Complexity, Chaos Theory and How Organizations Learn

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> Most people define learning too narrowly as mere "problem-solving", so they focus on identifying and correcting errors in the external environment. Solving problems is important. But if learning is to persist, managers and employees must also look inward. They need to reflect critically on their own behaviour, identify the ways they often inadvertently contribute to the organisation's problems, and then change how they act.
>
> Chris Argyris, Organizational Psychologist

Changing corporate behaviour is extremely difficult. Most corporate organizational change programs fail: planning sessions never make it into action; projects never quite seem to close; new rules, processes, or procedures are drafted but people do not seem to follow them; or changes are initially adopted but over time everything drifts back to the way that it was. Everyone who has been involved in managing or delivering a corporate change process knows these scenarios all too well. Just how difficult is it to change corporations? It is estimated that:

- 75% of all change efforts fail to make dramatic improvements[118];
- success rates for major change efforts in Fortune 1000 companies range from 20-50%[119];
- 50-75% of all mergers and acquisitions fail to meet expectations[120];
- 15% of IT projects are successful[121];
- 50% of firms that downsize experience a decrease in productivity instead of an increase[122]; and
- Less than 10% of corporate training affects long-term managerial behaviour.[123]

One organization development OD textbook acknowledges that, "organization change presents one of the greatest challenges in modern organizational life".[124]

Because of these difficulties, successful change agents are among the most valuable resources in corporations, and, correspondingly, there are innumerable corporate consultants and change processes that companies leverage to try to create change. These include Change Management[125], Program Management[126], Lean

Manufacturing (TPS)[127], Six Sigma[128], Good to Great[129], Process Reengineering[130], Operational Excellence**,** and the Balanced Scorecard[131], just to name a few. While each of these approaches has been successful in certain situations there is no silver bullet or proven change method that works in all situations. In effect, we are still learning how to learn within corporations.

The corporate fascination with change is so prevalent that almost any manager in North America will have been introduced to, or will be a part of, one of the above change processes at some point in their career. For example, in the course of my eight-year tenure with one large corporation, I was trained on project management, an executive course on change management, and a green belt in Lean Manufacturing and Six Sigma methodologies, Good to Great, and the Balanced Scorecard. Consistent with the data presented earlier, most of those programs were unable to accomplish the intended change.

Which raises an interesting question about corporate regulation: if corporations are so challenged to change for core business reasons (including profitability or survival), why do we expect them to be able to change in response to changes in the law and regulation? Legal scholars, practitioners, lawmakers, and regulators have long overestimated corporations' capacity to change. This is especially true of any regulatory theory that purports to rely on the internal governance systems of the corporation as the primary method of regulation.[132] That is why the learning approach to corporate law and regulation is so promising. It makes it possible for regulators and corporations to work together on the difficult task of corporate change. In order to be successful it requires legal scholars, lawmakers, and regulators to become more familiar with what corporations are, how they change, and how the law and regulation can assist them in changing.

The corporate change approaches outlined above are some of the more scientific and systematic approaches to organization change. They tend to undervalue the role that individuals, individual personalities, and interpersonal conflict have on change processes.[133] They also tend to be more of the "quick fix" type of solution. It may be that most corporate change initiatives fail because these approaches fail to take into account the human components of change in corporations. This is where organization development and organizational learning comes in.

3.1 Organizational Learning and Organizational Development

Organization Development ("OD") is the discipline devoted to helping organizations change by teaching them how to learn. It is a difficult discipline to define and describe because it encompasses such a broad range of practical and theoretical approaches.[134] However, most OD

approaches share several similarities:

- They adopt a long-term approach to change.
- They are focused on learning and education.
- They are based on the collaborative participation of organization participants in the change process.[135]

The following two quotes offer example definitions of Organizational Development:

> [A] process that applie[s] a broad range of behavioral science knowledge and practices to help organizations build their capacity to change and to achieve greater effectiveness. . .[136]

> [A] systemic and systematic change effort, using behavioral science knowledge and skill, to change or transform the organization to a new state.[137]

There are three OD approaches that are of interest for the purposes of developing the dialogic approach to regulation: Chris Argyris and Donald Schon's models of individual and organizational learning, Peter Senge's 5th discipline approach to the learning organization, and, most importantly, the new emerging dialogic OD practices. Each of these approaches offers a different perspective on how corporations learn that is important to dialogic regulation.

3.1.1 Theories of Action

Psychologist Chris Argyris and philosopher Donald Schon developed the Theory of Action learning perspective that offers insights into how both individuals and organizationslearn.[138] The Theory of Action learning perspective acknowledges that there is a difference between what people say and what they do, or their "espoused theory" and what they actually do, their "theory in use". They argue that every individual has a set of mental maps that tell them how to act in certain situations and it is these maps that guide what they do, rather than the theories or reasons they tell others as rationalizations.[139] While most people are aware of the theories they espouse to explain their own behaviour, few are aware of the maps or theories they actually use.[140] Argyris and Schon call these two types "Theories of Action". These theories govern behaviour in implicit ways and they contain assumptions about the self, others, and the environment.[141] The "espoused theory" is made up of the words that we use to convey what we do or what we like others to think we do. The "theory-in-use" is the theory that governs what we actually do. Reflection is the process by which individuals engage in thinking about the mismatch between what they say they do (their intentions) and what they actually do (their outcomes). Argyris and Schon argue that personal effectiveness lies in developing the reflective capacity to reduce the distance between the espoused theory and the theory-in-use.[142]

3.1.2 Single- and Double-Loop Learning

Argyris and Schon also outlined two different kinds of learning: single-loop learning and double-loop learning.[143] Single-loop learning is adaptive learning that focuses on incremental change within an existing system. It is about error detection and correction. It solves problems but ignores the question of why the problems arose.[144] This kind of error correction permits an organization to carry on its present policies or achieve its present objectives; in other words, it allows people to maintain the current theory-in-use.[145] Single-loop learning functions like a thermostat that detects that it is either too hot or too cold and adjusts.[146] The criterion for success for single-loop learning is effectiveness.[147]

Double-loop learning is learning that focuses on transforming the existing way things are done.[148] Double-loop learning uses feedback from past actions to question the assumptions underlying current views and the current system structure. Double-loop learning detects and corrects errors in ways that involve the modification of the organization's underlying norms, policies, and objectives.[149] It often involves individuals having to understand how theythemselves contributed to the problem they are trying to correct. It can involve a lot of reflective activities and may require modifications to the current theory-in-use.

The difference between single-loop learning and double-loop learning can best be described as the difference between learning a new way to do something and learning a new way to think about something. Single-loop learning is safe and allows individuals to follow routine or some pre-set plan. It is usually present when "goals, values, frameworks and, to a certain extent, strategies are taken for granted".[150] Reflection in single-loop learning is limited to making the strategy more effective. In contrast, double-loop learning "involves questioning the role of the framing and learning systems which underlie the actual goals and strategies".[151] Double-loop learning is more creative, reflective, and, more importantly, risky. It is risky because it often involves questioning the underlying assumptions of a goal or strategy – in a public or group forum. The diagrams of single- and double-loop learning are attached as Appendix E.

3.1.3 Compliance and Adherence

The difference between single- and double-loop learning is extremely important for corporate law and regulation because if individuals can engage in double-loop learning related to desired regulatory outcomes then they will have learned not only to change their behaviour but also to change the way they think about behaving. The difference between single-loop and double-loop learning in relation to dialogic regulation will be referred to as the difference between "compliance" and adherence".

Compliance is simply single-loop learning of desired regulatory outcomes and refers to the regulatory participants' ability to change their behaviour to match the new regulatory outcomes. Compliance, as used in this way, is doing what someone else wants you to do whether you believe it is the right thing to do or not.[152] Adherence is the outcome of a double-loop learning process of the desired regulatory outcomes and refers to the participants' changed way of thinking about the regulatory outcomes, or, in other words, learning why the regulator changed the outcomes and accepting those changed outcomes into their own mental maps. Adherence has a different meaning than compliance. Adherence means support for a cause or idea or faithful attachment and devotion.[153] Dialogic regulation argues that adherence is a better regulatory outcome than compliance and that dialogue and dialogic coaching is better at generating adherence than traditional regulatory approaches.

Traditional command and control and market-based types of regulation are only designed to coerce (or incent) single-loop learning or changes in behaviour and it is unlikely that they will promote double-loop learning. One way to understand this is to conceive of three different kinds of behaviour modification: coercion, inducement, and persuasion. Coercion is forcing a modification in behaviour through threat of punishment. This is the approach to behaviour modification built into the assumptions of command and control regulation: "do this – or else." Inducement is behaviour modification through providing incentives or rewards (financial or otherwise) for desired behaviour. This is the approach to behaviour modification built into the assumptions of market-based regulation: "if you research a technology important to the government, you will get a tax credit." Persuasion is behaviour modification by getting someone else to adopt your view. This is the assumption behind the new learning approaches to regulation: "we comply with safety regulations because we believe that safety is our number 1 priority." Both coercion and inducement are relying on external factors to force behavioural change; they are not focused on internally changing the way people think. Only persuasion focuses on internal behaviour modification, and that kind of modification is greatly increased with double-loop learning.

Unfortunately, double-loop learning is extremely difficult to accomplish. Argyris has shown, through years of research, that the way individuals act in organizations inhibits double-loop learning – especially when there is something important at stake. The result is that double- loop learning rarely occurs when it is most needed.

Argyris and Schon set up two models that described individual theories-in-use that either inhibit or enhance double-loop learning. They referred to them as Model I and Model II.[154] They

believed that people used these theories-in-use when confronted with problematic situations. Model I involves "making inferences about another person's behaviour without checking with whether they are valid and advocating one's own views abstractly without explaining or illustrating one's reasoning."[155] This theory-in-use is shaped by individual desires to win and not to be embarrassed because exposing our "actions, thoughts, and feelings can make us vulnerable to the reaction of others".[156] It is usually associated with action strategies dominated by unilateral control and unilateral protection of the self and others.[157] Model I often leads to deeply entrenched defensive routines at the individual, group, or even organizational level.[158] Model I is summarized in Appendix F-1.

Argyris has stated that most of the participants in his studies operated from theories-in- use or values consistent with Model I[159], but when asked they would usually espouse Model II. Model II is based on an approach that looks to include the views and experiences of participants rather than imposing one's own view on a situation. In this model, positions are reasoned and open to exploration by others. It is a more dialogic approach to problem resolution that involves shared leadership. OD scholars Edmundson and Moingeon have argued that employing Model II in difficult interpersonal situations "requires profound attentiveness and skill for human beings socialized in a Model I world."[160] Model II is summarized in Appendix F-2.

Chris Argyris' research focused on how to assist organizations in learning how to increase their capacity for double-loop learning, which involves teaching individuals how to move from Model I theories-in-use to Model II theories-in-use. He coined the term "deutero learning" to refer to the process of learning to learn better.[161] In this perspective an organization is the rules and interactions of individuals who have organized themselves, and organizational learning is changes to those rules.[162] Argyris and Schon call this the group's theory of action, which is "a complex system of norms, strategies, and assumptions" embedded in their processes of interaction. [163] In the case of the corporation, it can be argued that the corporation's theory of action is the corporation's culture. This theory of action resides in the thoughts of each individual in the organization and manifests itself in the form of physical images, texts, and maps – for example, organizational charts, corporate procedures, codes of conduct, corporate values, vision statements, etc. Each member of the organization is constantly trying to complete their version of the organizational theory-in-use, because as humans we are all sense-making beings who constantly try to understand the world around us. However, each member's understanding of the organization theory-in-use is always incomplete.[164]

For Argyris and Schon organizational learning is "a process mediated by the collaborative inquiry of individual members"[165] and organizational learning is a continuous process that is required by all organizations in order to ensure their survival.[166] Organizational learning is different to individual learning.[167] The difference is one of agency. The individual is the agent of organizational learning.[168] Organizations require individuals to exist and organizations can only learn through the experience and actions of individuals.[169] However, organizations are not simply collections of individuals, nor is organizational learning merely individual learning. There are lots of examples where the organization knows less than the individuals involved. Individuals reaffirm the existing patterns of the organization when their own theories of action are consistent with the organization theory-in-use. Individuals are agents of change when changes in their theories of action run counter to the existing organization theory-in-use. Organizational learning occurs when "individuals, acting from their images and maps, detect a match or mismatch of outcome to expectation which confirms or disconfirms organizational theory-in-use."[170] They continually change the theory in use, which is then recorded in the images and maps of the organization. As a result, organizing is a reflexive inquiry of collaborating individuals.[171]

Because of the personal and emotional risk involved in that kind of reflective process, conflict plays an important role in organizations that are actively engaged in double-loop learning.[172] Therefore, double-loop learning is the process by which groups of managers confront and resolve conflict. If the conflict takes the form of a fight with one side winning all, which is not double-loop learning because neither side emerges from the conflict with a new meaning of the organization, more likely the organization's dominant theory-in-use will prevail. If they engage with each other collaboratively, they can solve the problem and come to a new understanding of what that means for the way they interact with each other.

Individuals, organizations, and societies are built to inhibit double-loop learning.[173] This creates stability and avoids conflict. We tend to keep our conflicting ideas private, we let failures lie buried, and we do not share our mental maps with others. The result is that so many of our views of others and the organization remain fragmented, incomplete, and often incorrect. All of this limits the possibility for collaborative inquiry and inhibits learning. Learning also gives rise to anxiety because it causes one to shift one's individual and collective identity, which is existentially threatening. Therefore, it becomes really important to understand how people respond to anxiety and shut down learning processes to make themselves feel comfortable.[174]

The skills to engage in double-loop learning can be learned. It is possible to intervene in organizations to reduce these inhibitions to learning. Such interventions are focused on decreasing the defensiveness of individuals and groups within the organization.[175] They also encourage people to take risks and confront inconsistencies, and they teach people that public testing of assumptions, plans, and strategies is not harmful.[176]

These types of learning ideas were made popular and available to corporate actors with the publication of Peter Senge's book *The Fifth Discipline* in 1990. Senge took a novel approach in combining the psychological work on learning from Argyris and Schon with the emerging thoughts from systems theory to develop an overall systematic approach to organizational learning. He coined his ideal organization the "Learning Organization". For Senge a learning organization is an organization where "people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning how to learn together."[177] For Senge, a learning organization is an organization that has mastered the five disciplines of a learning organization, which are:

1. The Discipline of Personal Mastery
2. The Discipline of Mental Models
3. The Discipline of Building a Shared Vision
4. The Discipline of Team Learning
5. The Discipline of Systems Thinking

The discipline of personal mastery is the discipline of "continually clarifying and deepening our personal vision, of focusing our energies, of developing patience, and of seeing reality objectively."[178] This refers to the ability of individuals in the organization to become better learners. For Senge an "organization's commitment to and capacity for learning can be no greater than that of its members."[179]

Mental models "are deeply ingrained assumptions, generalizations, or even pictures or images that influence how we understand the world and how we take action."[180] These are very similar to the models about learning proposed by Argyris and Schon. Other scholars refer tothese maps as cognitive schemata or percepts.[181] A learning organization is able to explore mental models and engage in meaningful dialogue that allows these models to change.

The discipline of building a shared vision is important because "[w]hen there is a genuine vision . . . people excel and learn, not because they are told to, but because they want to."[182] Senge agrees with Argyris & Schon that "teams, not individuals, are the fundamental learning unit in modern organizations."[183] He built this into his discipline of team learning. He argued that if teams could not learn, the organization could not learn. For Senge, the discipline of team learning is based on the ability of team members to engage

in dialogue. Dialogue has a specific meaning for him: it is "the capacity of members of a team to suspend assumptions and enter into a genuine 'thinking together'".[184] The word dialogue comes from the Greek word "dialogus", which meant "a free-flowing of meaning through a group, allowing the group to discover insights not attainable individually."[185] Dialogue can be contrasted to discussion, which is simply the hurling of ideas back and forth at each other with a "winner take all" attitude.[186]

Finally, systems thinking is the ability to step back from a fragmented linear understanding of a situation and take a holistic and complex view that includes indirect and interdependent causality.[187] Senge calls systems thinking the "5th Discipline" because it is the
discipline that brings all the other disciplines together. None of the five disciplines on its own is enough – but when they are all drawn together with systems thinking they fuse into "a consistent body of theory and practice" that when used makes organizational learning possible.[188]

The switch to become a learning organization is a significant shift of mind for organizational participants: a shift from seeing themselves as separate from the world to connected to the world, and from seeing problems as caused by external forces to seeing how they themselves create their own problems. For Senge, a learning organization "is a place where people are continually discovering how they create their reality" and how they can change it.[189] Senge shares the view of Argyris and Schon that the primary things that get in the way of organizational learning are conflict, mental maps, and defensive routines.

The influence of complexity theory and postmodern language theory can be seen throughout Senge's work. One significant example is his discussion of the three core learning capabilities for teams inside a learning organization, which Senge describes as: "fostering aspiration, developing reflective conversation, and understanding complexity."[190] He argued that as the world becomes more complex and dynamic we all must work together to become more "learningful".[191]

One major drawback of the early attempts to integrate systems theory into organizational learning, including Peter Senge's approach, was that when it was put into practice the organization tended to be anthropomorphized. For example, Senge's work led to a practitioner boom about "learning corporations" and what the corporation needed in order to learn. When the corporation becomes anthropomorphized it is easy to forget that organizations do not learn – people do.[192] An organization is not an organism – you cannot point to it. It is more like an ecosystem. It is the system that results from the interaction of all the things you can point at.[193] So, if learning involves people, then the focus of organizational learning needs to be down at the

individual interaction level (the level of small groups) and not the system level.

The anthropomorphization of the corporation can be seen in some of the recent corporate law and regulation initiatives, for example the SEC's corporate monitorships. The attempts by corporate monitors to change corporate culture have often focused around implementing a new code of conduct for the subject corporation. This is a system level fix that is not focused on individuals. In the Theory of Action learning perspective, that new code of conduct will only exist in the corporation to the extent that it is taken up into each individual employee's theory of action for the corporation. Often the code of conduct is introduced with a simple training exercise and the signing of the code. This may not be enough because the kinds of changes intended with a change in the code of conduct are only possible in double-loop learning. But double-loop learning is most inhibited under the circumstances in which the corporate monitors are trying to make these changes: meaningful and stressful situations that are existentially challenging to corporate employees. To our knowledge, none of the corporate monitors to date have engaged in any OD practices to assist the employees with double-loop learning while engaged in their monitorships.

Therefore, the question remains: How do you cause the kind of transformational organizational change that requires double-loop learning? It has been an elusive goal for many OD practitioners and approaches. However, a developing movement in OD called Dialogic OD has the potential to cause these kinds of transformational changes by leveraging important insights from two additional intellectual movements in the social sciences to cause change in organizations. OD theorist Gervase Bushe has identified those two intellectual movements as chaos theory's understanding of dynamic non-linear systems and the postmodern focus on the importance of language and discourse.[194] In the next two sections, I will summarize the influence of these movements on Dialogic OD and then describe Dialogic OD.

3.2 Chaos Theory – Self-Organizing Systems

In modern science, the term "Chaos Theory" is used to refer to the study of complex, non-linear, and dynamic systems. Chaos theory emerged from the study of non-linear systems and the ability of computers to model non-linear equations over millions of interactions.[195] Then people began making the link between physical non-linear systems, like the weather, and living systems. The application of systems theory to living things is called complex adaptive systems theory (CAS). [196] CAS has four basic principles:

1. Complex adaptive systems are at risk when they are in equilibrium because equilibrium is a precursor to death;

2. Complex adaptive systems exhibit the capacity for self-organization and emergent complexity;
3. Complex adaptive systems tend to move toward chaos when confronted with a complex task; and
4. Complex adaptive systems cannot be directed only disturbed.[197]

While CAS is a natural systems perspective, these four principles can also be applied to dialogic systems. OD and business scholars have leveraged its insights to understand how organizations change. These four principles will be applied to the corporation as a dialogic system in four sections below: surfing the edge of chaos; emergence, including a discussion of the "butterfly effect"; learning complex tasks; and disturbing complex systems.

3.2.1 Surfing the Edge of Chaos – The Myth of Equilibrium

Richard Pascale is a business scholar who uses complexity and chaos theory to understand business organizations. In 1999, he wrote an important article called "Surfing the Edge of Chaos."[198] He argued that organizations exist in one of three states: organized, self- organizing, and chaotic. A diagram of these states is included as Appendix K. An "organized" organization is an organization that is in equilibrium – one where everyone knows what to expect all (or most) of the time. In chaos theory, an "organized" organization is one that is in trouble because it will have a hard time learning and generating the new ideas that are crucial for its survival. A "self-organizing" organization is one with a certain amount of emergent qualities. Centralized organizational patterns are present but they are more like guidelines and individuals are allowed to organize themselves. This state allows for the generation of novel organization patterns, the generation of new ideas, and promotes the learning that is necessary for the organization to survive. A "chaotic" state is problematic for an organization because without any structure it will cease to exist. Pascale's term "Surfing the Edge of Chaos" refers to the delicate balance that is required to maintain an organization in a self-organizing state without tipping over into chaos.[199]

Corporate theory, corporate law, and economics assume that organizations, markets, and economies are naturally in an equilibrium state. This idea is really just an assumption and it has never been proven to be true.[200] In fact, as we learn more about complex social systems comprised of interdependent human actors interacting, the more we realize that corporations, markets, and economies are anything but in equilibrium and we do not want them to be. When conceived of as complex, dynamic and non-linear systems, most corporations are self-organizing systems that must constantly learn and innovate

or else they fail in the same way complex adaptive systems do. This is one of the well-known paradoxes of corporations. On one hand, they need to have a vision, value system, and culture that creates strong bonds amongst corporate participants. On the other hand, they need to create dis-equilibrium in order to promote uncertainty, learning, and innovation in order to survive. It is a delicate balancing act and straying too far in either direction may result in the failure of the organization. OD scholar Gervase Bushe calls this "learning while performing" and it is the holy grail of OD and most corporate management teams.

"Surfing the edge of chaos"[201] is very important from an organizational perspective because when an organization is in that state it is at its peak performance in three major components of organizational success: engaging the processes of self-organization and emergence, leveraging sensitive dependence and changing the initial conditions of its organizing patterns (or what has popularly become known as the "butterfly effect"), and learning and generating new ideas.

3.2.2 Emergence and Self-Organization

In chaos theory, emergence is the capacity of complex non-linear systems to have an orderly state emerge out of a chaotic state.[202] This idea was first postulated by chemist Ilya Prigogine when he argued that order could appear out of chaos in a seemingly natural and inexorable manner without the benefit of an external organizer.[203] He based this idea on his observation of how chemicals acted in a self-organizing way – for example, the way molecules act in the boiling water of a teapot: at first they move around frantically in seemingly random patterns until they hit the boiling point, when they all organize into stable and repeated patterns of movement.

Emergence is best illustrated by describing an experiment conducted by geneticist Stuart Kaufman at the Santa Fe Institute. Kaufman was interested in discovering how individual genes that execute their instructions simultaneously fall into regular patterns that allow the replication of a species. To investigate this he designed a simple replication of a genetic system. He had 100 light bulbs. They all had instructions to turn on or off independently according to their own instructions. No governing system existed and so his hypothesis was that the random behaviour of the light bulbs would settle into random patterns. The results of the experiment were astonishing. Within a few minutes the system always settled down into a few more or less orderly states. This is emergent complexity – orderly systems that arise out of chaotic states where independent nodes are all operating according to their own instructions.

Another example of how to explain emergence is to use the concept of fractals from geometry.[204] A fern has a simple set of initial rules

on the construction of its body – its genetic code. As it repeats the set of instructions on a strand of a leaf, a leaf, a branch, or the overall plant, a complex system emerges that resembles the initial structure specified by the genetic instructions. The single pattern of the initial genetic instructions is repeated at ever-greater levels of complexity. The complete fern is the emergent complexity from the replication of the initial set of instructions at increasing levels of complexity, with higher levels of complexity emerging from lower levels of complexity.

OD practitioner Harrison Owen has used these insights from chaos theory to create the self-organization hypothesis: "All human systems are self-organizing and naturally tend toward high performance provided that the essential preconditions are present and sustained." The implicit idea in this hypothesis is that self-organization is the key to high performance. But how does emergence work? In human social systems (like corporations) the process of emergence works in a predictable pattern:[205]

1. The organization moves out of an equilibrium state because of an internal or external event (usually a complex problem it is unable to solve with current patterns of organization).
2. There is a breakdown of existing structures and events occur that sever possibility of ever going back to the previous equilibrium state.
3. There is a period of experimentation with new organizing patterns.
4. Order re-emerges in the system.

The key to this process is that organizations learn when they are confronted with complex new situations and in order to learn they are required to confront and consider the assumptions they have about the way they organize or do business. In order for this to work the social system needs to have rich networks for communications to flow.

3.2.3 Learning Complex Tasks and Generating New Ideas

Corporations that surf the edge of chaos learn better because they are leveraging the power of self-organization and emergence. That is because the most meaningful learning (double-loop learning) involves the challenging of assumptions and plans.[206] In an "organized" organization this kind of challenge is often not accepted or there are programmed responses or feedback loops designed to stop this kind of questioning from occurring. In a "self-organizing" organization these kinds of conversations are often normal. As an organization is challenged with complex tasks they move towards chaos because the normal responses and procedures in the organization cannot find a suitable solution for the task. A new solution is required and that often means changing the basic ways that the organization functions. One way to understand the underlying organizational assumptions from a

chaos theory perspective is to conceive of them as the initial conditions of the system – the pattern of organizing that then gets repeated as a fractal. For example, if the rules of interaction or cultural fractal contain distrust, self-interest, and a preference for competition it is almost certain that the emergent organization or social system will also contain those characteristics – often in an amplified way. In contrast, if the fractal contains trust, dialogue, and temperance the emergent social system may be different.[207]

3.2.4 The Butterfly Effect

Complex non-linear systems are extremely sensitive to variations in their initial set of conditions. Tiny variations in the initial conditions can be amplified through repetition and cause unpredictable and disproportionate outcomes in the system. This property of non-linear systems is called "sensitive dependence". It was made famous by Lorenz, who labelled it the "Butterfly Effect". In 1963, Lorenz was working on a computer model that predicted weather patterns. In setting up the model he accidentally entered an initial variable as .506 instead of .506127. The result was a completely different weather pattern than the one generated using the full number.[208] Lorenz coined the metaphor "butterfly effect" to explain this sensitivity to initial conditions. The metaphor goes something like this: Does the flap of a butterfly's wings in Brazil set off a tornado in Texas? The answer is yes.[209] Sensitive dependence states that complex non-linear systems (like organizations and social movements) are extremely sensitive to the initial sets of conditions (the conversations people have that replicate the organizational culture). Small changes in the initial set of conditions can have dramatic non-proportional (non-linear) effects on the emergent systems.

In the context of organizations, sensitive dependence means that if an organization is surfing the edge of chaos, small changes in the way people interact with each other or in the conversations they have with each other can have dramatic and transformative effects on the organization. The "tipping point" or "bifurcation point" is the point at which enough small changes have happened that the system switches over and a new pattern emerges.

Complex non-linear systems are not random. They still follow deterministic laws. They are in effect path dependent and future states depend on prior states.[210] However, because of their sensitivity to initial conditions it becomes very difficult to predict long-term outcomes in complex non-linear systems because each component of the system is caught in a complex non- linear feedback loop. Each time the component engages in a feedback loop it can carry out the initial set of conditions or it can vary them. If the initial conditions are repeated it leads to stable (and predictable) outcomes. If the initial conditions are varied it can lead to unstable

(and unpredictable) outcomes. The feedback loops are the deterministic structure of the system. The ability to vary the initial set of conditions is the non-deterministic property of the system. The interaction of these two effects is referred to as "bounded instability". Short-term predictions of chaotic systems are possible because the ability for the variation in the short term will most often be limited. For example, weather predictions are usually good up to about a week.

3.2.5 Directing vs. Disturbing Complex Systems

The consequence of applying the lens of chaos theory to corporations is that the difficulty in predicting the end result of an intervention or change in a complex non-linear system becomes understandable. In every conversation the current patterns may be reinforced or they may be changed. The result of all those conversations just emerges. Emerging complexity creates multiple futures. Chaos theorist Richard Pascale said it this way:

One consequence of emerging complexity is that you cannot see the end from the beginning. While many can readily acknowledge nature's propensity to self- organize and generate more complex levels, it is less comforting to put oneself at the mercy of the process with the foreknowledge that we cannot predict the shape that the future will take. Emerging complexity creates not one future but many.[211]

It also means that it is very difficult to direct complex systems because there are weak cause and effect relationships. Greater precision is neither sought nor possible. This idea, when applied to corporate law and regulation, calls into question the whole idea of command and control regulation that is attempting to direct corporations towards specific regulatory outcomes. The idea also calls into question the notion of managerial control and strategic planning because it may not be possible to plan and control activities in a corporation.

Harrison Owen has presented a few examples of how control and planning are really just illusions in corporations. His first example is that of the corporation's organizational chart – how come it always seems to be out of date and should not be trusted? His second example illustrates further the limits of the formal system within a corporation: he uses the example of a labour union's "work to rule" campaign where workers are only doing what the rules say they should do. In this situation, management should be happy – but they rarely are. That is because "if we actually did business the way we say we did business, we would be out of business."[212] Owen goes so far as to argue that control is really the enemy of high performance. In his words, the only way to make sure his OD practice Open Space will not work is for someone to take control.[213]As a result of these realizations there are new types of

corporate planning called improvisational planning and leadership within corporations being developed.[214]

The result of attempts at planning and control in self-organizing systems is usually unintended consequences. This is because the attempt at control is unable to understand the full complexity of the system and while it may cause the effect desired in the direct relationships, it will usually have counter-effects in other areas not considered when the control was designed or planned. Pascale provides two examples of attempted interventions in complex systems that had dramatic unintended consequences. In the first, the Forest Service in Yellowstone Park attempted to eliminate forest fires by putting them out every time they happened. In effect, they wanted to maintain the ecosystem of the park in an equilibrium state. The result was that 100 years of dead material accumulated until eventually the fire that erupted could not be put out and living things and top soil that otherwise might have survived was destroyed.[215] In the second example, the
U.S. Fish and Wildlife Service tried to control the coyote to protect sheep and cattle ranchers. They spent $3 billion over 100 years for a variety of measures, including bounty hunters, traps, poison, and genetic technology. The result was that the modern-day coyote is 20% larger and significantly smarter than its predecessors and can be found in 49 of the 50 states instead of the 12 states that were its traditional habitat.[216]

Emmanuel Ogbonna and others have studied the impact of unintended consequences on organizational interventions.[217] They argue that there will always be anticipated consequences and unanticipated consequences of every managerial action and that unintended results come from the divergences in the ways individuals intervene in or take up the managerial action. [218] In a case study in culture change initiatives in eight companies where they were looking for unintended consequences, they found that "in each company, the desired change had been undermined by at least one unintended consequence, which was accepted by members to have either slowed or even stopped the change programme."[219] The conclusion of the study was that practitioners "should be wary of culture change programmes or models that promise totally predictable change, and should embrace guidance that appreciates and incorporates unpredictable effects."[220] A second case study of attempted culture changes in the grocery retailing industry showed the same results for change initiatives aimed at corporate managers who, the authors hypothesized, should have been more accepting of culture change processes.[221] The conclusion of that study included the following: "we find it difficult to accept any notion that changing the organizational context would be easy, or indeed would be considered suitable for systemic pursuit."[222]

In the realm of corporate regulation there are many examples of unintended consequences. For example, sociologist Chalmers Johnson has argued that the United States' attempt to legislate away the Zaibatsu in Japan after the Second World War just led to the creation of the Kieretsu[223] and sociologist Neil Fligstein has argued that U.S. anti-trust laws attempt to break monopolies of trust power in the U.S. triggered the creation of the large multi- national corporations.[224]

3.2.6 Chaos Theory and the Corporation

The application of chaos theory concepts to the corporation has a long history.[225] One of the first was Peter Viall in 1975 in his article "Towards a Behavioral Description of High Performing Systems." His ideas led to the famous work by Peters and Waterman, *In Search of Excellence*, where they argued that excellence kept showing up in organizations – just not where it was expected and not according to plan. Their book and the OD practice that resulted from it called Operational Excellence led to a revolution in management practice and theory. Jerry Collins also found that excellence occurs not according to plan and where it is least expected in a popular recent study, described in his book *Good to Great*. After studying a large sample of Fortune 500 companies to determine what made great companies become great while their competitors floundered, Collins' team identified what they called Level 5 Leadership as one of the characteristics of great companies.[226] Collins argued that the way to identify these leaders in an organization is to look for excellence where no one is taking credit for it.

In a more recent example, the properties of self-organizing systems were used by AT&T during the preparation for the 1996 Olympics when they used Harrison Owen's Open Space Technology to fast track 10 months of design and planning for their pavilion in Olympic Village into a 2 day contractor summit. 25 contractors came to the summit with lots of difficult history and a blank page to design from.

Open Space, developed by Harrison Owen, is an example of a self-organizing dialogic process that leverages the insights of chaos theory. It involves collecting a large group of people in an empty room, with no agenda, and letting them do whatever they want. The rules are simple: anyone can suggest a topic and become the leader for that topic in a breakout session. Four principles then apply: 1) whoever comes are the right people; 2) whatever happens is the only thing that could have; 3) whenever it starts is the right time; and 4) when it's over, it's over. One law also applies: the law of *two feet*. If you are not contributing or getting value where you are, use your two feet to go somewhere else.[227]

In order for Open Space to work a few characteristics need to be present:

1. Need a real issue – something people care

about.

2. Voluntary self-selection – people come because they cared to come.
3. High levels of complexity – a situation that is so complex no one person can figure it out.
4. High levels of diversity in participant group.
5. Presence of passion and conflict combined with urgency.[228]

The outcome of Open Space is a community of people that are drawn together in a "nexus of caring." Owen describes the magic of Open Space in the following way: "When caring people gather around something they care about there is a high likelihood that useful things will happen."[229]

But all of this may be hard to believe for some because it is so far removed from conventional thinking about the way to manage corporations and to run change initiatives in corporations. OD practitioner and theorist Peggy Holman stated this the best when she said that you need to fall flat on your face in a change effort to understand the power of emergence.[230] Holman's work is focused on how to leverage the capacity of corporations to self-organize and exhibit emergence. She argues that there are two types of change in an organization: small incremental change with foreseeable outcomes, or spontaneous transformational change that occurs with emergence.[231]

Holman also argues that it may be possible to create "applied emergence" or actually create the conditions for emergence in an organization. She argues that in an emergent change no one is in charge and simple rules can engender complex behaviour. Peggy Holman's argument is that to cause emergent change you simply need to change the rules of interaction. By interaction she means the social interactions between the organizational participants and she is using an expansive use of the word "rules" here that includes not just the formal rules of the organization but also the informal ones. In a corporation people follow simple rules to organizational assumptions. In order to do the least to cause the greatest change and benefit you just need to focus on changing those organizational rules and assumptions. For Holman, emergent change processes are "methods that engage the diverse people of a system in focused yet open interactions."[232] She uses the phrase "designing conversations that matter" to describe this.[233] Her model of change is very similar to the model of change for self-organizing systems in CAS:

1. Disruption: Change starts with disturbance – a new complex problem that the corporation is unable to solve.
2. Differentiation: Accentuate the differences that matter among people. Things start changing while in a state of chaos.
3. Coherence: A new understanding or system

emerges.[234]

This is the model of change within corporations adopted here for the dialogic regulation model.

3.2.7 Chaos Theory, the Corporation, and Dialogic Regulation

The insights of chaos theory when applied to the corporation as a complex human social system hypothesize that the initial set of rules (or fractal structure) of the corporation are the daily interactions, dialogues, and conversations amongst corporate actors.[235] Corporate culture then is the context within which daily interactions are made possible and the emergent social system that is the result of all of those daily interactions. If the emergent corporate culture is not desirable the root cause of that problem probably lies in the interactions, conversations or dialogues happening at the small group level within the corporation. It also means that to change the corporate culture by leveraging the emergent properties of the corporations one needs to change the daily interactions of the corporate participants because any small change in those initial conditions can be repeated and taken up by many individuals and then emerge as a property of the overall corporate culture. How to change it in a desired direction is the question that Dialogic OD takes up. At some point, if small changes are repeated enough times a bifurcation or "tipping" point will be reached and a new culture will emerge.

In organizations, there are expected institutionalized interactions, which take the form of roles and scripted relationships between corporate actors. These institutions can be thought of as the bounded instability of the system. Corporate actors have no choice but to engage in the non- linear feedback loops which these institutions constitute. For example, corporate managers have to go to the weekly managers' meeting, do annual performance reviews with all of their direct reports, etc. To the extent that there are institutionalized feedback loops or scripted interactions within which the corporate actors operate, the corporation social system is deterministic. Each time a corporate actor engages in these feedback loops, however, that agent is free to vary, ignore, or alter the institutional arrangements. Corporate actors still have the capacity for freedom of choice. For example, what they say or do at the weekly managers' meeting or in their performance review meetings with their employees is their choice. Depending on the extent to which corporate actors change the rules or scripts, stable or unstable outcomes are possible. Complexity theorist Ralph Stacey refers to this as "transformative causality"[236] because cause and effect links are circular and can lead to unexpected outcomes.[237] In his words, patterns of interaction between human agents either reconstitute themselves though repetition or transform and evolve. If they evolve they can get

amplified if many people take them up. Small immeasurable changes in patterns of interaction can escalate into major changes in the system but the direct causal relationship is lost in the complexity of what happens.[238]

The idea that cultural change can happen simply by changing conversations probably seems a bit naive and hard to believe. So, I have developed a simple participatory exercise that can be completed in fifteen minutes that illustrates all of the basic ideas of emergence and corporate regulation firsthand for audiences. I use this exercise at conferences and workshops when I am talking about how changing conversations can change culture. The exercise is based loosely on the "Helium Stick" exercise used by consultants as a team building exercise. The exercise is perfect for illustrating emergence because it recreates a self-organizing system with initial conditions, emergence, and an attempt at control, unintended outcomes, and the learning of a complex task.

The exercise works like this. You need at least eight people and a light stick like a broom handle. You get the people to stand in two lines facing each other with the arms out at chest height. Each person should make a "gun" sign in each hand and extend his or her hands into the middle. The stick then gets laid across everyone's fingers so that their fingers are underneath the stick. At this point you have a system in equilibrium. Everyone is standing facing each other, the stick is flat, and everyone's fingers are in contact with the stick and holding it up at chest height.

We normally proceed at this point by explaining the system we just created by telling the team that they are a corporation and the stick represents their environmental performance. If the stick is on the ground they are having no impact on the environment. If the stick gets to shoulder height they will have an environmental catastrophe like the Deepwater Horizon. Everyone is asked to acknowledge that the stick is in equilibrium and then it is removed for the next few minutes (it can have a tendency to act like helium during the instructions that follow).

The next step is to create the initial conditions in the culture of their organization. This is when the team is told that there is one rule in the corporation – your fingers must always be in contact with the stick. Next, the attempt at control is introduced. The facilitator states that they are the environmental regulator and that the environmental performance of the corporation is unacceptable. The regulator then instructs the team that a new law has been passed and that they need to put the stick on the ground. Simple? Understood? Great.

The stick is then put back on people's hands and the regulator watches diligently. Every time someone's fingers are off the stick they remind them to "keep your fingers in contact with the stick". The result – without exception – is that the stick rises, usually very fast to

above shoulder height. At this point we take the stick away and we say, "You failed. What happened? Were we not clear enough? Did you not hear us? We want the stick on the ground. Let's try again." People are usually surprised and willing to try again. If it is done quickly before people are allowed to start a "self-organization" process, the same result will occur. If they do start self- organizing – we usually play a trick on them after the second failure by stating that as regulators we need to punish the corporation and so we are going to put the CEO in jail, and we always pick the person who was beginning to organize people – it has the effect of slowing down the self-organizing process.

The exercise gets really interesting at this point because the only way to solve the problem is for the team to start challenging its own assumptions and to self-organize under new assumptions. Often they start by setting a count to lower the stick or agree to bend their knees to lower at the same time – and it usually involves someone taking the lead. While they will make progress doing this, it is not the solution to the problem because the stick can never get on the ground while their fingers are under it. Inevitably, after about ten minutes, someone will ask one of the two crucial questions: "Why do our fingers always need to be in contact with the stick?" or "Why are we holding our hands like guns? Why don't we just grab the stick in our hands and put it on the ground?" This solution came via a demonstration at the Canadian Business Ethics Research Network and it is a brilliant solution. That team was able to put the stick on the ground within two seconds after struggling with the exercise for the previous ten minutes after having lost their CEO member to jail in the corner. The CEO continued to try to organize them by lobbing instructions to the team from jail. If we want a different outcome we should just question our own assumptions, change our behaviour, and achieve the future we want.

The exercise is also interesting at this point for what it shows us about the behaviour of the regulator. If the regulator is vigilant and active and does not provide the team the time to organize, the same result will keep happening over and over. More rules, laws, or re-stating the rules may not be helpful. Putting the CEO in jail, punishing and humiliating them, just shuts down conversation, slows down the self-organizing process, and usually prolongs the time until the solution is found. When the regulator steps back and asks the team "Do you understand the objective?" "Is everyone honestly trying to put the stick on the ground?" and the key one "What is stopping you from doing that?" and when these questions are combined with some time between attempts, the team can usually solve the problem very quickly.

This exercise illustrates all of the concepts introduced in this section on self-organizing systems and it also provides a quick insight into

the change to regulation that will be required if corporations are considered to be self-organizing systems. To summarize the insights of the exercise:

- It creates a human social system in an equilibrium state.
- It sets initial conditions: hands in "guns" and fingers in contact with the stick.
- It introduces a new complex task to the system that cannot be solved with the current sets of organizing principles.
- It involves an attempt at control in a complex system (the regulatory outcomes).
- That attempt at control leads to unintended consequences – the stick goes up instead of down.
- The system goes into chaos and confusion until someone starts to ask the questions about the assumptions built into the initial conditions.
- Once the initial conditions are changed, the result is a dramatic and transformative effect on the system and the desired regulatory outcomes are achieved easily.

3.2.8 Conclusion

To summarize, in a chaos theory perspective of the corporation, the corporation is a self- organizing system: a complex human social system that is non-linear and dynamic.[239] Therefore, it shares many of the characteristics of other self-organizing systems:

1 Corporations exhibit emergent qualities.
2 They are sensitive to initial conditions.
3 They are replete with feedback loops (both negative and positive).
4 There is no proportionality between cause and effect.
5 More complex levels of organization arise out of lower levels of complexity organization – for example actions and outcomes may arise out of corporate culture.
6 The patterns and content of the conversations and interactions between system participants are the initial conditions of the system.
7 Small changes in the initial conditions can have dramatic non-proportional effects on the resulting system.[240]

If these characteristics are true, it means that we have been approaching corporate law and regulation with the wrong approach and from the wrong perspective and we will have to reconsider and redesign our attempts to generate regulatory outcomes by focusing on the patterns of interactions of the individuals in the corporation and leveraging the corporation's self- organizing properties.

Endnotes

[118] M.E. Smith, "Implementing Organizational Change: Correlates of Success and Failure" (2002) 15(1) *Performance Improvement Quarterly* 67.

[119] P. Strebel, "Why do Employees Resist Change?" (May/June 1996) *Harvard Business Review* 139.

[120] M. Schraeder & D.R. Self, "Enhancing the Success of Mergers and Acquisitions: An Organizational Cultural Perspective" (2003) 41(5) Management Decision 511.

[121] S. Amber, "Defining Success: There Are Lessons To Be Learned When Defining IT Project Success" (2007) quoted from Rothwell et al. (2010) *infra* note 136 at 21.

[122] S. Applebaum, A. Everard & L. Hung, "Strategic Downsizing: Critical Success Factors" (1999) 37(7) *Management Decision* 535.

[123] Bushe (2009) *infra* note 176.

[124] Rothwell et al. (2010) *infra* note 136 at 21.

[125] Change Management is the process of helping a person, group, or organization implement a desired change. A good definition of it is: "a set of principles, techniques, and prescriptions applied to the human aspects of executing major change initiatives in organizational settings. It is not a focus on 'what' is driving change (technology, reorganization plans, mergers/acquisitions, globalization, etc.) but on 'how' to orchestrate the human infrastructure that surrounds key projects so that people are better prepared to absorb the implications affecting them". See L. Anderson & D. Anderson, *The Change Leader's Roadmap: How to Navigate Your Organization's Transformation* (San Francisco, Pfeiffer, 2001) at xxviii. Change Management is usually more mechanistic than organizational development approaches. Many business schools offer executive education programs on Change Management that provide managers with a framework and toolkit for managing change. For a description of change management, see Rothwell et al. (2010) *infra* note 136 at 16-17.

[126] Program Management is a methodology for delivering projects. The industry standard for Program Management is now the Program Management Institute (PMI). For a description of Project Management methodologies, see Sebastian Nokes, *The Definitive Guide to Project Management*. (2nd Ed) (London: Financial Times / Prentice Hall, 2007).

[127] Lean Manufacturing is the North American term that refers to the manufacturing process pioneered by Taichi Ono at Toyota. It is also called the Toyota Production System. For a description of Lean Manufacturing, see James Womack & Daniel Jones, *Lean Thinking: Banish Waste and Create Wealth in Your Corporation* (New York: Free Press, 2003).

[128] Six Sigma is a change approach focused on applying basic statistics to business processes to reduce variation in process outputs. A Six Sigma company aims to have 3.4 defects per million in their processes or, in other words, all of their processes run effectively to within 6 standard deviations from the mean. This approach was pioneered by Motorola and has been used by many other Fortune 500 companies. It is often combined with Lean Manufacturing or the Total Quality Manufacturing (TQM) approach. For a description of the Six Sigma approach See Peter Pande Robert Neuman & Cavanagh Roland. *The Six Sigma Way: How GE, Motorola, and*

Other Top Companies are Honing Their Performance (New York, NY: McGraw-Hill Professional, 2001). For a more detailed description of the Six Sigma methodology, see Geoff Tennant, *SIX SIGMA: SPC and TQM in Manufacturing and Services* (Aldershot, UK: Gower Publishing, Ltd, 2001).

[129] Good to Great is a recipe for successful and sustainable change that was created by Jim Collins. See Jim Collins,
Good to Great: Why Some Companies Make the Leap . . .and Others Don't (New York: Harper Collins, 2001).

[130] Business Process Reengineering is the analysis and design of workflows and processes within a corporation. See
M. Hammer & J. Champy, *Reengineering the Corporation: A Manifesto for Business Revolution* (New York: Harper Business, 1993).

[131] The Balanced Scorecard is a strategic performance management tool that can be used by managers to track the performance of teams and the outcomes of their activities. It is one of the most widely adopted corporate management tools. For more information on the Balanced Scorecard, see Robert Kaplan & David Norton, "The Balanced Scorecard – Measures That Drive Performance" (Jan 1992) The Harvard Business Review 71.

[132] Examples of these types of theories include self-regulation, market-based regulation, and meta-regulation combined with self-regulation (that is not dialogic).

[133] Conflict is an often under-emphasized issue with corporate change. Most of the change models talk about managing stakeholders but when significant or transformational changes are happening in a corporation, the power structure is also changing, which inevitably will lead to conflict. In addition, in order to have significant changes in a corporation the people within the corporation need to learn new behaviours. To learn something new requires an individual to unlearn something that exists – which can be a very uncomfortable process. Therefore, effective change processes have to have ways to manage and engage with conflict productively.

[134] For a discussion of a number of definitions of OD, see William Rothwell, Jacqueline Stavros, Roland Sullivan & Arielle Sullivan, *Practicing Organization Development: A Guide for Leading Change* (3rd edition) (Pfeiffer, San Francisco: 2010) at 12-16.

[135] *Ibid* at 12.

[136] T. Cummings and C. Worley, *Organization Development and Change* (9th ed.) (Cincinnati: South-Western College Publishing, 2009) at 1.

[137] Quoted from Rothwell (2010) *supra* note 136 at 13.

[138] Chris Argyris and Donald Schon wrote three important OD books together: Chris Argyris & Donald Schon, *Theory in Practice: Increasing Professional Effectiveness* (1974) (San Francisco: Jossey Bass, 1974); Chris Argyris & Donald Schon, *Organizational Learning: A Theory of Action Perspective* (Addison-Wesley, Don Mills: 1978); and Chris Argyris & Donald Schon, *Organizational Learning II: Theory, Method and Practice* (1996) (Addison Wesley: Reading, Mass, 1996).

[139] Argyris & Schon (1974). *Ibid.*

[140] Chris Argyris, *Inner Contradictions of Rigorous Research* (New York: Academic Press, 1980).

[141] Argyris & Schon (1974) *supra* note 140.

[142] *Ibid.*

[143] Note: single- and double-loop learning should not be confused with Christine Parker's triple learning loop referenced in Chapter 2. Parker's loops simply involve three different participants. Argyris and Schon's loops are the depth to which learning takes place – either within the framework of the existing assumptions and system or changing the existing assumptions or system.

[144] Peter Senge refers to this as "coping". See Peter Senge, *The Fifth Discipline: The Art & Practice of The Learning Organization* (New York: Currency, 1990). Fiol and Lyles refer to this as "lower-level learning". See C. Marlene Fiol & Margorie Lyles, "Organizational Learning" (1985) 10(4) Academy of Management Review 803 at 807.

[145] Argyris (1978) *supra* note 140 at18.

[146] *Ibid* at 3.

[147] *Ibid* at 29.

[148] Senge calls this "generative learning". See Senge (1990) *supra* note 136. Fiol and Lyles call this "higher level learning". See Fiol & Lyles (1985) *supra* note 136 at 308.

[149] Argyris (1978) *supra* note 140 at 3.

[150] Mark Smith, "Chris Argyris: Theories of Action, Double-loop learning and Organizational learning" (2001) *The Encyclopedia of Informal Education*. Online: <www.infed.org/thinkers/argyrtis.htm > (accessed November 22, 2010).

[151] *Ibid.*

[152] For example, Webster's defines compliance as: "1) Act or practice of complying; yielding as to a desire, demand, or proposal, 2) a disposition to yield to others." See *Webster's New Collegiate Dictionary* (New York: Merriam Webster, 1959) at 169.

[153] For example, Webster's defines adherence as: "Quality, act or state of adhering;. . . steady or firm attachment; fidelity as to party or principle." See *Webster's New Collegiate Dictionary* (New York: Merriam Webster, 1959) at 11.

[154] There are similar organizational versions of these models called O(I) and O(II).

[155] Amy Edmondson and Bertrand Moingeon, "Learning, Trust and Organizational Change" in E. Easterby-Smith, L. Araujo and J. Burgoyne (eds.) *Organizational Learning and the Learning Organization* (London: Sage, 1999) at 161.

[156] Mark Smith (2001) *supra* note 152.

[157] *Ibid.*

[158] See Chris Argyris, *Overcoming Organizational Defenses: Facilitating Organizational Learning* (Boston: Allyn and Bacon, 1990) and Chris Argyris, *Knowledge for Action: A Guide to Overcoming Barriers to Organizational Change* (San Francisco: Jossey-Bass, 1993).

[159] Chris Argyris, *Strategy, Change and Defensive Routines* (Boston: Pitman, 1985) at 89.

[160] Edmondson & Moingeon (1999) *supra* note 157 at 162.

[161] This term applies to learning either single- or double-loop learning.

[162] Argyris (1978) *supra* note 140 at 13.

[163] *Ibid* at 15.

[164] *Ibid* at 16.

[165] *Ibid*

[166] *Ibid* at 9.

[167] *Ibid* at 9.

[168] *Ibid* at 19.

[169] *Ibid* at 9.

[170] *Ibid* at 19.

[171] *Ibid* at 17.

[172] *Ibid* at 22 where they state that in organizational double-loop learning, "incompatible requirements in organizational theory-in-use are characteristically expressed through a conflict among members and groups within the organization."

[173] *Ibid* at 4.

[174] For a discussion of these defensive behaviours, see Gervase Bushe, *Clear Leadership: Sustaining Real Collaboration and Partnership at Work* (Boston, MA: Davies-Black, 2009).

[175] Argyris (1978) *supra* note 125 at 139. See also Gervase Bushe, *Clear Leadership* (2009) *supra* note 161.

[176] Argyris has engaged in this practice for a few decades.

[177] Senge (1990) *supra* note 146 at 3.

[178] *Ibid* at 7.

[179] *Ibid* at 7.

[180] *Ibid*

[181] See Bushe (2009) *supra* note 176 at 7.

[182] Senge (1990) *supra* note 146 at 9.

[183] *Ibid* at 10.

[184] *Ibid* at 10.

[185] *Ibid* at 10.

[186] The word discussion has its root in percussion or concussion. See *Ibid* at 10.

[187] Social processes are circular and filled with feedback loops but we tend to think in linear ways, so we still use the term causality in systems thinking.

[188] *Ibid* at 12.

[189] *Ibid* at 12. He refers to this "shift in mind" as metanoia – the Greek word meaning shift of mind.

[190] *Ibid* at xii.

[191] *Ibid* at 4.

[192] Ralph Stacey, "Learning as an Activity of Interdependent People" (2003) 10(6) The Learning Organization 325.

[193] *Ibid* at 238.

[194] Bushe & Marhsak (2009) *infra* note 283.

[195] A lot of work came out of the New Mexico Santa Fe Institute.

[196] In the context of organizational development and corporate change CAS is often associated with the work that Arie de Gues did at Royal Dutch Shell. His most recognized book evidencing a natural systems approach is Arie de Gues, *The Living Corporation* (London: Nicholas Brealey, 1997).

[197] Richard Pascale, "Surfing the Edge of Chaos" (1999) Spring Sloan Management Review 83 quoted from Ralph Stacey, et al., *Complexity and Organization: Readings and Conversations* (New York: Routledge, 2006). This article was later turned into a book that was important for the formation of Dialogic OD. See Richard Pascale, Mark Milleman & Linda Gioja, *Surfing the Edge of Chaos: The Laws of Nature and the New Laws of Business* (New York: Three Rivers Press, 2000).

[198] *Ibid.*

[199] For the description of surfing the edge of chaos see *Ibid* at 67-72.

[200] This assumption is part of the dominant narrative in philosophy that social systems are stable with periods of change. This assumption is now under attack from many different sources that contend that social systems are ever- changing with periods of stability.

[201] For a more detailed description of this concept, see Shona Brown & Kathleen Eisenhart, "The Art of Continuous Change: Linking Complexity Theory and Time-Paced Evolution in Relentlessly Shifting Organizations (Mar 1997) 42(1) Administrative Science Quarterly 1.

[202] Pascale (1999) *supra* note 200 at 58.

[203] See Ilya Priorogine and Isabelle Stengers, *Order Out of Chaos: Mans New Dialogue with Nature* (New York: Bantam, 1984),

[204] This analogy was taken from an article by Margaret Wheatley, see Margaret Wheatley, "Chaos and the Strange Attractor of Meaning" in Ralph Stacey, et al, *Complexity and Organization: Readings and Conversations* (New York: Routledge, 2006) at 101.

[205] When chaos theory ideas have been applied to small groups it has generated interesting results where systems had transformative change – there appears to be a common set of events. For examples see Priorogine & Stengers (1984) *supra* note 206 and C. Smith and G. Gemmill, "A Dissipative Structure Model of Organization Transformation (1985) 38(3) Human Relations 751.

[206] This statement is based on Chris Argyris and Donald Schon's theory of action learning model, which was described in detail earlier in this chapter. See note 140.

[207] It is interesting to note that this is not a new idea at all. In fact, this is one of the oldest ideas we have – and many of the word's religions are based on this idea.

[208] He published this finding that complex non-linear systems are extremely sensitive to initial conditions in his 1963 paper, see Edward Lorenz*, "Deterministic Nonperiodic Flow"* (March 1963) 20(2) Journal of the Atmospheric Sciences 130–141.

[209] In fact, Lorenz did not refer to a butterfly at all but rather a seagull. The more elegant butterfly was developed through later speeches. For a description of Lorenz's contribution to chaos theory and the butterfly effect, see Tim Palmer, "Edward Norton Lorenz" (2008) 61 (9*)* Physics Today 81. For Lorenz's papers containing the ideas that would lead to the butterfly effect, see Edward Lorenz, "Three approaches to atmospheric predictability" (1969) 50 Bulletin of the American Meteorological Society 345 and Edward

Lorenz, "Atmospheric predictability as revealed by naturally occurring analogues" (1969) 26 Journal of the Atmospheric Sciences 636.

[210] The concept of path dependence has featured prominently in corporate law scholarship in the debate on convergence of corporate governance. See Lucian Bebchuk & Mark Roe, "A Theory of Path Dependence in Corporate Ownership and Governance" (1999) 52 Stanford Law Review 127.

[211] Pascale (1999) *supra* note 200 at 65.

[212] Harrison Owen, *Wave Rider – Leadership for High Performance in a Self-Organizing* World (San Francisco: Berrett-Koehler, 2008) at 100.

[213] *Ibid* at 130.

[214] *Ibid* at 4. For a leading example see Henry Mintzberg's work on emergent strategy: Henry Mintzberg & James Waters, "Of Strategies, Deliberate and Emergent" (1985) 6(3) Strategic Management Journal 257.

[215] See Pascale (1999) *supra* note 200 at 59-60.

[216] *Ibid* at 69-70.

[217] See Lloyd Harris & Emmanuel Ogbonna, "The Unintended Consequences of Culture Interventions: A Study of Unexpected Outcomes" (2002) 13 British Journal of Management 31; and Emmanuel Ogbonna & Barry Wilkinson, "The False Promise of Organizational Culture Change: A Case Study of Middle Managers in Grocery Retailing" (2003) 40(5) Journal of Management Studies 1151.

[218] Harris & Ogbonna (2002) *Ibid* at 35-36.

[219] *Ibid* at 37.

[220] *Ibid* at 46-47.

[221] *Ibid.*

[222] Ogbonna & Wilkinson (2003) *supra* note 220 at 1174.

[223] See Chalmers Johnson, *MITI and the Japanese Miracle* (Stanford: Stanford University Press, 1982).

[224] See Fligstein (1990) *supra* note 118.

[225] These historical notes are summarized from Harrison Owen, *supra* note 215 at 26-40.

[226] Level 5 leaders are leaders who "build enduring greatness through a paradoxical blend of personal humility and professional will." See 131.(2001) *supra* note at 20.

[227] See Holman et al. (2007) infra note 384 at 135. For a guide on how to run an Open Space event see Harrison Owen, *Expanding Our Now: The Story of Open Space Technology* (San Francisco: Berrett Koehler, 1997) and Harrison Owen, *Open Space Technology: A User's Guide* (2ed) (San Francisco: Berrett Koehler 1997).

[228] Owen (2008) *supra* note 215 at 69-70.

[229] *Ibid* at 76.

[230] Peggy Holman, *Engaging Emergence: Turning Upheaval Into Opportunity* (San Francisco: Berrett Koehler, 2010) at xi.

[231] *Ibid.*

[232] *Ibid* at xi.

[233] *Ibid* at 47.

[234] *Ibid* at 10-18.

[235] Wheatley (2004) *supra* note 207 at 110.

[236] Ralph Stacey, *Complexity and Organizational Reality: Uncertainty and the Need to Rethink Management After the Collapse of Investment Capitalism* (Milton Park: Routledge, 2010) at 17.

[237] Stacey (2006) *supra* note 207 at 79.

[238] *Ibid* at 82.

[239] There is no settled definition of a chaotic system. However, there are three properties that are generally associated with chaotic systems: 1) sensitivity to initial conditions; 2) topologically mixing (components of the system blend into each other over time); and 3) periodic orbits are dense (components come into contact with each other on a regular basis). These three properties are what allow small changes in the initial conditions to spread in a non-linear fashion. The corporation, as a human social system, exhibits all three of these properties.

[240] This list closely mirrors Ralph Stacey's list for the application of chaos theory to organizations: 1) fractal structure – irregular forms are scale dependent; 2) recursive symmetries between scales and levels – repeat a basic structure or fractal at different levels; 3) sensitive to initial conditions – small changes in the system send the system in a wildly different direction; and 4) replete with feedback loops. Systemic behaviour is the emergent outcome of multiple chains of interaction. See Stacey (2006) *supra* note 207 at 255.