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Applying Chaos Theory to Human Resource Development

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Abstract

As organizations increasingly recognize the shortcomings of scientific management approaches and traditional top-down approaches to change, there is an increasing openness to new lenses for understanding change. Chaos Theory, with its roots in the natural sciences, provides a holistic approach for understanding the dynamic and fluid nature of organizations. This paper provides a review of literature that outlines the origins and basic principles of Chaos Theory, applies the concepts to organizations, and connects the concept to human resource development.

Keywords: chaos theory, organization development, organizational change

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Within organizations there are many different internal or external change catalysts. Externally, there may be the involvement of new investors or new competition. Internally, change may be facilitated due to new leadership, the use of a new software program, or implementation of a new strategy. How the people within organizations deal with change varies a great deal, depending upon organizational culture and the approaches taken by organizational leaders.

The modern idea of an organization has its roots in the industrial revolution of the 18th and 19th centuries. Prior to that period, most people were self-employed, lived on self-sustaining farms, or were employed by small proprietorships (Ciulla, 2000). Technological advances resulted in the building of large organizations to create efficiencies in production. During this period, the advancement of human understanding through science and industrialization were revered. Since concepts from the natural science enhanced mechanical productivity, those principles were extended to the management of humans (Wheatley, 1999). Innovations such as Fredrick Taylor's scientific management began to dominate the way in which organizations operated. Scientific management approaches continue to dominate our discourse and influence our approaches to organizational change. Even today, we often refer to organizations working like "well-oiled machines" or refer to the need to "fix a broken link." Through using such metaphors, we subconsciously imply that we view organizations as machines. Such thinking reflects the way in which we approach organizational problems and affects our actual approaches to organizational problems (Morgan, 2006).

Repeated organizational failures, failed efforts to force change from the top, and meltdowns of organizations during crises have caused some to search for new approaches to

organization development and change. Ironically, the natural sciences provide another, less mechanistic view of the world that can be applied to human organizations: Chaos Theory. Chaos Theory is defined by Miriam-Webster's dictionary, as "a branch of mathematical and physical theory that deals with the nature and consequences of chaos and chaotic systems" (2009). According to Duffy (2000), Chaos Theory explains "period[s] of transition in which change occurs in unpredictable, irregular, and uncertain ways" (p. 234). Cutright (1997) argues that the natural sciences do not characterize chaos by randomness and total lack of order, as it is commonly defined. Instead, chaos approaches provide evidence that seemingly random activities and systems are in fact evidence complex, replicated patterns (Cutright, 1999). The purpose of this paper is to investigate the various approaches to Chaos Theory and its relation to human resource development (HRD) practitioners facilitating changes within organizations.

The Development of Chaos Theory

The roots of Chaos Theory can be linked to the 19th century, when Henri Poincare found that the "gravitational and orbital behavior of bodies in the solar system could not be explained with simple, Newtonian, linear physics" (Cutright, 1997, p. 3). In the 1960's, Chaos Theory was expanded upon by meteorologist Edward Lorenz. Lorenz examined computer models of weather patterns; his goal being to improve the predictability of these advanced systems (Cutright, 1997). While attempting to verify the graphing of these models, the meteorologist decided to round the mathematical measurements of weather conditions to three decimal places instead of six, due to the primitive computer system he was using. Lorenz expected only small deviations from his initial graphs. However, after a few iterations, he realized that the rounded and non-rounded models were incredibly different, to the point that there was no correlation between the two models (Cutright, 1997; Mendenhall, Macomber, & Cutright, 2000). Lorenz was struck by the

dramatic effects of the dropping just three decimal points from his mathematical measurement of predicted weather patterns. Both the starting points and any slight deviations in a process can affect the interactions among variables. This extreme sensitivity to influx in Lorenz's trial is a characteristic of non-linearity, in which cause-and-effect results from interrelationships between variables. A specific change along the way does not merely have one linear effect on variables; instead, the web of relationships has nonlinear effects that are created through multiple feedback loops. These ideas form the basis for the phenomenon known as the "butterfly effect".

The Butterfly Effect

The butterfly effect is the most commonly demonstrated concept stemming from Chaos Theory. The idea, as explained by Hannay, Ross, and Erb (2000), is that the seemingly insignificant effect of a butterfly flapping its wing can have a substantial impact on other systems. The typical example is one in which the butterfly flaps its wings in China and this small change in the environment causes a hurricane in Florida (Hannay, et. al., 2000). While the butterfly does not cause the chaos, the effect of the butterfly flapping its wings can change aspects of systems with which it is directly and indirectly involved. The impact of new inputs into the system, such as the butterfly flapping its wings can yield positive or negative results depending on the type of intervention and culture.

As an example of the butterfly effect, if an organization is implementing a new telephone system within their organization, this will affect the manner in which customer service representatives do their jobs. If the implementation is not successful this can affect both their customers and the community outside their organizations. The sequences of non-linear events could start with the company losing customers due to problems with decreased customer service from the new phone system. Next, the company's customers could lose business due to changes

in suppliers. As the effects network out through the system, businesses in other communities with no direct ties to the organization with the new phone system could lose customers or ultimately fail. This sequence of non-linear events can have a greater impact on their community than would be evident from traditional economic models. Applying Chaos Theory to organizations, we can see that short term solutions or small changes within an organization can have a catastrophic impact on the system as a whole (Stapleton et al., 2006).

Important Elements of Chaos Theory

Small, seemingly irrelevant changes within a system are inputs that force a system to experience periods of chaos or irregular behavior. From mathematics and physics, we understand that there are forces that pull systems into regular behavior (attractor) and forces that pull a chaotic steady state (strange attractor) (Marion & Richardson, 1991).

Although operating systems and organizations may appear chaotic, they continue to have individual identities, histories, and a common purpose governing their behavior (Bechtold, 1997). These aspects define organizations' boundaries and guide organizational evolution. According to Bechtold (1997), "Chaos Theory assumes that a system creates its own order and natural growth by integrating transformations into its identity and thus ensuring continual growth" at an improved level of functioning (p. 194). Small fluctuations within the system cause instability which, in turn, causes the system to adapt how it operates to accommodate the changing environment. Due to the system being non-linear, small fluctuations, or inputs into the system, are amplified exponentially; and as a result, can greatly impact the system and its governing operations.

Feedback is another factor that can have direct implications for the system's functioning. There are two types of feedback that can occur as a result of change within a system: positive

and negative feedback. Positive feedback occurs when an input into the system amplifies the system's anomalies and causes the destruction of the system's current state while adding new, productive aspects into the system (Bechtold, 1997). Negative feedback, on the other hand, is a corrective process where an input is taken out of the system to "manage, control, or limit the outcomes" (Stacey, 1999, p. 1). The belief that a seemingly chaotic workplace can eventually result in an organization with a higher level of functioning and the ability to adapt to change is one of the reasons why Chaos Theory has become an attractive method for examining how organizational systems operate.

Chaos Theory and its Use in Organizations

Chaos Theory, although once based entirely in mathematical and physical applications, is now applied to the organizational realm. Among the first to apply Chaos Theory to the social applications was Physicist Alvin M. Saperstein (Kiel & Elliott, 1996). Mason (2007) defines Chaos Theory as a tool for self-organization within the workplace. Chaotic systems are often seen as being subject to random activity; however, what is actually being observed is unpredictability resulting from the complexity of the organizational system (Pryor, Amundson, & Bright, 2008). Margaret Wheatley (1999) explains that Chaos Theory helps us understand the age-old tension between predictability and freedom or the debate between determinism and free will. We exist and have freedom within an orderly environment. Chaos does not mean an embrace of disarray. Instead, it helps us see that although the system's shape is predictable, its exact form occurs through individual acts and choices (Wheatley, 1999). Within organizations, order exists without predictability (Cartwright, 1991, as cited by Wheatley, 1999).

According to Theitart and Forgues (1995), "organizations are dynamic systems governed by nonlinear relationships" (p. 21). Each department within the organization acts as an

independent system; contributing to the dynamic of the whole. Interacting with the organization are internal and external actors and stakeholders. Each actor and stakeholder holds their own agendas, values, and ideas which change over time and uniquely contribute to the development of the organization. Countering forces are continuously at work, pushing the organization in and out of stability. Planning, structuring, and scheduling are forces that bring stability to the organization. Innovation, advancement, and experimentation can lead the organization to a state of chaos. Theitart and Forgues suggest that organizations are subject to outside sources, many of which are difficult to predict. Forces of the environment can also play a large role selecting those organizations that will survive.

Even with these unpredictable dynamic systems at work, organizations require stability to effectively operate. It is of great importance for actors and stakeholders within the organization to have a sense of order and certainty. Through order, they can “position themselves within the power structure and the hierarchy” (Theitart & Forgues, 1995, p. 24). To combat the forces of instability, organizations must draw upon organizational planning to manage uncertainty. Planning allows for increased communication among individuals and provides a process to address and manage important decisions. According to Theitart and Forgues (1995), planning improves the organization’s ability to protect themselves against potential environmental threats.

It is necessary for organizational leaders to be aware of the multiple systems which are inherently involved within the organization; both internal and external. Even a small change in the system can impact the whole. It is the responsibility of the HRD professional to be prepared for the unexpected and to have plans in place that provide greater stability within the organization.

Rationale for Applying Chaos Theory to HRD

Within the HRD field, repeated calls have occurred for broadening the scope of the field and utilizing new tools, practices, and paradigms that reflect the complexity in which organizations exist (Lee, 2001; Lee, 2007; Smith, 2006; Yorks & Nicolaides, 2006). According to Mason (2007), the implications of Chaos Theory are that “many interactions in a system can produce unexpected patterns or behaviors because stimulating one part of the system can have unexpected effects in the other, unanticipated, parts of the system” (p.12). Unexpected reactions within different parts of the organization, can lead to uncertainty in the workplace and unintentional results for organizational change. Chaos Theory can be useful for HRD practitioners working with organizational leaders to observe, hypothesize, and describe why this seemingly random behavior occurs. From those observations, leaders can make meaningful predictions by applying knowledge regarding the systems that govern these organizations (Fitzgerald & van Eijnatten, 2002). HRD practitioners and researchers can apply Chaos Theory by recognizing and attempting to understand the randomness that is involved in the change process, while also acknowledging that it cannot be controlled (Hannay, Ross, & Erb, 2000). Peters (1987) contends that organizations must adapt and thrive amongst chaos, rather than merely learn to cope. HRD principles can be applied to help organizational leaders proactively work within a chaotic system, adapting their business strategy to allow for flexibility, and therefore, gaining market advantage. Chaos Theory has been helpful in describing the ambiguity, confusion, and periods of rapid change that we often experience on a daily basis, both in our personal lives and in the workplace (Hannay et. al., 2000). Accepting Chaos Theory as a looking glass for viewing an organization’s overall adoption of the change process effects the way in which plans are made and carried out. Instead of forcing a pre-determined set of changes,

organizations adopting this theory can begin to develop and consider potential, previously unrecognized, ramifications of implementing change.

Levy (1994) offers a chaotic perspective of business strategy. The author contends that small changes, including a competitor's new business strategy or new technology implementation within the business, can account for large impacts on the organizational system. For example, when Dell presented their mail order system of personal computers to consumers, this drove their competitors to dramatically change their own methods of doing business by cutting costs and re-examining their own service channels (Levy, 1994). A seemingly small change in Dell's service strategy set off a series of reactions within other organizations, changing the face of the industry. Chaos Theory can be drawn upon to assist practitioners and organizational theorists in understanding the chaotic way in which organizations sometimes operate (Stapleton, Hanna, and Ross, 2006).

Many companies around the world face an ever-changing environment and continuing technology advancements that often results in restructuring (Snyder, Acker-Hocevar, & Wolf, 1995). Organizational theorists and practitioners are turning to new theories such as Chaos Theory due to the frequency in which many organizations fail to adapt to these changing conditions. Chaos Theory provides a framework for acknowledging the deep interconnectedness that exists both inside and between organizations. This interconnectedness can result in explosive effects resulting from seemingly irrelevant or insignificant changes in the system. Chaos Theory acknowledges the orderliness and predictability of the inherent chaos and unpredictability that is present in organizations, which is often ignored in other theories and organizational frameworks. Snyder, Acker-Hocevar, and Wolf (1995) postulate that if organizations considered chaos as a

norm within their organization, they would open themselves to a variety of options and possibly new, previously unimagined futures.

According to Bechtold (1997), through embracing chaos, an organization can continuously change and evolve when needed, based on the company's intelligence and ability to adapt. Seemingly small changes, such as the implementation of a new computer system for the customer care center within an organization, can have large internal and external ramifications. In this case, all internal and external relationships and connections are affected by an organization's implementation of a new information technology system (Peters, 1987). After a new system is implemented, decisions are made continuously which have exponential impacts throughout the complicated web of relationships.

Hannay, Ross, and Erb (2000) state that organizations are constantly situated on the edge of chaos and are vulnerable to unpredictability and ambiguity; resulting in change. Due to the development of chaos within the workplace, individuals within the organization seek stability (Mason, 2007). Out of this need for stability is the potential for creativity; inspired by an infinite number of possibilities. In actuality, it is only when an input is taken out of the system (referred to as negative feedback) that the organizational system gets pushed back to its original state, resulting in stability (Mason, 2007). Returning to our earlier example of the new telephone system, a training program might be initiated for customer service agents to learn the new system (positive feedback). Due to the comprehensive features of the new phone system and the learning process involved, the organization's customer service policy of answering each call within one minute has been severely affected. This, in turn, causes undue stress for the customer service agents and affects the ability of the agents to provide quality interactions with current and potential customers. Therefore, during a two-week learning period, the customer service manager

has decided to suspend the one minute policy (negative feedback). As a result of this change, new policies and procedures may be created in reaction to the implementation of the new phone system, producing creativity from the chaotic environment. Although leaders cannot precisely plan for a change process, they can recognize patterns, as they occur, and design conditions that lend themselves to adaptability (Hannay et. al, 2000). By being adaptable, organizations leave themselves open to new ideas and prospects for change implementation. This approach could also be used in combination with more conventional change approaches, in which scenarios, goals, and milestones are mapped, but an openness to new possibilities and mid-stream adaptations is deeply embedded into the organizational culture.

Applying Chaos Theory in HRD

Hannay et. al. (2000) provide four general guidelines for organizations that reflect the principles of Chaos Theory. HRD professionals recognizing the salience of Chaos Theory can apply these principles to their practice. First, organizations need to find ways of embracing continuous changes as they emerge. Second, organizations need to stress the importance of teamwork among their members as a means of operation. Third, organizations need to focus energy on widespread involvement in decision making by those affected by the decisions. Lastly, organizations must remain flexible and emphasize a holistic process in the workplace, as opposed to emphasizing isolated tasks among individual members. These four recommendations, “foster change capacity within a chaotic environment as well as supporting an inter-related web of relationships” (Hannay et. al., 2000, p. 3). These inter-related relationships are important to organizational functioning in the change process. If relationships are not maintained, communication deteriorates within the organization, leaving the organization susceptible to greater problems as a function of chaos.

One of those most common applications of Chaos Theory to organizations is seen in the idea of self-organization (Mason, 2007). Self-organization is a process in which an organization is pushed from equilibrium to a state of disorder (Duffy, 2000). Through experimentation and discovery, the organization returns eventually to a state of equilibrium, after implementing new ideas and concepts discovered while in the chaotic state (Theitart & Forgues, 1995).

Much like the aspects that govern chaos, self-organization “is not controlled by an outside party or ‘manager,’ but spontaneously self-organizes from the bottom through the inter-relationships of the system’s parts” (Mason, 2007, p. 12). Acknowledging that the change process is not the function of one single entity allows for fluidity in the change process. Continuous self-organization, according to Mason (2007), promotes a variety of creative ideas as a response to a changing environment. If an organization wants to change a fundamental system, leaders need to “embrace the natural order of chaos, and to guide patterns of regularity toward a vision, mission and set goals” (Snyder et al., 1995, p. 10).

Murphy (1996) offers the example of special interest groups as an application of Chaos Theory. Interest groups, Murphy (1996) contends, are best understood through the chaos lens. Issues often arise from a small set of individuals from a single dissatisfaction, and as more individuals join the cause, the group gains definition (Murphy, 1996). Once these individuals connect, they foster a strong and complex power when organized lobbying groups become involved in the cause. These groups mobilize human resources in lobbying for a cause. Extending that concept to workplaces, HRD practitioners can create mechanisms for special interest groups, such as employee resource groups based around personal status (e.g., African Americans, women, LGBT status), personal condition (e.g., working mothers), or interest (e.g., pet lovers, employees in a retail company with a personal interest in gaming). Such groups allow

for community building, but also provide “relief valves” and official mechanisms for expressing dissatisfaction. Many such groups have become de facto advisory groups for marketing campaigns, product development, and employee recruitment efforts (e.g., Agnvall, 2008; Jirak, 2001). Moving beyond special interests, another similar approach might be to build structures within organizations that allow employees to freely share knowledge and ideas so that creativity and sharing are embedded into the culture. Such mechanisms could allow for quicker responses in times of crisis since employees would already have the expectation of creatively collaborating to discuss organizational issues. Chaos Theory can also be applied as a model for handling public relations in high-profile crisis situations. According to Murphy (1996), at the onset of a crisis situation, “an organization may have power to influence events, but after a certain escalation point, it often loses its capacity” (p. 105). For example, Exxon has been scrutinized for losing opportunity to mold public perception more positively following the Valdez oil spill (Murphy, 1996). As the crisis moved forward, more actors became involved including interest groups, legislatures, and animal rights activists, each providing their own version of, and solution for, the incident. With additional stakeholders involved, the complexity of the crisis was beyond what Exxon could control. Murphy (1996) contends that Chaos Theory called for allowing the situation to self-organize prior to implementing a plan of action, in order to bring stability to the crisis. While this idea might be controversial and unrealistic in many organizational realms, the principles can be applied in small ways. Organizational leaders might work to create emergency action plans that recognize the inherent chaos in a crisis situation and reflect the need to allow for some self-organization while still actively managing aspects of the response.

Concepts from Chaos Theory can be applied to the realm of international HRD. With the increasing globalization of labor markets, a major concern for HRD practitioners is preparing

expatriates for international assignments. In looking at expatriation as a nonlinear phenomenon, Mendenhall (1999), explains that “the expatriation experience would be viewed as one that is highly complex and unpredictable in nature, and one in which no two expatriates will experience the same reality” (p. 78). In this view, the adjustment process would be seen as an ongoing process in which the individual is sensitive to initial conditions. Due to the sensitivity to initial conditions, if an individual encountered one negative cross-cultural experience in the host country, it can have a dramatic impact. Applying a chaos lens, we can see that the individual’s life and the future of the organization could be put into a state of instability or failure. Mendenhall claims that another implication for a nonlinear view of expatriate assignments is the idea that the expatriate will experience a shift in values and world outlook as a result of the seemingly insignificant experience of continuously interacting with host-country nationals. These unexpected changes can produce unintended effects, both positive and negative, on the expatriate’s family life, career, and self-esteem.

To combat the unintended ripple effect that expatriates may experience during cross-culture exchanges, HRD practitioners need to provide expatriates with “cross-cultural training in real-time” (Mendenhall, 1999, p. 79). Previous attempts of “one-size-fits-all” pre-departure training programs are not significant enough to combat these serious issues. Expatriates need to be equipped with strategies to handle cross-cultures issues as they arise. The most effective way to deliver cultural training in real-time is to have “cultural consultants” available, whether located inside or outside of the host country. The consultants should be experts on the host-culture and should be able to provide support to the expatriate in areas of need. According to Mendenhall, HRD practitioners need to offer emotional support and a personalized training program for expatriates; since each person has different perceptions, feelings, and experiences. A

training program of this kind may be effective in creating a more pleasant expatriate experience, and in doing so, deter potential negative effects due to expatriate instability. Such an approach would create a flexible responsiveness that would interact with the inherent chaos and multifaceted consequences of positive and negative expatriate experiences.

Chaos Theory has also been applied in the career development field. In a study by McKay, Bright, and Pryor (2005), Chaos Theory was drawn upon as a method for evaluating individual career choice. The authors argue that career choice is not always logical or predictable. Therefore, traditional theories do not apply to the field of career counseling. McKay, Bright, and Pryor's (2005) study stepped away from traditional methods which include standardized tests and trait matching and opted for a method they termed "chaos counseling." The authors argued that chaos counseling is a holistic approach that emphasizes qualitative assessment focusing on the client's self-awareness in which past, present, and future events are examined. In chaos counseling "the client is viewed as an adaptive, chaotic, and open system that is sensitive to change" (McKay et al., 2005, p. 101). They found that while traditional approaches to career counseling have value, chaos counseling has a longer lasting effect on the client.

It is human nature to seek an environment of certainty; especially when it comes to career development. According to Bloch (2005), individuals usually see their career as illogical and unpredictable, being unable to provide logical connections with past career choices and events. HRD practitioners can assist in creating connections by providing assistance with career planning through offering career development tools including more holistic career self-assessments, planning discussions, and career planning workshops.

Implications for Practice

There are many implications when applying Chaos Theory to HRD. Marion and Richardson (1991) maintain that Chaos Theory offers organizational practitioners a different perspective for viewing organizational change over time, and offers a different perspective in which causality is perceived. For example, when a new system implementation is integrated into the organization's functioning, the effects of that change may be seen as a result of that implementation. However, when viewing an organizational change through the chaos lens, we might conclude that the changes are not merely the direct result of the new system implementation, but may actually result from the chaos that is integral in the change process. According to Snyder et al. (1995), the "implications of Chaos Theory are to reject a deterministic view of change, where assumptions are made about order and control" (p. 10). Marion and Richardson (1991) argue that causality is created through the interaction of seemingly unrelated events, or inputs into the system.

Griffeth and Hom (2004) compare the likeness of a pinball machine to the chaotic nature of employee turnover. The authors contend that "The path of the ball is used as an analogy for the trajectory of an employee in the firm. In pinball, an entirely deterministic input, the velocity of the ball, yields an extremely complex outcome" (Griffeth & Hom, 2004, p. 196). The final result is the exit from the organization. Employees enter the organization at very similar initial conditions, however, like the ball, they yield drastically different trajectory patterns (Griffeth & Hom, 2004). Sensitivity to initial conditions defines the chaos theory. Due to the variability for each employee and nonlinearity and feedback involved in human employment, employee turnover could be viewed with a chaos lens to assist in overall understanding (Griffeth & Hom, 2004). Mark and Critten (1998) return to the principle of the butterfly effect to describe HR's

role within organizations. The role of HR is to continuously watch the butterfly wings for potential future effects. Additionally, HRD must help create conditions in which employees continuously reflect on the multiple feedback loops affecting an organization's web of networks and relationships.

Stacey (1999) contends that chaos enables creativity if dialogue and challenging of ideas are allowed to bubble up. Facilitating these creative outcomes make HRD's role essential to the development of the creative futures of the organization (Mark & Critten, 1998). Through this process, organizations evolve by adapting to the environment through bottom-up initiative.

Criticisms of Chaos Theory

Despite Chaos Theory's usefulness in understanding change; it is rarely used as a management tool due to its complicated nature (Stacey, 1999). Another factor inhibiting Chaos Theory's wide usage within organizations is that, by nature, unpredictability and instability are scary. Many practitioners would rather avoid than embrace instability. The very nature of the application of Chaos Theory seemingly renders all other traditional methods of facilitating change useless, without providing an alternative which is equally as easy to use (Stacey, 1999). Not acknowledging chaos allows organizational leaders to predict a future outcome, which provides them and their stakeholders with stability and confidence in the organized change process (Stacey, 1999).

According to Galbraith (2004), the problem with applying Chaos Theory to an organization is that the leaders of the organization are open to misunderstandings of the factors that bring about chaos. Such misunderstandings may include the mis-identification of a problem as being chaos at work, when further exploration may determine that it had a well defined cause

(Galbraith, 2004). This, in turn, can cause a wide variety of interpretations and solutions provided by organizational leaders, based on the wrong foundational assumption.

Cutright (1997) explains that critics contend that Chaos Theory is a set of principles for the natural sciences and that application to social sciences is overextension of the ideas. Critics of the theory's application to the social realm claim that it is often used when organizations cannot explain the dynamics of the situation. As an excuse for not knowing the real issue, they chalk it up to chaos, which allows people to say the situation will eventually organize itself (Cutright, 1997). This too, can be dangerous. Without providing a solution, or searching for one, organizations are left open to more chaotic behavior in which a solution may never be provided. Galbraith (2004) warns that if an organization is going to apply a mathematical theory, such as Chaos Theory, to their understanding of change in the workplace, there needs to be swift follow-up in proposing action. Additionally, many individuals within organizations will not be familiar with mathematical theories and their use within the organizational realm. Murphy (1996) contends that Chaos Theory is better used as an analogy for general understanding rather than for applied purposes since it not sufficient for understanding an organizational system alone.

Another reason why Chaos Theory has not been used in organizations on major scale is because it can be very difficult to document (Cutright, 1997). Chaos cannot often be qualitatively or quantitatively measured, and therefore, it is difficult to document when it is occurring (Cutright, 1997). Cutright (1997) argues that its limited documentation is the reason for little information or research about the application of Chaos Theory within organizations.

Conclusion

Although challenges are present, we conclude that Chaos Theory does have practical applications for organizations. As a method of understanding ongoing or past change, limited

research has been conducted. However, this does not mean that it is not a viable tool for understanding change and a valuable tool for HRD practitioners. Allowing chaos to operate as a means of facilitating change has been linked to a growth of creativity out of the tension chaos often inspires.

Chaos Theory also allows organizational leaders to appreciate the chaotic nature behind the change process and in doing so, plan for alternatives if the organization does not follow a traditional model of change. Though it may not be wise for an organization to assume that a chaotic dynamic, once recognized, will organize itself, it is important for the organization, as a whole, to understand the elements behind the theory in order to come up with viable solutions. While there are legitimate criticisms of Chaos Theory as it applies to organizations, its use is becoming more popular as leaders look for explanations to why their organization is not following the typical change paradigm.

References

- Agnvall, E. (2008). Older, wiser and ready to network. Retrieved from http://www.shrm.org/diversity/library_published/nonIC/CMS_025340.asp
- Bechtold, B. L. (1997). Chaos theory as a model for strategy development. *Empowerment in Organizations*, 5, 193-201.
- Bloch, D. P. (2005). Complexity, chaos, and nonlinear dynamics: a new perspective on career development theory. *The Career Development Quarterly*, 53, 194-207.
- Chaos Theory. (2009). In *Merriam-Webster Online Dictionary*. Retrieved from [http://www.merriam-webster.com/dictionary/Chaos Theory](http://www.merriam-webster.com/dictionary/Chaos%20Theory)
- Complexity Theory. (2000). In the *American Heritage Dictionary of the English Language*. Retrieved from <http://www.thefreedictionary.com/complexity+theory>

- Ciulla, J. B. (2000). *The working life: The promise and betrayal of modern work*. New York: Times Books.
- Cutright, W. M. (1999). *A chaos metaphor for strategic planning in higher education: An exploratory study*. Unpublished doctoral dissertation, University of Tennessee, Knoxville.
- Cutright, W. M. (1997, March). *Planning in higher education and chaos theory: A model, a method*. Paper presented at the Education Policy Research Conference, Oxford, England.
- Duffy, J. A. (2000). The Application of chaos theory to the career-plateaued worker. *Journal of Employment Counseling*, 37, 229-236.
- Fitzgerald, L. A. & van Eijnatten, F. M. (2002). Reflections: Chaos in organizational change. *Journal of Organizational Change Management*. 15, 402-411.
- Galbraith, P. (2004). Organizational leadership and chaos theory: Let's be careful. *Journal of Educational Administration*. 42, 9-28.
- Griffeth, R. W., & Hom, P. W. (Eds.). (2004). *Innovative theory and empirical research on employee turnover: Research in Human Resource Management*. Greenwich: Information Age Publishing.
- Hannay, L. M., Ross, J. A. & Erb, C. S. (2000, April). *Building change capacity within secondary schools through goal-driven and living organizations*. Paper presented at the American Educational Research Association, New Orleans, LA. (ERIC Document Reproduction Service No. ED 447580)
- Jirak, D. (2001). Gay and lesbian law enforcement groups fend for their rights. *Diversity Factor*, 9(4), 34-37.
- Kiel, L. D. & Elliott, E. (1996). *Chaos theory in the social sciences: Foundations and applications*. Ann Arbor, MI: University of Michigan Press.

- Lee, M. (2001). A refusal to define HRD. *Human Resource Development International*, 4(3), 327-341.
- Lee, M. (2007). Human resource development from a holistic perspective. *Advances in Developing Human Resources*, 9(1), 97-110.
- Levy, D. (1994). Chaos theory and strategy: Theory, application, and managerial implications. *Strategic Management Journal*, 15 (Special Issue: Search for New Paradigms), 167-178.
- Marion, R., Richardson, M. D. (1991). *The mathematical modeling for chaotic social structures*. Clemson University, Clemson, South Carolina (ERIC Document Reproduction Service No. ED 345321)
- Mark, A., Critten, P. (1998). Chaos and complexity: The future for health care HRM. *Health Manpower Management*, 24(4), 139-142.
- Mason, R. B. (2007). The external environment's effect on management and strategy: A complexity theory approach. *Management Decision*. 45, 10-28.
- McKay, H., Bright, J. E. H., & Pryor, R. G. L. (2005). *Journal of Employment Counseling*, 42, 98-112.
- Mendenhall, M. E. (1993). On the need for paradigmatic integration of international human resource management. *Management International Review*, 39(3), 65-87.
- Mendenhall, M. E., Macomber, J. H., & Cutright, M. (2000). Mary Parker Follett: Prophet of chaos and complexity. *Journal of Management History*, 6(4), 191-204.
- Morgan, G. (2006). *Images of organization*. Thousand Oaks, CA: Sage.
- Murphy, P. (1996). Chaos theory as a model for managing issues and crises. *Public Relations Review*, 22 (2), 95-113.

- Peters, T. (1987). *Thriving on chaos: A handbook for a management revolution*. New York, NY: HarperCollins Publishers.
- Pryor, R. G. L., Amundson, N. E. & Bright, J. E. H. (2008). Probabilities and possibilities: The strategic counseling implications of the chaos theory of careers. *The Career Development Quarterly*. 56, 309-318.
- Smith, P. J. (2006). Technical rationality and professional artistry in HRD practice. *Human Resource Development International*, 9(2), 271-281.
- Snyder, K. J., Acker-Hocevar, M. & Wolf, K. M. (1995, September). *Chaos theory as a lens for advancing quality schooling*. Paper presented at the British Educational Management and Administration Society, Oxford, England (ERIC Document Reproduction Service No. ED 413630)
- Stacey, R. D. (1999). Is this chaos, at least in theory? *The Antidote*. 20, 1-3.
- Stapleton, D., Hanna, J. B. & Ross, J. R. (2006). Enhancing supply chain solutions with the applications of chaos theory. *Supply Chain Management: An international journal*. 11, 108-114.
- Thietart, R. A., & Forgues, B. (1995). Chaos theory and organization. *Organization Science*, 6(1), 19-31.
- Wheatley, M. J. (1999). *Leadership and the new science: Discovering order in a chaotic world* (2nd ed.). San Francisco: Berrett-Koehler.
- Yorks, L., & Nicolaidis, A. (2006). Complexity and emergent communicative learning: An opportunity for HRD scholarship. *Human Resource Development Review*, 5(2), 143-147.