Paper/Article name:	Complexity (internal & external dynamicism) in organisations
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Overview:	This paper explores the rich interplay of both external and internal systemic dynamics on organisations

Complexity dynamics in both internal and external environments of any organisation

Organisations are open systems subject to diverse external and internal forces, the combination of which cause entangled, chaotic organisational dynamics. When managers and employees are unable to cope with these dynamics, organisations are inevitably thrown either into a fixed order and rigidity or into an uncontrollable chaos and collapse. In order to remain viable entities, organisations must be able to reproduce their dynamics whilst evolving and shaping themselves in a vital *structural coupling* with the ever-changing dynamics of their environments. This survival process of the interlocked fluidity between internal external environmental dynamics has been labelled ***organisational autopoiesis*** (Dimitrov and Fell, 2000). They note key complexity notions to be root characteristics of such autopoiesis:

Sensitivity to Initial Conditions (Butterfly Effect)

In chaos theory, seemingly insignificant actions can cause large effects. In organisations, insignificant decisions usually produce slight changes in the initial conditions of apparently similar decision-making processes, but these changes can eventually lead to entirely different problem situations. In chaos theory, such a phenomenon is *sensitivity to initial conditions*, and reveals the unpredictability of social systems (e.g., organisations). Since one can never succeed in a precise identification of initial conditions of even the simplest decision-making processes in an organisation, one can never succeed in predicting long-term organisational behaviour influenced by these processes.

Attractors

In its everyday manifestation, organisational activities are attracted to “islands” or tend toward specific areas or activities (**attractors**) within the sea of possible areas or activities. These islands of dynamic stability represent specific kinds of settled organisational activity (for instance, activity oriented towards technological innovation, business development, R&D or new products, etc). Each kind of activity represents a specific pattern in overall organisational dynamics. One cannot predict exactly how a given kind of activity will evolve in time. The chaos inherent around each “island of attraction” continually interferes with meticulous plans of managers. Attractors in organisations are "*organisational configurations which demonstrate regularities in their macro-characteristics even though they may reveal large differences in their internal processes*" (Thietart, 1995). There are various types of attractors (e.g. strange attractors).

Non-linearity

Organisations displays many of the key characteristics displayed by **non-linear dynamic systems**. One of such characteristic is the *lack of linear cause-effect relationships*, i.e., organisational activities are so interwoven and entangled that factors influencing its dynamics is hardly possible to define exactly (usually because it is a combination of factors), that causes the observed effect. The key is thus to understanding the process whereby a multitude of factors influence organisational dynamics. In chaotic systems, one cannot pass through the same coordinates twice. Similarly, in organisational management, a decision will never be made under the same set of circumstances as previous ones were made. This creates problems in

management practice (Gajendragadkar and Johnston, 1977). The implications for organisations in this context is therefore:

(1) Decisions that have led to beneficial results in the past will not necessarily lead to beneficial results again or in the future;

(2) A deliberate innovation process is necessary to remain viable;

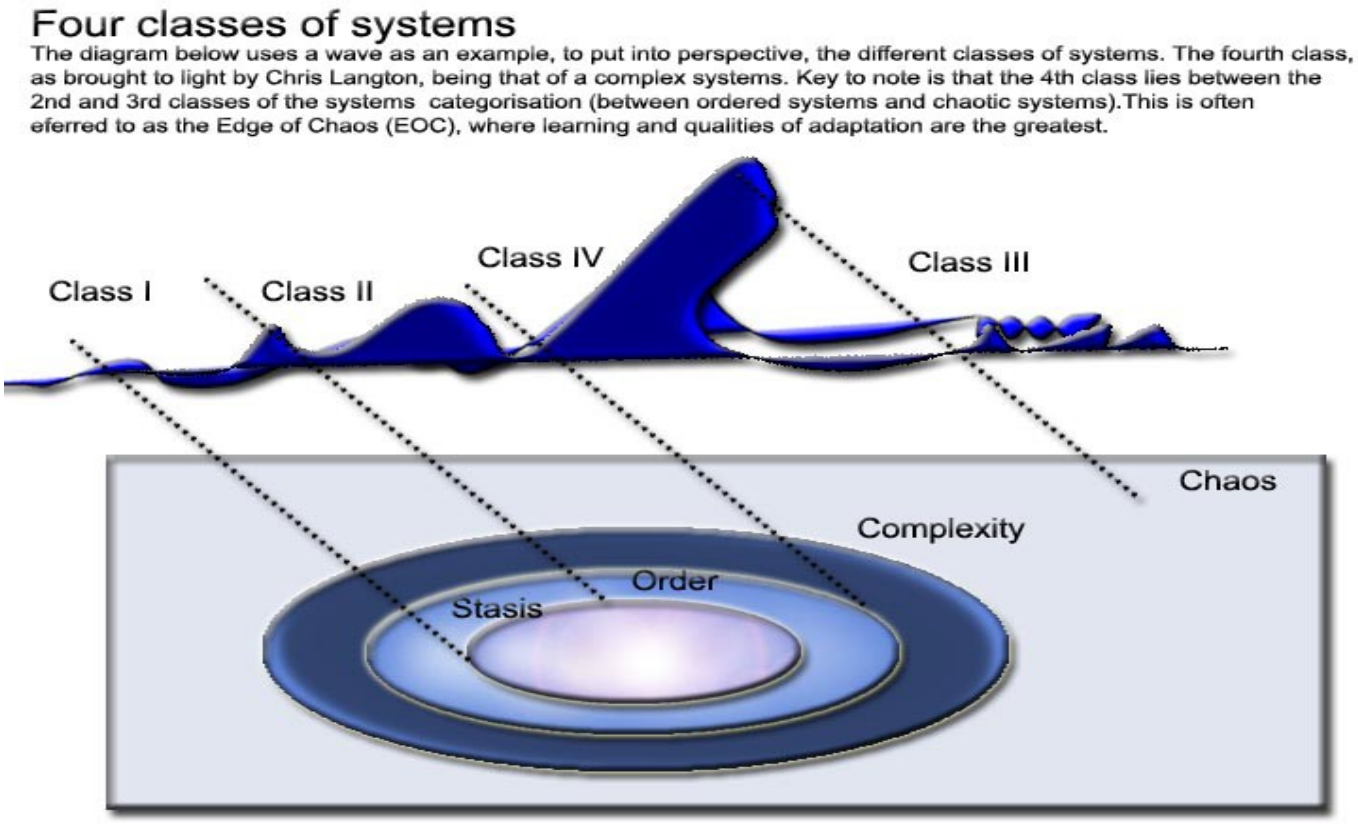
Fractal Structure

In an organisation's chaotic environment, it should ideally sustain a **fractal** (self-similar) structure. For instance, several layers of similar patterns and configurations should be observed at the overall organisational level, at sub-organisational levels, and at the level of the individual, i.e. a recursive design. What is essential for the fractal structure is that it does not become simpler when one goes from a higher to a lower level. The whole of the organisational structure consists of "wholes" of sub-organisational structures. The complexity of an individual employee is at least as large as the complexity of the whole organisation. When one deals with chaotic dynamics, reduction never simplifies.

Both external and internal fluctuations test the stability of existing organisational structures, which generally produce two different effects. First, the structures can fight off the fluctuations using some appropriate negative feedback mechanisms. Second, the fluctuations can be absorbed or amplified through a positive feedback mechanism creating a critical stage in the functioning of the organisation.

Edge of Chaos

The ideal organisational state is strangely in an out-of-equilibrium zone - a place between order and disorder, where learning and thus adaptation is maximal, resulting in the emergence of new qualitative states, transformation and flexibility. This zone is called the *Edge of Chaos* (see illustration below).



The Edge of Chaos is an important place for any organisation. One step further and the organisation may fall into a deep chaos in which it may be overwhelmed with change.

One step back and organisation may find itself in the region of order, unable to adapt sufficiently to remain viable. It is just on the frontier between these two regions - at the Edge of Chaos - where a delicate, dynamic balance between random chaos and rigid order can emerge. This state of balance is impregnated with the seeds of innovative transformations. While managers cannot be masters of organisational transformation at the Edge of Chaos, they need not be slaves to it. They can co-create it. This is an entirely new and challenging way of perceiving the role of managers in the age of 'living with Chaos.'

"In a recursive, complexly interwoven world, whatever one does propagates outward, returns, recycles and comes back in a completely unpredictable form. We can never fully know to what results our action leads. We take action, the action can have a very potent shaping effect. Then we relax the drive to control and allow the process to unfold - the process learns, shapes and changes itself through all its inseparable components, not under the direction of one of them only. Together with overall changes in the process, we also change, almost unnoticeably, without any strain"... (Goerner, 1994).

Self-organisation

The turbulence of non-linear dynamics produces energetic vortices, from which a self-organising force may emerge. The self-organising force cannot appear, unless the participating streams (e.g., running water or turbulent airflow, ideas in the brain, burning emotions, etc.) are permanently in motion (i.e. out of equilibrium), and interacting intensively with each other.

When these two conditions are satisfied, the powerful self-organising force spontaneously emerges. Such immense energy is also hidden in organisational dynamics, and therefore a challenge to leaders and managers to ignite these. The following table seeks to support the above and has been adapted to highlight the difference between organisations seeking equilibrium, and those pursuing constant renewal (Gajendragadkar and Johnston, 1977).

Organisational Attribute	***Equilibrium-Seeking Organisation***	***Self-organising Organisation***
Strategy	Balance Preserving	Allows Emergence
Planning	Fixed Goals	Open for Qualitative Changes (Bifurcations)
Fluctuations	Damping	Creative Responses at the Edge of Chaos Perpetual Innovation
Change Process	Incremental	As an Opportunity for Growth
Chaos	As an Excuse	

To become adept at critical decision-making, managers must cultivate a self-renewal process, thereby the action in itself acknowledging that chaos and instability are the sources renewal.

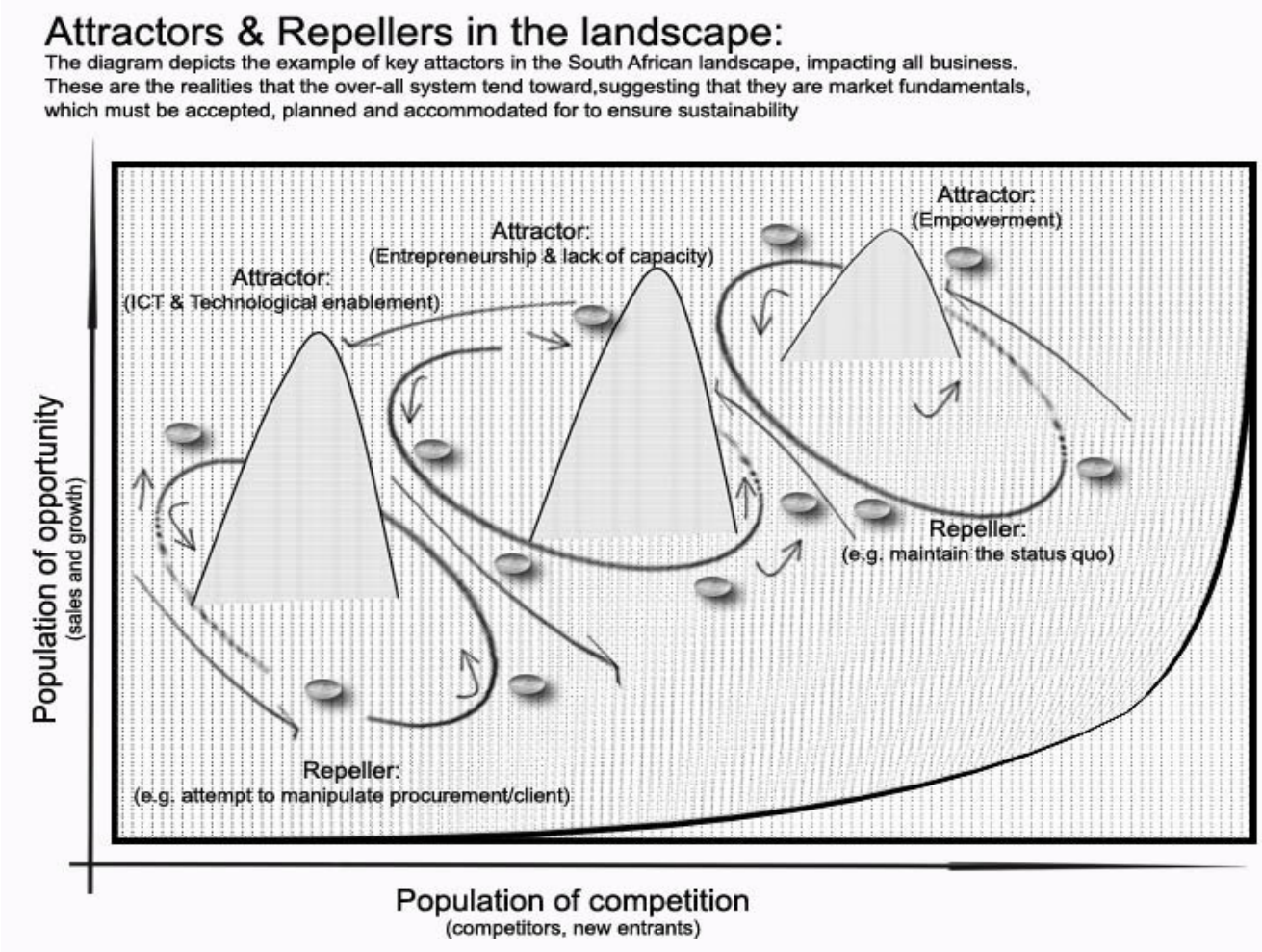
"*A self-organising organisation can survive discontinuous changes and make the transformation necessary to organise itself into more complex forms. The self-organising agency does not respond to every fluctuation from inside or outside the organisation. Instead, it possesses the internal potential and energy to break with existing symmetries and methods when positive fluctuations occur. This internal potential is the basic resource of the self-organising agency that managers foster and develop*" (Kiel, 1994).

Conclusion

The concept of organisational autopoiesis help managers to relate to their operations more effectively, with less wasting of resources in trying to force complex organisational development in a pre-planned, non-negotiable direction; instead they must ***learn how to move the organisational system, in context of its chaotic dynamics***.

The unpredictability of complex behaviour must not be seen as an obstacle, on the contrary, by exploring unpredictable dynamics, managers and employees can gain insights with enormous predictive power – e.g., *There are no trivial or non-valuable actions*: even randomly chosen and seemingly insignificant actions can lock-in, because of this effect, organisations tend to permanently be out of equilibrium. For managers, it shows the need to open minds and hearts to adopting systems based views and constructs. Giving all agents greater control over day-to-day decisions and can help the organisation to become more responsive and flexible. In contrast to equilibrium physics and mechanics, where a critical state is an exception, in the far-from-equilibrium reality of organisations, *a critical state is the typical state of matter*.

Our managers must forget simplistic notions of a steady or equilibrium state, and rather learn techniques of how to deal with such real-life dynamic states. *These dynamics are "ruled" by attractors:* emerging phenomena having strange forms (when mapped geometrically).



When dealing with organisational complexity, managers need to understand what kinds of attractors are impacting their organisations (see above example of South African attractor landscape). They need to discover what fields of activity could attract, inspire and concentrate the energy of the employees, what are the regions where this energy dissipates and any hidden forces responsible for bringing forth specific organisational dynamics. Since chaos is a part of life processes, both managers and employees can use instabilities in order to manipulate the energy in organisations on a large scale (using the butterfly effect), whereby small changes can bring forth significant results. The butterfly effect gives great power to the hands, brains and hearts of people working in organisations. When properly used, this power can produce the improvements that are most essential. Such action will bring forth constant innovation and produce new solutions to old and new problems.

References

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