reality is full of continuous phenomena: “the stages into which you analyze a change are states; the change itself goes on between them. It lies along their intervals, inhabits what your definition fails to gather up, and thus eludes conceptual explanation altogether” (James, 1909: 236). If this is understood, as in Lewin’s schema, as a succession of distinct stages, it leads to a crucial paradox. Tsoukas and Chia sum it up thus:
Towards a far-from-equilibrium science of organizations

To develop a framework in which to position this blind spot in this form of science, we draw on the work of Nobel prize-winning scientist Ilya Prigogine, and his concept of far-from-equilibrium conditions (Prigogine & Stengers, 1984). We are aware that there are currently a number of competing accounts of “chaos theory” and “complexity science,” and we do not want to claim too much for Prigogine’s work. For us it has a number of merits. Owing to the input of the historian of science Isabelle Stengers, he has a more comprehensive and judicious account of the previous history of science than do most other scientists. Although a chemist, he has collaborated with social scientists more than most other scientists of chaos. And finally and most importantly, his scheme has a clear place for all forms of science, linear and nonlinear.

Prigogine criticized the limitations of “Newtonian science,” particularly its assumptions about change and chaos. He argued that the principles on which the Newtonian paradigm rests do not apply to many important phenomena. He distinguished between mechanics, the exemplary science for Newton, and his own area of thermodynamics, the study of heat and energy; and within thermodynamics, between “equilibrium” and “far-from-equilibrium” dynamics. In equilibrium dynamics, the state of a system stabilizes around an equilibrium. Fluctuations may briefly disturb the equilibrium, and at such moments its behavior is unpredictable, but ultimately it returns to equilibrium and becomes predictable again. Stability is the default condition. This is also the case with Lewin’s model.

But many systems are not at or close to equilibrium, and these are so common and important, with so many interesting and relevant properties arising out of their far-from-equilibrium condition, that they need a new nonlinear science, with some laws not reducible to the laws of equilibrium science. For instance, “in such a state certain fluctuations, instead of regressing, may be amplified, and invade the entire system, compelling it to evolve towards a new regime” (Prigogine & Stengers, 1984: 140—41).

Some cybernetic systems may help to produce such behaviors through negative and positive feedback loops. Negative feedback loops stabilize systems. Positive feedback increases the rate of change, pushing systems closer to the edge of chaos. Life has invented many such loops to slow down or speed up the processes without which elaborate forms of life could never have evolved (Briggs & Peat, 1989).

Prigogine recognizes that these processes can be destructive, but insists that complex forms of order in the biological and social worlds come from far-from-equilibrium conditions: “order out of chaos,” as he calls it. Order forms at the “edge of chaos”: “The interaction of a system with the outside world, its embedding in non-equilibrium conditions, may become in this way the starting point for the formation of new dynamic states of matter — dissipative systems” (Prigogine & Stengers, 1984: 143). Dissipative systems “emerge” by a process of self-organization in these fluctuating conditions. They form, thrive, and proliferate in these conditions, not imposing order onto chaos but negotiating it, creating new forms of order more intricate and complex than close-to-equilibrium forms, better adapted to complex conditions.

Nonequilibrium space is not a single, unvarying condition. Prigogine invokes the notion of threshold: “In cases where instability is possible, we have to ascertain the threshold, the distance from equilibrium, at which fluctuations may lead to new behavior’ (Prigogine & Stengers, 1984: 141). This threshold is a space, not a line, a substantial space highly charged with potential uncertainty and contradiction, where change may be so extreme that things may become their opposite.

Lewin’s model works best in conditions where change is being managed by a change agent (e.g., an incoming CEO), who identifies a desired change to an unsatisfactory situation, implements it, and then presides over the new, better situation. A far-from-equilibrium model gives a more comprehensive picture of what can happen when change cannot be so totally controlled.

Modeling change in far-from-equilibrium conditions

In our thinking about change in organizations in far-from-equilibrium situations, we have found value in Heisenberg and his “uncertainty principle.” Heisenberg is not usually ranked among the influences on chaos theory, because he made his contribution in the 1920s, before “chaos theory” supposedly was invented, and his field, quantum physics, is usually separated, by Heisenberg as by other scientists, from the rest of science. Yet his idea, although formulated specifically to meet an acute problem facing his emerging field, turns out to have important implications for all change in far-from-equilibrium conditions, in many fields of knowledge, including organization studies. We are aware that this claim is contentious, so that given the importance of these ideas to our argument, we discuss them in some detail.

Heisenberg’s “uncertainty principle” states that it is not possible to measure with equal precision both the position and the...
Emergence: Complexity and Organization

In this article our aim is to suggest some useful implications for organization science and its understanding of change. Here we want to address a common misunderstanding of our aim. Many readers suppose that we must be espousing chaos theory as a new, all-encompassing theory. On the contrary, as Prigogine insists, linear science and its models are not discredited or swept aside by chaos theory. In conditions close to equilibrium, over short stretches of time before the effect of fluctuations has time to assert itself, linear models work well enough. The best contribution of a chaos approach in such circumstances is to situate these models in a more complex framework, to recognize and account for their limitations in a principled way.

To illustrate, we take Lewin’s linear model for change, and suggest ways it can be adapted for different conditions. Figure 1 is our first adaptation of Lewin’s three-stage model, in which a designated change agent introduces a given force into Stage A in a given direction, producing an intended effect as the new second stage B. In line with Tsoukas and Chia’s critique of the invisibility of change in this model, we introduce some complications that exist in the real world of organizations. For instance, there is always some resistance to change in any organization, which has to be represented, however inconvenient it may seem to the change agent. For this and other reasons, force applied to a situation will typically produce unintended effects, positive and negative, in addition to effects in line with the aims of the change agent. Instead of representing the new situation, stage B, as a stable, homogenous and known state — “frozen,” as in Lewin’s model — we represent this new state as a fuzzy penumbra.
including positive, negative and neutral effects that fall outside the linear plan, forming a more complex next stage.

This model is basically linear, modified to help it correspond better with reality. In Figure 2 we propose a three-stage model, representing the organization before the change, during it, and after it, under conditions further from equilibrium, in which fluctuations emerge to produce contradictions (bifurcations) in the change stage, which affect the conditions out of which the later post-change conditions will grow. In Heisenberg's terms, each stage marks an attempt to fix the positions of agents and forces, yet change also occurs during each stage, which may include nonequilibrium fluctuations, as a result of which momentum and position become impossible to fix precisely. This indeterminacy affects predictions of later progressions of the changes, since each successive set of changes is a change in a prior state that is itself not precisely knowable.

We propose this model as a better representation of how change unfolds in ordinary situations, in institutions guided by ordinary change agents, facing the complications of normal organizational life. As in the Enron case, which we will examine in more detail later, some resistance is always encountered. This model represents it as a complex response, integral to the dynamic analysis of the process of change. It may have positive as well as negative outcomes, which need to be allowed for in the model or else they will only surprise the change agent, not become part of the analysis. As the Enron case also illustrates, changes are linked to one another. There is no static moment without ongoing change, and this affects how later changes are to be understood. A fuzzy analysis of all three phases and the changes between them will help change agents to see multiple possibilities that always coexist in organizations, sometimes as competing tendencies but sometimes vectors of positive changes, leading to a rich, coherent new state at the edge of chaos.

**Postmodern organization in a far-from-equilibrium world**

In the previous section we pointed to the value of these ideas about change for the more linear forms that are still dominant in organization sciences. As we insisted, we do not seek to replace all linear models with nonlinear models; only to point out some intrinsic problems of such models in dealing with complex change in unstable conditions. In this section, we argue a similarly limited case about an apparently opposite tendency in social theory, one that does not minimize instability but emphasizes it, as a defining feature of the contemporary global system, variously described as “postmodern” (e.g., Harvey, 1989; Lash & Urry, 1994) or “late modern” (e.g., Jameson, 1984; Giddens, 1990). These theorists share the idea that the world today acts and organizes itself in significantly new ways, undergoing transformations on a greater scale, at a faster pace, in an environment more fluid than ever before (Beck, 1992). This is no minority position in social theory, and others have begun to apply its ideas to organization sciences (e.g., Clark & Clegg, 1998). The affinities between this line of social theory and complexity studies have also been recognized. Urry (2003) claims that ideas from complexity have a special affinity with globalization theory. Our aim in this section is to contribute to this synthesis.

Following Tsoukas (1999), we begin with Ulrich Beck's influential thesis of the “risk society” (1992). Beck argues that new concepts of risk and risk management have recently emerged as a dominant theme. As he notes, all societies have had to cope with risk, but he points to a heightened consciousness of risk in late modernity, mediated by the powerful modes of knowledge and rationality that are now available.
Emergence: Complexity and Organization

This development illustrates Zadeh's principle of incompatibility. The desire for certainty and precision, underpinned by new technologies and institutions of knowledge, leads paradoxically to the construction of a new kind of risk, new levels of uncertainty manufactured by new instruments and methods of evaluation. The attempt to use scientific rationality (crisp, linear thinking) to remove all uncertainty paradoxically brings those uncertainties into the present:

“[T]he center of risk consciousness lies not in the present, but in the future. In the risk society, the past loses the power to determine the present. Its place is taken by the future, thus, something non-existent, invented, fictive as the ‘cause’ of current experience and action” (Beck, 1992: 34).

Without using Heisenberg, Beck envisages a temporal inversion in which causality (“momentum”) becomes paradoxical. The future determines the present, partly because both (“position”) are described with dangerous hyper-precision. Science, intended to limit the effects of the risk and uncertainty in the world, has the opposite effect, creating a new sense of risk and a new world further from equilibrium, more chaotic and dangerous, than the world it was meant to secure.

Beck exemplifies the four qualities that Tsoukas (1999: 511) abstracts from the literature in a four-axis grid:

1. Action at a distance. He cites Thompson (1995), that the global reach of modern communication systems means that actors now influence events in distant parts of the world.

2. Thought at a distance. (“mediated communication”). He cites Thompson (1995), that the spread of media allows people to feel they are participating in remote events.

3. Dematerialized economy. He quotes Lash and Urry (1994) on a growing tendency in the economic sphere for signs and sign production to play major roles.

4. Disembedding social relations. He endorses Giddens (1991) on the progressive disembedding of social relations to separate traditional from modern societies, and late (post)modern societies from earlier forms.

From our perspective, we note two qualities of Tsoukas’s map and the writers he summarizes. First, the four factors produce a picture similar to Prigogine’s description of far-from-equilibrium space, without emphasis on chaos, unpredictability, and contradiction. Yet in Beck’s theory of the “risk society,” paradox is systemic. Secondly, these theories of the fluid, ever-changing postmodern world have a surprisingly simple, linear account of how the world came to be that way. These writers share an account, best articulated by Giddens, in which the present (post/late modern) follows the modern, which followed the pre-modern. In this picture, if the present has far-from-equilibrium characteristics, the pre-modern (“traditional”) seems close to equilibrium, with the “modern” somewhere between the two.

In adapting Tsoukas’s diagram to a more dynamic picture of change, we have followed the lines of our earlier model for complex change (Figure 2). Where previously we were modeling change in organizations at a given time, here we seek to map epochal changes in the conditions of change over centuries.

In Figure 3 a series of three concentric circles represents three conditions shaping these four factors, which correspond to Giddens’s three stages in human history. The innermost circle, “traditional society,” is close to equilibrium, with social relations closer, mainly direct, perception mostly unmediated, action limited, and the economy mainly an exchange of goods. The second circle represents the lesser degree of embedding of “modern” societies, with more distant social relations, a monetary economy, and effective communication systems. The third circle represents “postmodern” global society.

This map is still too crisp. In practice transitions take place unevenly, following a spiral rather than crossing discrete circles, moving backwards as well as forwards, across spaces rather than lines. Yet the circles have a heuristic value, representing transitions from one condition to the next, marking distinct conditions and logics. This map, which pools the work of many theorists, gives a space in which to locate different organizations and contexts, and different kinds of change and change dynamics. It reminds us that linear analysis of change will be more unreliable the further a situation is along the four axes.
Applying Heisenberg, the axes at their edges would curve around to meet each other, creating a space where it will become impossible to distinguish them from each other, or assign specific causality to any one.

Organization @ the edge of chaos: The Enron story

Our third site to apply our ideas on change is a specific organization, Enron, whose spectacular rise and fall were so extreme and well publicized that the basic story is not in doubt. Enron rose from a struggling natural gas company in 1986 to post $520m profit in 1995. In 2001, it filed for the largest bankruptcy in US history. We will not attempt a total analysis of Enron. Instead, we use it as an object on which to base some reflections on how to understand and describe change in far-from-equilibrium conditions.

To anchor our discussion we use a popular book, by financial journalists Bethany McLean and Peter Elkind (2003), partly to make a general point: that to cope with complex histories like Enron’s, the format of academic articles, prioritizing precision and unity of focus, may filter out much of the essential complexity that can be captured better in the common language and narrative strategies of popular works. Each chosen issue, such as ethics (e.g., Zandstra, 2002; Sims & Brinkmann, 2003) or accounting failures (e.g., Benston & Hartgraves, 2002) is clearly part of the picture, but typically such articles focus on the end, the catastrophic failure, missing the complex processes where failure was inseparable from success.

Fuzzy analysis

McLean and Elkind report on Enron in a series of stories, each chapter linked around a main protagonist. A narrative with multiple heroes captures the many strands that made up the changing situation. It allows the flow of events to remain fuzzy, as McLean and Elkind say:

“When, exactly, did Enron cross the line? Even now, after all the congressional hearings, all the investigative journalism, all the reports, lawsuits, and indictments, that’s an impossible question to answer… The Enron scandal grew out of a steady accumulation of habits and values and actions that began years before and finally spiraled out of control” (2003: 132).

McLean and Elkind here use a commonsense form of fuzzy logic, refusing notional lines that separate legal from illegal activities, and success from failure. In their story, change was continuous and multidirectional, sometimes going as intended, but often producing paradoxical outcomes. They note a trajectory that is difficult to break down into discrete stages: an exponential curve that accelerates over time. Early parts may look fairly linear and predictable. But without changing its basic form, it bifurcates into a qualitatively different form: “spiral[ling] out of control.”

Following Heisenberg’s principle, the object, Enron, needs to be kept fuzzy as we describe the trajectory of the constantly changing entity that was Enron across its various changes. What was Enron? A crisp answer might describe Enron as the firm registered in 1986 under that name. But before Enron there were two firms whose merger created this new company. Later, Enron budded entities that were officially both Enron and not Enron, companies set up sufficiently independent to be classified as not Enron, but whose function was to manage Enron debt, including a series of “special purpose entities” whose legality became a serious issue after Enron’s accounting structures became public (Benston & Hartgraves, 2002).

The fuzziness needed to describe change in Enron blurs boundaries, recognizing that at crucial points Enron was changing from one thing to another and could not be described crisply as either. Sometimes the relevant categories incorporate extreme contradictions. Enron did not pass, in the course of a tumultuous few weeks at the end of 2001, from success to bankruptcy. The seeds of great success and catastrophic losses coexisted for many years, in an extended period throughout which Enron was highly successful and doomed.

Signs of chaos

Inappropriate crispness in a far-from-equilibrium environment was a factor in the disaster. Gordon (2002), like McLean and Elkind, points out that the increasingly fraudulent accounting practices were not simply instances of individual criminality. Andy Fastow, chief financial officer, set up many arrangements for his personal benefit, which is merely criminal behavior. But much of his “creative” accounting was driven by the need to solve systemic problems. Enron aspired to be seen as a “growth” stock by the market, and set precise quarterly targets accordingly. But those targets, presented in the form of a smooth upward-moving graph, became ever further from the turbulent reality of Enron’s economics. As the discrepancy grew, so did the scale of the distortions needed to sustain the illusion. That was Fastow’s job. Perhaps he exercised too much creativity, too little morality, but the issue goes beyond individual failure.

McLean and Elkind report a number of factors at work here, driven by exponential curves that are a signature of chaos. This kind of growth became “a treadmill that becomes faster and steeper as the company gets bigger” (McLean & Elkind, 2003: 41).
When targets had to be hit precisely quarter by quarter, in spite of normal fluctuations, distortion became extreme, illustrating Zadeh’s principle: “As the complexity of a system increases, human ability to make precise and relevant (meaningful) statements about its behavior diminishes until a threshold is reached beyond which the precision and the relevance become mutually exclusive characteristics.” As Enron’s accounting continued to be hyper-precise in the complex, far-from-equilibrium environment, its descriptions became irrelevant. This precision was a contradiction driven by Wall Street investors, who demanded both the exciting returns of nonlinearity and the order and precision appropriate to a close-to-equilibrium system.

Creativity

Enron’s success came from a genuinely innovative response to an uncertain market situation in the natural gas industry, created by partial deregulation. Initially its founder, Ken Lay, saw only problems not opportunities in this instability. Enron recorded a loss of $14m for its first year, 1986 (McLean & Elkind, 2003: 14), and was not profitable until 1988, a modest profit of $109m, mainly from selling off stocks and assets. Lay needed a big idea. It came from Jeffrey Skilling, a consultant and financial whiz kid. Skilling devised the idea of a gas bank, to solve the problems of buyers and sellers in the newly deregulated gas industry, in fluctuating, unpredictable conditions of supply and demand. Skilling sold Enron the idea, and they hired him to run it.

Skilling’s “gas bank” set up Enron as a third term, between suppliers and users of natural gas, potential and actual, who previously were restricted by uncertainties of supply and demand. The existence of this third term allowed suppliers to explore, discover, and produce larger supplies at known prices, and the industry grew massively. Users, actual and potential, could buy larger quantities of gas under predictable conditions, which suddenly made it more attractive than alternative forms of energy. It is a fine example of Prigogine’s “dissipative structures,” an open dynamic system forming and thriving at the edge of chaos. Its stable, open system grew rapidly. The idea, followed by others, transformed the industry while providing competitive advantage for Enron.

Enron is famous as the largest bankruptcy in US history, and the fraudulent accounting that accompanied and was revealed by the collapse provided many lessons on the need for better corporate governance and regulations (e.g., Tonge et al., 2003). At the same time, it is important to recognize its extraordinary achievements, which are as much part of the story as fraud and collapse: each inseparable from the other, none reducible to the others. McLean and Elkind, highly critical of Skilling as a manager, acknowledge that “his way of thinking not only reshaped Enron, it helped revolutionize the entire natural gas industry” (McLean & Elkind, 2003: 28). Our commentary does not decide between these two judgments, or draw from Enron’s example a single recipe for organizational change at the edge of chaos.

Risk and resistance

One marker of the far-from-equilibrium post-modern environment is the centrality of risk, in Beck’s sense. An Enron in-house risk-management manual quoted by McLean and Elkind indicates Enron’s position:

“[C]orporate management’s performance is generally measured by accounting income, not underlying economics. Therefore, risk management strategies are directed at accounting, rather than economic, performance” (quoted in McLean & Elkind, 2003: 132).

As they stress, this statement was not an Enron aberration. At the time, most corporations would have agreed. It already points to a potential split between “economics,” real money paid for real goods, and “accounting,” in which the sphere of accounting has become distinct and dominant. In Prigogine’s terms this is a bifurcation, in which the previous relation between accounting and economics, balance sheets and money and goods, has been reversed. This is already a sign of a far-from-equilibrium system. In this condition, Prigogine says, there can be cascades of bifurcations. There is a threshold between this first split and the later series of schemes that spun out of control, “creative” accounting that accountants who finally looked at them described as “labyrinthine” (McLean & Elkind, 2003: 380).

In this far-from-equilibrium world, risk was not just something to be managed, avoided, or controlled. It attracted interest, and created energy (and investment). Investors operated with a version of far-from-equilibrium theory, believing that the biggest profits were to be found at the edge of chaos, provided they were protected by dissipative (open, dynamic) structures. As with the Gas Bank, that is what Enron claimed to provide. It set up a Risk Assessment and Control department (RAC) whose existence and powers it publicized widely. McLean and Elkind report that as public relations this was highly successful. They quote Todd Shipman, a market analyst: “We rely heavily on Enron’s risk-management ability... It gives you a nice, warm, fuzzy feeling... Even though they’re taking more risk, their market presence and risk-management skills allow them to get away with it” (McLean & Elkind, 2003: 116).

In the wash-up to the bankruptcy it became clear that the RAC was totally ineffective, rubber-stamping every wild idea that came before it. It was a system of control that controlled nothing. The RAC was set up as a cybernetic loop to provide negative feedback to keep the host organization in equilibrium, but it was also linked to the market itself. As the negative feedback loop
was taken over by the organization and converted into positive feedback, that feedback then influenced the market to invest heavily in Enron, thus rewarding and provoking the risky behaviors the RAC was designed to limit and control. A mechanism designed to reduce risk increased it. Such contradictions and paradoxes are signs of far-from-equilibrium conditions.

The RAC and annual audits by respected auditors Arthur Andersen were two negative feedback loops that Enron neutralized. It did so because in its linear model of control, any obstacle to the executive will was construed as “resistance” to overcome. Enron developed a culture of bullying, in which the powerful had unfettered capacity to exert pressure on underlings who disagreed with them (Tourish &

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**Fig. 4: Figure 4**

*Enron routes to chaos*

Vatcha, 2005). With hindsight, it is clear that Enron needed much more resistance, not less. This case shows again the dangers of linear models of change for managing organizations in a complex world.

**The four axes of a far-from-equilibrium world**

Enron quickly went national on a grand scale, then global, huge changes for a local company from Houston, Texas. Again, it is not possible to draw a line before and after this explosion. For instance, pre-merger Enron already had interests in Peru, which lost $218m in Enron’s first balance sheet of 1986 (McLean & Elkind, 2003: 14). Expansion and globalization were not inventions of Enron, and the Enron case is no different from many others. We want here to use the diagram we introduced earlier in order to map (in Figure 4) the complex changes in both Enron and its environment over its growth phases, to make some general points about such changes as an organization moves into far-from-equilibrium environments.

Over 10 years from 1986, Enron shifted dramatically along all four dimensions of our grid. In the *action* grid, Enron’s international division marketed aggressively abroad, firstly with great success in England, in a major development at Teeside, and later, catastrophically, in the “third world,” losing $3bn on the Dahbol deal in India alone. Each sphere, local, national, developed world, and developing world, represents a threshold, which Enron passed over in a cascade of bifurcations. This was complemented by new patterns of *perception*, where media brought back glossy images of Rebecca Mark, photogenic head of Enron International, doing yet another deal in yet another barely known part of the globe, to impress and delight the corporate world, who devoured them in the pages of journals like *Forbes* and *Fortune*. This process was driven by an increasing shift from the economics of commodities (production and flows of goods) to an *economics of signs*, to such an extent that Enron’s success, at the height of its fame, was, in Boje et al.’s. words, a “dramaturgical spectacle” (Boje et al., 2004). Its terminal event, the bankruptcy, was an event in the financial world, not a gas explosion or breakdown of a pipe.

In terms of *social relations*, signs of disembedding happened everywhere in Enron. McLean and Elkind report that outside a small elite circle at the top, lavishly nurtured by CEO Ken Lay, relationships inside the organization were dysfunctional, exacerbated by a system of rewards introduced by Skilling, which encouraged selfish, aggressive behaviors in the interests of profit. Carr and Downs (2004) analyze Enron as a “postmodern pathology” in which humans could only relate through “quasi-objects” like SPEs. Relationships with clients were increasingly exploitative and unhappy (“we managed to screw and piss off every major utility customer we had,” according to one employee; McLean & Elkind, 2003: 122). McLean and Elkind (2003: 121) report a perception that this cultural change happened swiftly, after the early 1990s.

Our diagram follows the Heisenberg principle, focusing on change, leaving position and structure fuzzy. We map the trajectory of the changes, across thresholds that represent the conditions of the environment, only indicating positions and structures of the moving, changing body that was Enron and its context. The diagram shows the four axes connected to each other, representing interrelated dimensions of change. Each step away from equilibrium in any one axis tends to trigger off complementary movements along the other axes, which become more interdependent and hence unpredictable. But this constant expansion is not an inevitable outcome. To become a relatively stable object at the edge of chaos, some mechanisms were needed to counteract this continual expansion, negative feedback loops along all four axes. Our Enron diagram shows a pathological state for an organization at the edge of chaos.

**Conclusion**

We set ourselves a limited task in this article: to bring together concepts from three scientists as they bear on the theme of change, in itself and especially in organizations. We emphasized productive affinities between these thinkers, which come from
the importance to them all of a complexity that challenges core assumptions of modernist science. Yet we did not want to engage in system building, to propose a single theory of chaos or complexity. We prefer to emphasize the explanatory power of this perspective on change, whether for linear organization science or the sociology of globalization. We wanted to use it to provide an illuminating account of actual organizations like Enron, and treat their behaviors not just as aberrations but as windows into processes of the postmodern world. Postmodernism did not invent the paradoxes of change, but it has forced us all to look for new ways to understand it, across all its forms.

Note
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References