Fractal Population Ecology Theory

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Abstract

Purpose - The aim of this paper is to describe the population ecology theory through fractal thinking, an emergent human operating system that is creative, adaptive, healthy, and evolutionary; furthermore, a parallel is drawn between the population ecology model and the fractal structure. Top-down hierarchies are typically characterized by command and control systems of the authority that creates harmful stress and internal competition for advancement within organizations as environment control survival of the organizations based on population ecology theory. To further diminish the tendency towards internal competition, forward-thinking organizations may adopt an 'in-out' pattern instead of top-down. This article tries to imply such pattern.

Design/methodology/approach -The fractal concept is applied to the organizational population ecology. It can be used to describe the strategy of management within an organizational environment.

Findings - By applying the fractal thinking to an organizational population ecology theory, we try to evolve a never-ending and complex pattern that is self-similar across different scales in the scope of organizations and their environments. We consider repeating a simple process over and over in an ongoing feedback loop in organizations. The new perspective presented in our discussion lends itself to the description of the current pattern of organizational growth within the fractal strategy.

Practical implication - The organizational ecology theory through fractal management describes how fractal concepts impact success. A fractal approach allows managers to ascertain the effectiveness of their organizations in the ecosystem and accordingly, devise strategies to embrace changes and challenges of the global environment.

Originality/value - The conceptual framework of the population ecology via fractal structures offers promise for a more sophisticated and methodologically rigorous

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approach to future investigations by the re- searchers. The population ecology theory based on fractal structures is an extension of the literature.

Keywords: Fractal concept, Population ecology theory, Top-down hierarchy, Evolutionary.

1. Introduction

The population ecology theory through fractal thinking voted 'Best Places to Work', as their members (organizations) share a purpose and core values that unite their efforts and create the pattern integrity or self-similarity characterizing a fractal population ecology theory. Members feel appreciated for their efforts and supported by their environment, which boosts healthy culture naturally _a happy heart is a healthy heart (Hsieh, 2010). In the population ecology theory through fractal thinking, relationship development at all scales between the organizations unites group efforts around a common purpose and attracts more resources from the external environment. When organizations are open with perspectives and are engaged with participation in collective creative efforts, they naturally thrive and create best outcomes together. The emergent collective behavior has a pattern integrity, which generates trust both internally with the members and externally with the public. All of the information necessary for making good decisions is available and flowing throughout the organization's structure, which ensures better use of resources and greater success for environments (Custer, 2007).

The phrase 'fractal population ecology theory' is inspired by the mathematics of Benoit Mandelbrot, the father of fractal geometry. He wanted to understand the geometry of Nature and how the patterns we see all around us retain their integrity over time and through evolutionary changes. The population ecology theory through fractal thinking, inspired by systems theory, fractal geometry, quantum mechanics, information dynamics, sociobiology, epigenetics, cosmology, and evolutionary biology, describes how natural organizational structures within their environments mimic systems in Nature and enable relationships to thrive. When competition energy is focused internally rather than externally, organizations withhold or hoard the information as they pursue their personal agendas and limit their environment's ability to be creative, adaptive, healthy, and evolutionary.

With few exceptions, most species in Nature cooperate internally in order to compete externally for resources, ensuring the survival of the group (Lipton,

2005). However, we have been hoodwinked by ‘survival of the fittest’ interpretations of evolution to perceive the opposite Command and control systems of the authority, which characterize top-down hierarchies, create harmful stress and internal competition for advancement within such organizations.

As emphasized by Darwin’s erstwhile rival, Alfred Russel Wallace, natural selection is enabled by the ‘elimination of the weakest’ elements so that the majority may survive. Systems based upon command and control combined with opportunistic ideas such as survival of the fittest create cultures of competition that voraciously consume precious resources (including time, money and innovative ideas) in the interests of the few over the many. Information silos naturally develop in these situations and hinder an organization’s ability to compete in the environment (without acquiring competitors), because information acquired at the edges of a system (the bottom in top-down hierarchies), which is required for evolutionary change and adaptation to the surrounding environment, rarely flows efficiently to the top (Zammuto et al., 1988).Stress builds among the ranks of organizations whose natural impulse to be creative is squandered in such situations, to the ultimate detriment of the environment. Every organization holds a unique perspective and gathers information daily, like a bee gathers pollen. If bees don’t make enough honey, the hive doesn’t thrive in winter. Similarly, when environments disregard the information that organizations collect they restrict their organization’s ability to make ‘honey’ and must acquire it from another environment. A c quisitions and mergers, though commonplace for more than a century, rarely satisfy the needs of all parties involved.

Our contemporary human society is an interesting test of the Darwinian evolutionary model that has guided its economic organization. We have assumed that competitive individualism, with profits as a bottom line, in leading to a healthy ‘survival of the fittest’ would somehow benefit us all. But this model leads to a ruthless elimination of all but the most aggressive competitors and those who can eke out their existence in noncompetitive roles or in support of the fittest. We are now reaping the unfortunate effects of this model as mega corporations flourish at the expense of an organization ‘downsized’ or replaced by competitively more economical organization in other parts of the world.Many environments already have flattened their hierarchies in an effort to deal with systemic issues, and sometimes this effort is good enough. Some environments use ‘matrix’ designed organizational charts that map relationships between numerous principles, and this seems to work well in many firms where

organizations collaborate on sequential projects. The population ecology theory through fractal thinking is a new and different way of envisioning the networks of relationships and how information flows in situations.

Considering the introduction, the rest of this article is as follows:
Section 2 describes the fractal structures. Section 3 discusses population ecology theory in management. Section 4 implies fractal approaches to population ecology theory in management. And in section 4 conclusions are presented.

2. Fractal

A fractal is a natural phenomenon or a mathematical set that exhibits a repeating pattern that displays at every scale. If the replication is exactly the same at every scale, it is called a self-similar pattern. An example of this is the Menger Sponge. Fractals can also be nearly the same at different levels. Fractals also include the idea of a detailed pattern that repeats itself. A fractal is a branchlike structure. Think of a tree:

1. Trees have many more small branches than large ones. This characteristic is also sometimes called a 'power-law' or 'inverse power law' or a '1/f' organization. Each of these terms means that there are exponentially more small branches compared to big ones.

2. Trees are 'self-similar' meaning that small branching patterns resemble larger ones. This characteristic is also sometimes called 'scale invariance' or 'scale free' because no matter the size you are looking at, the general branching shape is the same.

3. The complexity of tree branching patterns can be quantified.Fractals are called 'fractals' because they exist in fractional dimensions. A line fits perfectly in one-dimension. A plane (like a piece of paper) fits in two-dimensions. Fractals fit in between a line and a plane (or in the real world between two and three dimensions). More simply, because they are so complex, with huge numbers of tiny branches, trees never quite reach three dimensions. If you put them in a box, there will always be some space left over.

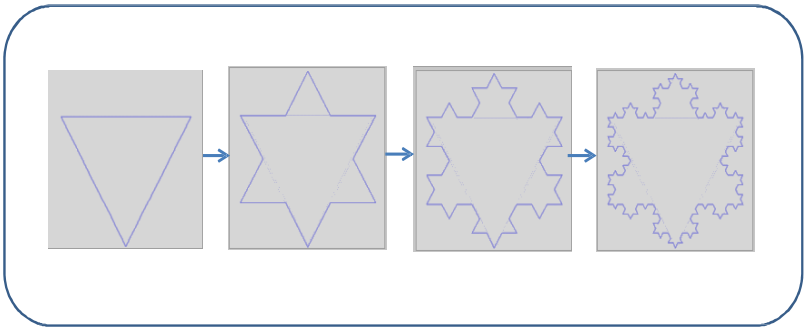

Figure 1. Fractal structures

Figure 1 shows the fractal structures. Mandelbrot defined two types of fractal patterns, random and non- random. Randomness is one characteristic of chaos theory, in which 'strange attractors' evolve to exhibit patterned order. The Cantor set and the Sierpinski triangle, successive enlargements keep reproducing always the same structure: these fractals are self-similar [non-random]. Random fractal patterns, such as the celebrated Mandelbrot set, are 'chaotic' in nature. Fractal geometry was invented independently of chaos theory and would provide a powerful mathematical language to describe the fine-scale structure of chaotic attractors. Fractal theory is not the same as chaos theory, which is derived from mathematics. But chaos does have a place in fractal theory in that systems exist on a spectrum ranging from equilibrium to chaos. A system in equilibrium does not have the internal dynamics to enable it to respond to its environment and will slowly (or quickly) die. A system in chaos ceases to function as a system. The most productive state to be in is at the edge of chaos where there is maximum variety and creativity, leading to new possibilities.

2.1 Fractal Compared to Top-down Hierarchy

Operating in a natural hierarchy comes naturally to humans. Top-down systems are unnatural hierarchies that emerged to manage large projects. Top-down characteristics are as follows:

-In Top-down structures, competitors tend to hoard information as power or leverage in gaining internal advancement, directing their com- petition energy inward and tearing asunder the pattern integrity of the environment.

-In Top-down hierarchies, systemic issues such as internal competition, unwanted turnover, and unhealthy organisations are commonplace.

-Top-down hierarchies are based on command and control systems. In

command and control systems, When competitor perceive that leaders control their reality, whether literally or figuratively, it causes stress.

Whereas fractal structures distinguished by:

-Happy, healthy environment because of their emphasis on positive information flows and relationship structures that create best outcomes.

-Fractal concepts ensure pattern integrity during evolutionary adaptations.

-Shared purpose and values that create pattern integrity; universal participation in ideas and solutions for continuous improvement; decision making at functional levels.

-A consistency and predictability to the quality of behavior.

-The quality of iterative information flows, from the edges to the center and back, enables successful relationships throughout.

3. Population Ecology Theory in Management

Organizational ecology (also organizational demography and the population ecology of organizations) is an approach in the social sciences that is especially used in organizational studies. Organizational ecologists examine the birth and mortality of organizations and organizational forms within the population over long periods. Organizational ecology describes the environment in which organizations compete and a process like natural selection occurs.

In the organizational studies scope, Population Ecology Theory seems as the study of dynamic changes within the organizations through the adaptation perspective. Hannan and Freeman believe that long-term change occurs through selection rather than adaptation. Inertia structural in the organizations affect adaptation when the environment changes (Hannan et al., 1989) Those organizations that become incompatible with the environment are eventually replaced through competition with new organizations better suited to external demands (Hannan et al., 1997).
Population ecology is based on three Phases:

1. The birth and mortality of organizations.

2. Vital-rate interaction between populations.

3. Sharing similar environments by ‘communities of populations’.

In general, an evolutionary view of organizational change creates population ecologists view. Organizations descend from previous organizations and population-level change in organizational forms is usually slow and continual. A major problem in organizational ecology is how does the environment support the organizations? What is the structure between the environment and organizations? Has the organizational ecology theory the best outcome based on selective approaches?

More supports mean more opportunities and more reducing inequality. Natural selection follows as an optimization process. However, the selection process in organizations is not necessarily optimal (Esmaeilzadeh et al., 2014 ; Esmaeilzadeh ,2013). The dynamic organizational processes of selection remind us about the inheritance and transmission of organizational forms.

Based on Lamarckian point of view, organizations can learn from each other and can copy other structures, more adaptive forms. Darwinian view present the selection process as the basis of adaptation; however, the selection process (Darwinian view) is stronger than organization’s ability to quickly adapt. It is considerable that much organizational change is random and not matching expected future states. Internal politics impact the organization adaptation with external demands.

4. Fractal Population Ecology Theory

Indeed, as the organizations have grown more educated and aware of the value of their outcome to an environment, they have demanded a fairer share. However, most environments are chartered to maximize profits, not to share them.

Management should explore the possibilities of creating new forms of organization that would be economically efficient yet more in harmony with the social values on which the cooperative movement was based (Martens, 2011). In other words, organizations need leaders who are thinkers not of great ideas _as most of those come from the organizations interacting with the environment_ but of ways to encourage organization growth and improve the information flowing between the members of their team. Leaders must understand that each individual is programmed with opinions and assumptions that can block both their ability to expand and grow as

well as to contribute to meaningful dialogue regarding environment and product improvements (Bennis et al., 2001). Modern leaders who spend time analyzing the nuances of inter organization relationships and guiding their organization toward greater organization growth and achievement are able to help organizations overcome limiting beliefs and achieve greatness.

If our belief systems fundamentally change, through whatever process or experiences, our perceptions and everything else about our lives will change.

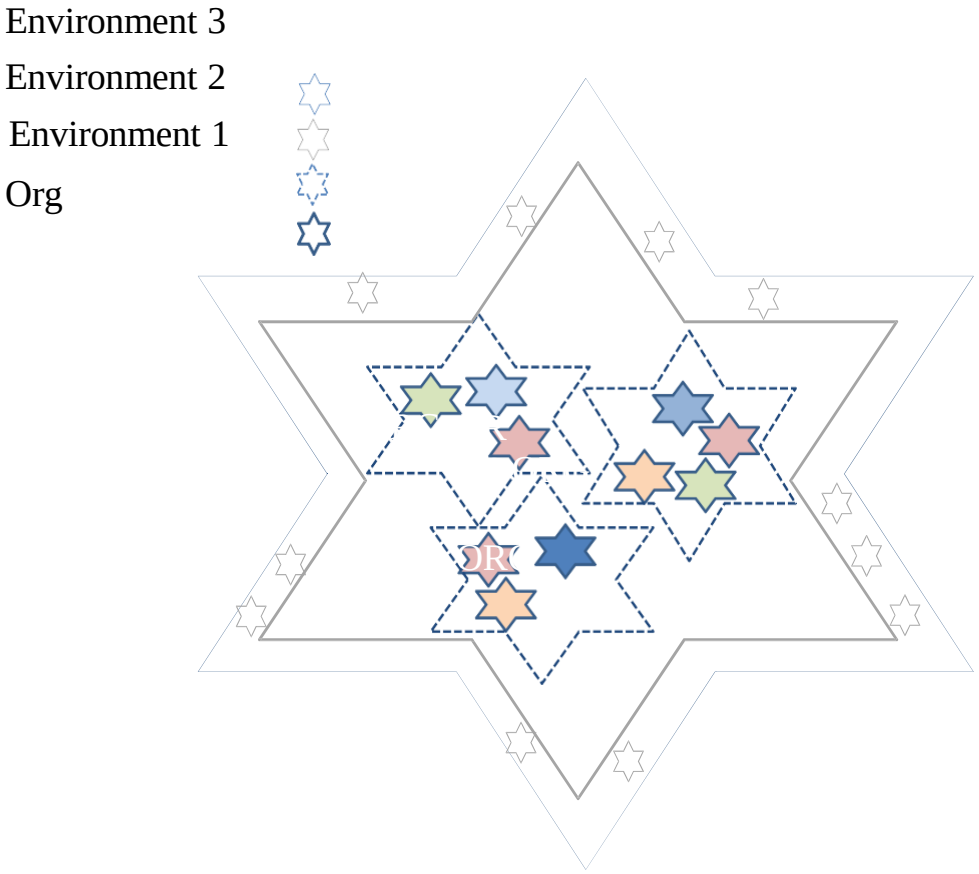

Figure 2. Fractal population ecology theory

Figure 2 shows fractal population ecology theory. As the figure shows, the organizations interacting with each other build an environment, and several environments interacting with each other build a Meta environment. This shows that each environment is not like the other one and each environment reflects fractal concepts and chaotic dynamics.

Since seminal studies of chaos in discrete time models in population ecology, the issue of chaotic dynamics in ecological systems has been widely controversial and considerable progress has been made in analyzing complexities in the chaotic behavior of ecosystems (Surowiecki, 2004).

Population ecology theory through fractal thinking is more chaotic and open to environmental changes, which gives them a self-organizing quality. It enables expansion while maintaining pattern integrity. As an environment grows, new branches or arms form that allow individuals to take on new responsibilities and grow as individuals, which is our natural propensity. The great and terrible irony of modern environment is that so many environments feel overburdened with responsibility while so many organizations feel unchallenged and unfulfilled in their tasks. The way to a happier and more prosperous state is clear: Concede once and for all that organizations, not environments and have not the environment power are the true engines of progress and dedicate your management career to creating an environment in which organizations can stretch for higher and higher levels of performance(Iverson and varian,1998).

Edge organizations are more likely to take day-today decision making into their own hands, without seeking approval from central environment. In general, this idea is anathema to managers in top-down hierarchies, as decision making is a source of power and control.

When pondering the Sierpinski Triangle, a non- random fractal and the closest geometrical equivalent to a top- down hierarchy structure, Mandelbrot noted that "the non-random fractals' essential failing is that they are not symmetric enough. Second, a non- random fractal cannot be uniformly scaling" (Mandelbrot, 1982). In geometry, non-uniform scaling describes objects that change shape as they expand, which means they lose pattern integrity. Top-down hierarchies constrain the potential growth of individuals as opportunities to advance are limited. The majority of organizations often remain in fixed positions and bide their time toward extinction, if they work in an environment that manages to survive changing market conditions through mergers and acquisitions. The need to innovate and keep up with constant change is an ever greater challenge, as collective wisdom and the expansion of information drive the desire and need for continuous improvement.

5. Implications and Conclusion

Fractal systems are all around us. Most things we take for granted are fractal systems, and the agents in every system exist and behave in total ignorance of the concept but that does not impede their contribution to the system. Fractal systems are a model for thinking about the world around us and a model for predicting what will happen. Fractal thinking about the population ecology theory helps us to change our perceptions about management.

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Biography

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