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The Challenge of Transitioning to a Sustainable World - Clues to Barriers in the Interstitial Spaces Between Systems Thinking, Edge of Chaos, and Holistic Perspective

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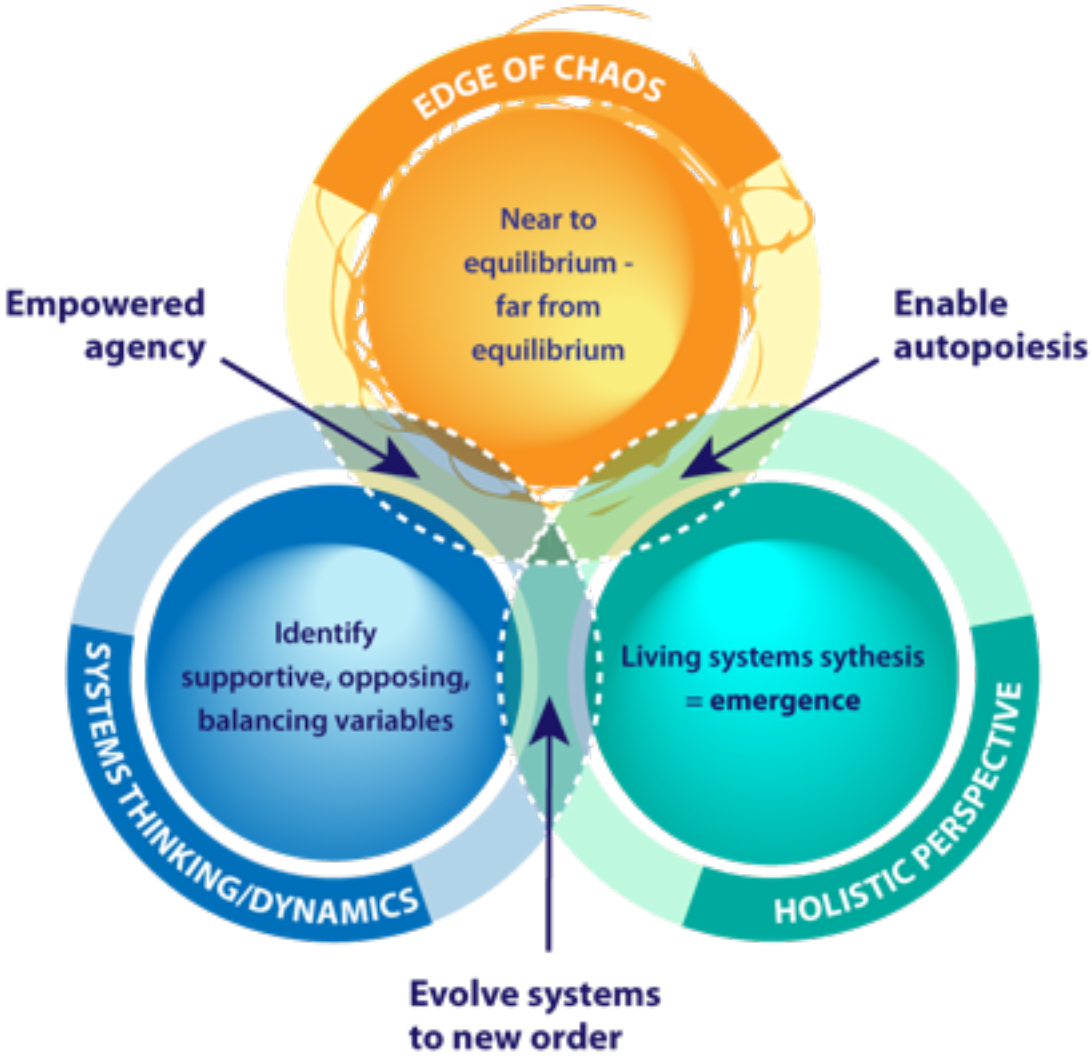

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UK Systems Society International Conference - 15 September 2023

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Abstract:

This explorative foray considers a South African test case as a potential illustration of transforming conventional systems thinking to more encompassing holistic systems practice. In charting the course towards a sustainable world, a hidden obstacle is examined—the inclination towards prediction and control that often accompanies the mechanistic application of linear systems mapping. This recognition serves as a pivotal turning point. By embracing the concept of 'emergence' as a product of the synthetic tendencies inherent in living systems, holistic systems practice redirects its focus toward steering the regenerative forces of life at the local level.

A transformative epistemological framework embracing 'edge of chaos' is presented. In the delicate balance between the extremes of equilibrium and chaos, 'edge of chaos' is the fertile ground for engaging with emergence. With this process-oriented perspective, holistic systems practitioners can develop enhanced ability for adaptive problem-solving. Attention shifts from isolated components to the intricate dance of processes, reframing interventions from the pursuit of fixed 'solutions' to the nurturing of regenerative cultures.

Further potential illumination emerges from the interstitial spaces that lie in a Venn diagram at the intersection of systems thinking, 'edge of chaos,' and the holistic perspective. These insights might empower individuals with further agility and agency for adaptation. By embracing collaborative engagement with emergence, autopoiesis, as the self-sustaining nature of living systems, is catalysed. As practitioners acknowledge their integral role within the systems they influence, they might pivot from theoretical problem-solving to immersive participation. Entering more deeply into the state of 'interbeing', heightened sensitivity can unlock the inherent intelligence and purposefulness of localised systems. Consequently, efforts evolve towards a harmonious collaboration with these systems, propelling their continued growth and evolution.

Keywords: Edge of Chaos, Holistic Systems Practice, Interstitial Spaces, Epistemology, Ontology, Autopoiesis, Regenerative Cultures, Interbeing

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1. Introduction: Navigating Sustainability with Holistic Systems Practice

E. F. Schumacher's insight into epistemology and ontology provides a context for this exploration:

"The distinction between epistemology and ontology becomes significant as we move higher up the chain of being."

In our quest to assess the impact of systems thinking on global sustainability, it becomes increasingly evident that the practical application of the holistic perspective is overdue. We find ourselves at a juncture where the evolution from systems thinking to holistic systems practice is not just a choice but a pressing necessity. This urgency arises from the looming prospect of a global crisis, both human and environmental, which appears increasingly imminent. While our overarching theme revolves around the potential transition to a sustainable world in general, a closer examination of a localised initiative in South Africa offers an elementary yet illustrative example of applying such a holistic perspective. This case study revolves around the empowerment and application of local agency to address the consequences of institutional system breakdown. Although the South African example primarily focuses on the socio-economic revival of dysfunctional communities resulting from institutional collapse, it offers valuable insights that resonate with the broader global ecosystem.

In 2021, Sir David Attenborough sounded a solemn warning before the UN Security Council, cautioning against the perilous path of environmental destruction that humanity was treading[1]:

"...We will face the collapse of everything that gives us our security: food production, access to fresh water, habitable ambient temperature, and ocean food chains."

As we stand eight months into 2023, with August 2 marked as Earth Overshoot Day—signifying the depletion of Earth's natural resources for the entire year—it is evident that despite diverse initiatives, the spectre of continued environmental degradation looms even larger. Rostrum et al. (2009) provide the backdrop by highlighting the planetary boundaries acknowledged on Earth Overshoot Day. Divergent ideological and economic agendas have led to fragmented efforts that resonate with Ackoff's (1979) warning of a system of problems spiralling into 'messes.' Sir David Attenborough's prediction of a 'potential civilisation breakdown' remains an ominous spectre. Given that

[1] https://www.reuters.com/article/us-climate-security-un-idUSKBN2AN1LP

worst-case scenarios anticipate such a breakdown preceding a generalised systems collapse, this inquiry advocates preparation by adopting holistic systems practice approach.

The McKinsey report by Bradley et al. (2002) implicitly identifies significant global disruption, signalling that we stand at the brink of a new era. The report anticipates a global 'seismic shift,' propelled by a multitude of dynamic forces. These forces encompass the multi-polarity of the world order, the rise of new technological platforms, demographic disparities, the spectre of climate change and its impacts on resource systems, and the intricate dance of capitalisation and economic growth. These forces, by their very nature, herald increasing complexity that will profoundly shape any efforts toward transitioning to a sustainable world. The core concepts of 'reorientation' and 'reorganisation' inherent in the idea of a 'change of era' demand deeper exploration. To engage effectively with this seismic shift, we venture to offer a mental framework that embraces complexity and emergence. Navigating these forces, both on a micro and macro scale, necessitates holistic systems practice.

In contrast to endeavours rooted in prediction and control—achievable solely within systems devoid of life—holistic systems practice shifts its focus. Rather than attempting to manipulate conditions to attain a sustainable world, it centres on enabling regenerative cultures. The concept of regeneration, we argue, operates on a different plane, one that doesn't demand the same degree of control and predictability. A regenerative approach aligns more harmoniously with the rhythms of life and adaptation. Regeneration is the act of life begetting the potential for further life, even amidst the flux of unpredictable circumstances. Holistic systems thinking emerges as the reflexive stance in this process, facilitating a form of 'steering.' Crucially, this mode of reflexivity, while enabling foresight, does not aspire to absolute foreknowledge. This understanding forms the basis for our case to reframe the notion of 'transitioning to a sustainable world' into 'enabling regenerative cultures.'

2. Contextualising Systems Thinking in Complexity: Re-engaging the Challenge

In 2010, IBM's Global CEO study[2] pinpointed an escalating issue—increasing complexity—as the foremost challenge confronting CEOs worldwide. Their observations echoed the sentiment that we now operate within a world marked by heightened volatility, uncertainty, and complexity. Many CEOs concurred that incremental changes were no longer adequate in a landscape that had

[2] https://disclearningsolutions.com/news/9/2010-IBM-CEO-Study.html

fundamentally shifted its modus operandi. This recognition of the inadequacy of incremental adjustments in a world experiencing fundamental transformation lies at the crux of our challenge. As elucidated in the McKinsey report, there is a growing inclination to seek solutions primarily through technological advancements. However, this technological perspective often becomes oblivious to the ubiquity of humanity's role in this evolving era. It notably overlooks the reality that life is intricately woven into the deeper, sustaining global ecosystem. The report underscores the implications of this oversight: *"... climate change and resource systems raise concerns about stability and access to resources."* Therefore, it becomes imperative for leadership to embrace the transformed perspective offered by holistic systems theory and practice to align with the accelerating shift. The more it permeates all levels of application, it could contribute to shaping the emerging era with a focus that nurtures life within its intricate web of interdependencies. The capacity to recognise, embrace, and engage with the inevitable dynamics of complex systems is the cornerstone upon which we will redefine systems thinking into holistic systems practice.

Cilliers (2000) identifies seven defining characteristics of complex systems:

* They comprise a multitude of elements engaged in dynamic interactions, exchanging energy or information.
* Despite specific elements interacting with only a few others, the ramifications of these interactions ripple throughout the system.
* The interactions are nonlinear, featuring numerous direct and indirect feedback loops.
* They are open systems, constantly exchanging energy or information with their environment.
* This ongoing exchange places them in conditions ‘far from equilibrium’.
* These systems possess memory, distributed throughout rather than centralised.
* Each system has a unique history that remains a pivotal driver of its behaviour.

Among these attributes, at least three directly impact holistic systems practice. First, the system's behaviour is dictated by the nature of interactions rather than the intrinsic components it comprises. Second, due to the richness, dynamism, feedback loops, and crucially, nonlinearity of these interactions, predicting the behaviour of the entire system based solely on component inspection becomes futile. Third, complex systems exhibit adaptability. They possess the capacity to self-organise and regenerate their internal structure, without external intervention. It is this autonomy, when recognised, that will enhance agency.

Beck and Cowan (1996) encapsulate the challenge we face when managing complexity:

"The complexity of the internal leadership patterns and organisational systems must match or exceed the complexity in the external world in which they operate. If the external world offers greater complexity over time, the internal systems will ultimately collapse."

In contemplating the scope of what system thinking can and cannot achieve, we can include additional tools and processes from system dynamics. Living systems, unlike their mechanical counterparts, exhibit distinct behaviour due to the nonlinearity of direct and indirect feedback loops that facilitate both self-organisation and autopoiesis. We propose that by incorporating the insights garnered from high-order complex causal loops within system dynamics, systems thinking can take further strides towards evolving into holistic systems practice. In the following section, we will briefly explore the South African test case to illustrate some of these concepts in practice.

3. The South African Example: A Crucial Test Case for Local Agency

To effectively address the intricate challenges posed by the pressing global sustainability issues, we must grasp the fundamental insights of systemic wholeness, emergence, and autopoiesis. South Africa today not only offers a glimpse into the potential ramifications of systemic collapse but, more importantly, can also serve as an inspiring example of the transformative potential of innovative local initiatives when confronting such challenges. Terreblanche (1981) observed that South Africa, in many respects, mirrors the global macrocosm. It embraces a diverse multi-ethnic population, a widening chasm between the first and third worlds, and a rich tapestry of languages, cultures, and religions. Additionally, its variety of bioregions and landscapes echoes the dynamics prevalent on a global scale.

However, despite its potential, South Africa now grapples with widely reported inefficiencies and corruption, evolving from a nation once hailed as Africa's most advanced economy into a projection of a failed state. Gumede (2022) contends that the country's infrastructure teeters on the brink of complete disintegration, with the state-owned electricity grid representing a glaring example of this decay. Prolonged and debilitating power blackouts, lasting up to 10 hours a day, inflict severe economic and social disruptions, carrying potential health consequences. The challenges extend to the delivery of clean water and functional sewage systems, with similar stressors and health risks.

The widespread dysfunction of state-owned enterprises, coupled with inadequate service delivery at various governmental levels, especially local governance, has fuelled mounting and increasingly violent protests.

What makes the South African scenario significant in the global context is the recognition that infrastructural decay is not exclusive to developing nations; it plagues developed nations as well. The 2023 WEF Global Risk Report[3] underscores the pivotal role of climate change in exacerbating this decline. This insight positions climate change and the broader ecological health of our planet at the core of sustainability. Sir David Attenborough's solemn warning to the UN Security Council further reinforces the argument presented in this paper:

"...If the natural world can no longer support the most basic of our needs, then much of the rest of civilisation will quickly break down."

South Africa's threatening systemic collapse and the accompanying social turmoil could foreshadow the global system breakdown as Attenborough forewarns. However, there is a crucial distinction. Observers attribute South Africa's system breakdown primarily to corruption-driven state ineptitude in maintaining infrastructure. In contrast, Attenborough's dire concern arises from our collective detrimental impact on the increasingly fragile global ecosystem, leading to the accelerating effects of climate change and the subsequent risk of systemic failure. It is not beyond reason to consider this negligence as also pointing to a globally pervasive form of economic corruption. As demonstrated by World Overshoot Day, we continue to prioritise economic interests over the regenerative capacity of nature. This ecological crisis is fundamentally about the sustenance of our shared life support system. Climate change and its broader repercussions will inevitably exacerbate not only South Africa's predicament but also those of numerous less affluent nations as they grapple with their own critical challenges.

Attenborough's assertion that we can no longer evade the consequences of ecological disruption places fresh demands on leadership in guiding society as it adapts to increasing turmoil. The deeply vested interest in the prevailing political and economic status quo mitigates against top-down fundamental systemic change beyond ‘green-washing’. A just released August 2023 report from Oxford University [4] shows that fossil fuel producers have overshot climate targets. This harsh reality inevitably calls for bottom-up approaches. Against this disconcerting backdrop, hope emerges in the South African initiative

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[3] https://www.weforum.org/reports/global-risks-report-2023?gclid=EAIaIQobChMI4s-SsOWLgQMVU5DVCh1GbQDwEAAYAiAAEgLk2PD_BwE

[4] https://www.oxfordmartin.ox.ac.uk/news/fossil-fuel-producers-overshoot-climate-targets/

facilitated by The Kagiso Trust—the 'Makana Circle of Unity.'[5] It can serve as an early illustration of holistic systems practice applied to address South Africa's troubling trend of service delivery breakdown. In the face of political and social polarisation, along with mounting protests, this collaborative civic coalition, hereafter referred to as 'Makana,' has emerged. By fostering collaboration among stakeholders, this initiative offers glimpses of transformative change and significantly improved service delivery, serving as an inspiring model for diverse entities to join forces at the local level.

Founded in 1985 during the anti-apartheid struggle, The Kagiso Trust, henceforth 'Kagiso,' with its history of supporting development institutions and initiatives across various sectors, extended its support to the beleaguered Makana Municipality. In this formerly known City of Grahamstown, the municipality fell into dire financial straits, primarily due to revenue mismanagement. Financial mismanagement is a pervasive issue in South Africa, as revealed in the 2023 report by the SA Auditor General, which indicated a decline in clean audit reports for municipalities[6]. Poor leadership, a lack of accountability, and a shortage of skills are highlighted as underlying problems. The AG report affirmed that the growing dysfunction of local governments, characterised by financial mismanagement and administrative instability, has resulted in deteriorating living standards for communities. According to Gumede (ibid), the problem of poor and corrupt governance is systemic, and at its core lies the practice of political cadre deployment.[7]

The practice of cadre deployment of necessity inhibits the quality of local agency. Makana Municipality stands out as a particularly challenging case. The South African Parliament's Portfolio Committee on Cooperative Governance and Traditional Affairs, following its visit to Makana in September 2022, described it as *"a dysfunctional and toxic environment"* and *"…a key root cause of its consecutive audit disclaimers."*[8]

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[5] https://www.biznews.com/sponsored/2023/07/28/creating-collaborative-civic-coalitions-the-makana-circle-of-unity

[6] https://www.biznews.com/sponsored/2023/07/19/fostering-purpose-collaboration-transforming-municipalities-community-prosperity

[7] https://www.wits.ac.za/news/latest-news/opinion/2023/2023-06/revolutionary-ideas-are-not-so-cut-and-dried.html

[8] https://grocotts.ru.ac.za/2022/11/15/makana-is-dysfunctional-and-toxic-cogta-finds-in-its-damning-report/

The South African trajectory to a failed state appears inevitable. Nevertheless after 'Kagiso' stepped in to support the municipality with its dysfunctional revenue management, evidence emerged to offer possibilities of altering that direction. Kagiso quickly realised the need for stakeholder and community participation in Makana. Aligned with its holistic philosophy, the Trust's response to the broader governance challenge centred on *"...radical collaboration to improve service delivery at the local level."* Their aim was to create replicable models of community empowerment that would build trust, navigate challenges, and bring together stakeholders with a common purpose.

Key identified issues included community polarisation and the absence of an enabling development environment. Emphasising the importance of an engaged citizenry, it became evident that what was urgently needed was a shared political will to transform municipalities into functional collaborators with non-governmental stakeholders. Achieving this required non-governmental stakeholders to unite and structure themselves for effective collaboration. Recognising this need, an educational cluster was established. A further challenge was the perceived threat to local political actors. Service delivery problems provided a convenient political platform to be exploited. This, in turn, underscored the ultimate challenge of transforming a self-serving political and leadership culture into what the Trust aptly terms a culture of 'ecosystem-centric decision-making'.

As evident in Cilliers' (ibid) complex systems, systemic wholeness, emergence, and autopoiesis are essential factors to consider in Makana. They apply even more emphatically when addressing global challenges. The Makana approach led to exploring ways to empower marginalised communities further by fostering a more community-centric development environment. To address the fundamental issue of polarisation, the focus was on collaborating with all key stakeholders to *"...bring back the voice of the community"* in community-centred local development. By gradually reinstating collaborative community agency, seemingly insurmountable problems are indeed being addressed, and service delivery is being restored to the community's benefit.

4. Redefining System Thinking/Dynamics: Insights from 'Makana'

The 'Makana' example might hold valuable lessons for addressing complex dynamical systems on a global scale. Mittleton-Kelly (2003) highlights three essential processes for effectively engaging with such systems: (i) recognising the multidimensionality of the problem-space, (ii) creating an enabling environment, and (iii) entering the imaginative 'field of possibilities'.

What might set 'Makana' apart from other struggling local government coalitions in South Africa is its acknowledgment of the multi-dimensionality inherent in the facilitation process. Part of this multidimensionality includes acknowledging personal agendas and vested interests. Recognising this, the commitment to a distributed leadership model allowed competent individuals to contribute their expertise and skills without the constraints of formal leadership positions. To create an enabling environment, the coalition rallied around the unifying slogan, *'A good place for all to live.'* By together identifying the necessary steps to move towards this ideal, the initiative remained apolitical, ensuring that collaboration with the municipality remained effective and focused on common goals rather than partisan interests.

The 'Makana' initiative thus highlights the imperative to shift away from a linear and mechanistic application of systems thinking, where specific problems are identified and solutions are designed. For instance, the AG report on Makana Municipality pointed to increasingly unaffordable expenditures on external consultants to address various challenges. These diverse activities, even when employing external expertise to tackle specific issues, might still have contributed to what Ackoff referred to as 'messes.' In contrast, 'Makana' demonstrates that complex systems necessitate participation and engagement with emergent process. In taking incremental steps it still can deliver unexpected consequences, both positive and negative. As Cilliers (ibid) illustrated, emergence defines complexity, requiring active presence.

This inquiry questions whether the hidden barrier to the effectiveness of systems thinking in contributing to the desired transition to a sustainable world might lie in its inclination toward a mechanistic application of linear mapping. When geared towards prediction and control, it generates additional challenges. Blignaut (2013) suggests that systems thinking often attempts to define an ideal future and then devise strategies to 'close the gap.' In contrast:

"Complexity works with the evolutionary potential of the present, i.e., it seeks to understand the 'now,' find out what can be changed (in a measurable way), and then take small evolutionary steps in a positive direction without any assumption of the end destination."

We consider this approach from two angles: first, how to shift the framework of thinking toward such an emergent process-oriented approach, and second, whether the concept of transitioning to a sustainable world is influenced by the potentially process-inhibiting intent of *'seeking to define an ideal future and close the gap,'* as Blignaut suggests. In response to this question, the alternative concept of 'enabling regenerative cultures' is proposed.

Any approach, including systems thinking, when applied linearly to address complex sustainability issues, must grapple with the challenges posed by rapidly evolving environments. Forrester (2007), evaluating the limitations of human cognition, stresses the need for system dynamics to help comprehend complex systems in both nature and human affairs. He argues that because simple solutions of necessity fall short in capturing the complexities of feedback systems, it necessitates more sophisticated computer simulations to *"deepen our understanding of real-world situations".* This contention however calls for further examination.

The 'Anthropocene' notion, evidence of a growing awareness of humanity's disruptive ecological footprint, has spurred growing interest in technological solutions. The broad expectation of the potential role of artificial intelligence, with its vast data processing capabilities, has been noted. Despite this potential sophistication, Schumacher's 'epistemology/ontology' challenge persists. Korzybski's (1933) epistemological 'map' is still not the ontological 'territory', no matter how sophisticated the simulation. From the world of system dynamics, Turner[9] makes it clear that such advanced computer simulations remain 'models,' not reality itself. Yet Lovelock (2019), author of the 'Gaia' concept that considers the world to be one integrated living organism, still anticipates the rise of hyper-intelligent cyborgs to address these complex challenges. This apparent limited view of human cognition, raises the critical question of whether the innate human capacity to sense and respond to complexity continues to be overlooked. Penrose (2005), by implication questions the validity of the prevailing scientific world view:

"It is quite likely that the twenty-first century will reveal even more wonderful insights… But for this to happen, we shall need powerful new ideas, which will take us in directions significantly different from those currently being pursued. Perhaps what we might need is some subtle change in perspective — something we have all missed…"

Could Penrose's 'subtle change in perspective' be the rediscovery of an innate human capacity to access an even deeper inherent wisdom? Might the shift from abstraction to participation unlock a richer human wisdom capable of making more effective contributions to a healthy world? If it were to embrace holistic systems practice, could systems thinking/dynamics, augmented by the relevant data processing capabilities of artificial intelligence, take yet a further significant leap forward? Might humanity thus be better placed to address Forrester's challenge of dealing with complexity and maintain its human sovereignty even as it engages with the unfolding human global drama?

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[9] https://www.linkedin.com/in/kerry-turner-b7812511/?originalSubdomain=uk

5. Transitioning Systems Thinking/Dynamics (STD) to Holistic Systems Practice (HP)

Holistic systems practice requires a profound and exploratory understanding of holistic systems theory, transcending the simplistic conventional interpretation of *'the whole being greater than the sum of its parts,'*. Instead, it aligns with J. C. Smuts' original definition of holism as a *"...real vital organic unity of which the multiplicities of the universe are not the constituent parts but aspects, phenomena, or manifestations."* Our examination thus will be how to transcend the idea of holism being about wholes and parts to the perceived phenomena (wholes) being constitute by roles and functions.

In the intention of transitioning to a sustainable world, contrary to holistic systems thinking, conventional scientific risk assessment often follows a reductionist approach, where individual risks associated with each element are evaluated. Jackson (2006) recognises the inadequacy of such non-holistic solutions and advocates for a critical systems approach, known as 'creative holism,' to address complex problems. This approach does not deny reductionism, but places holism on equal footing with it. It requires utilising trans-disciplinary analogies and acknowledging the interrelatedness of structure and process in system development. Assessing risks in the relationships, rather than individual parts, is vital for a more comprehensive risk assessment. Complex systems exhibit dynamic risk in their relationships and interactions, highlighting the importance of considering these connections comprehensively.

Irwin (2011) emphasises that holistic complex systems design and planning requires novel principles and practices that incorporate continuous co-design and adaptability. This aligns with Wahl's (2017) view that co-designing complex systems is an ongoing process; nature is in a constant state of change, and adaptations must accommodate both short- and long-term shifts.

Belohlavek (2015) introduces the concept of 'human onto-intelligence,' that *"... Allows individuals to apprehend the nature of the environment they are dealing with and defines their adaptive behaviour"*. Individuals can anticipate the outcomes of their actions only if they possess a conceptual understanding of them. Integrating 'onto-intelligence' with system dynamics simulations can deepen conceptual understanding and optimise adaptability and intelligence. Simply put holistic systems practice does not seek to break entities into parts but focuses on ensuring proper interrelations and functionality of the whole as an ongoing and emergent process. Von Bertalanffy (1968) underscores that systems are dynamic processes that give rise to stable structures temporarily—balanced equilibrium. Therefore Maturana and Varela's (1991) distinction

between 'structure' and 'organisation' helps in conceptualising the interrelatedness of structure and process in system development.

Jackson (ibid) additionally introduces human subjectivity, emphasising the benefit of holism in developing theoretical awareness but recognising that knowledge is inherently partial and influenced by our adopted worldview. This aligns with Cilliers' (ibid) observation that all complex systems have memory and 'history,' underscoring the importance of evaluating the paradigms that shape our world views. Such evaluations emphasise the role of reflexivity, which we propose as 'Complex Reflexive Adaptive Intelligence.'

Holistic systems theory integrates the emergence of novelty into it's thinking and acknowledges that practitioners are integral parts of the systems in which interventions occur. This stance leads to a deeper awareness of the 'intelligence' and 'purposiveness' of the systems we interact with. Intervention transforms into collaboration, focusing on enabling the further evolution of the system rather than merely fixing it.

6. Integrating Systems Thinking/Dynamics (STD and the Holistic Perspective HP)

Holistic systems practice, as a fusion of systems thinking/dynamics and the holistic perspective, avoids abstract universal approaches and focuses on effective local-level agency. To transition from systems thinking to holistic systems practice, we will presently examine the role of embracing the concept of 'edge of chaos' as the necessary epistemological frame.

Preparing for the disruptive emerging era will require strategic approaches informed by a paradigm shift focused on participation rather than control. Viewing the world as an integrated self-organising system, with a particular emphasis on functional agency within specific ecologies, will better facilitate generative engagement with its dynamic and emergent nature. System thinking/ dynamics contributes by offering a practical tool for identifying high-order causal loops and key variables for influence within functional wholes. Furthermore it supports the identification of the eco-system as the functional

'whole' being addressed. Recognising energy and information flows, the structure and pattern of the whole becomes more apparent.

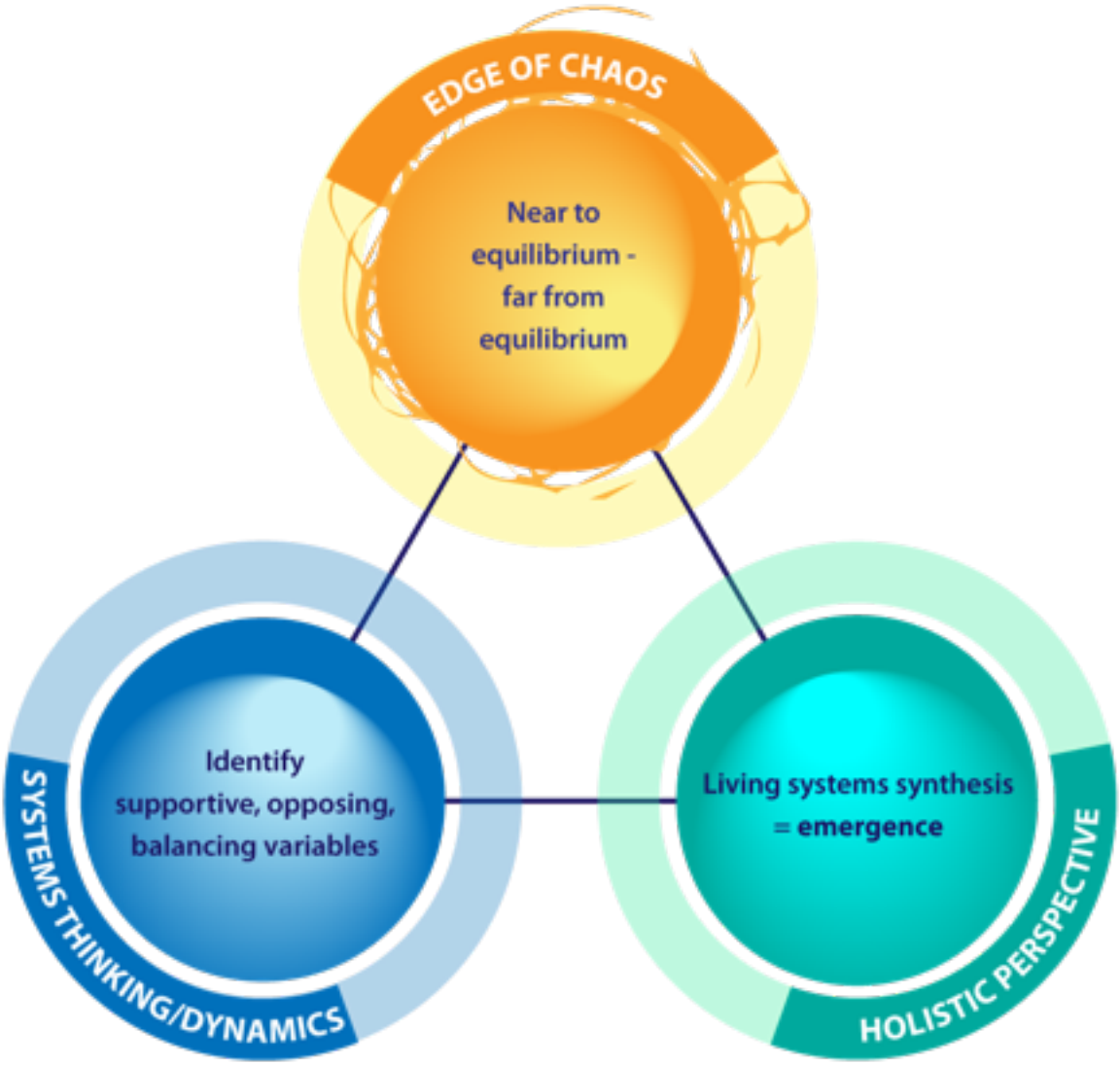

Image 1: System thinking/dynamics (STD) and the holistic perspective (HP)

The holistic perspective (Image 1 above), by identifying supporting, opposing, and balancing variables, engages more effectively with equilibrium and dynamic conditions, enabling adaptive structural changes. When considering such variables, the Makana identification of cadre deployment's disruptive effect that promotes loyalty to the party at the expense of community service, offers an example. In that example the potential balancing variable was to promote stronger community agency. As identified by Bertalanffy (ibid), systems are not static, they are dynamic, giving rise to stable structures temporarily. This insight is embraced in holistic perspective in acknowledging life's tendency toward adaptive synthesis through emergence. Thus, applying systems thinking/dynamics in the holistic perspective enables the identification of structure and pattern within a whole functional system. Thereby it provides a

functional framework for engaging with emergence. Employing Venn diagram imagery we examine opportunities in the interstices.

The interplay of systems thinking/dynamics and holism highlights dynamical synthesis as the capacity to generate coherent new order (Image 2 below). This occurs through participation in emergence, adding comprehensibility and meaning to responses in the face of uncertain outcomes.

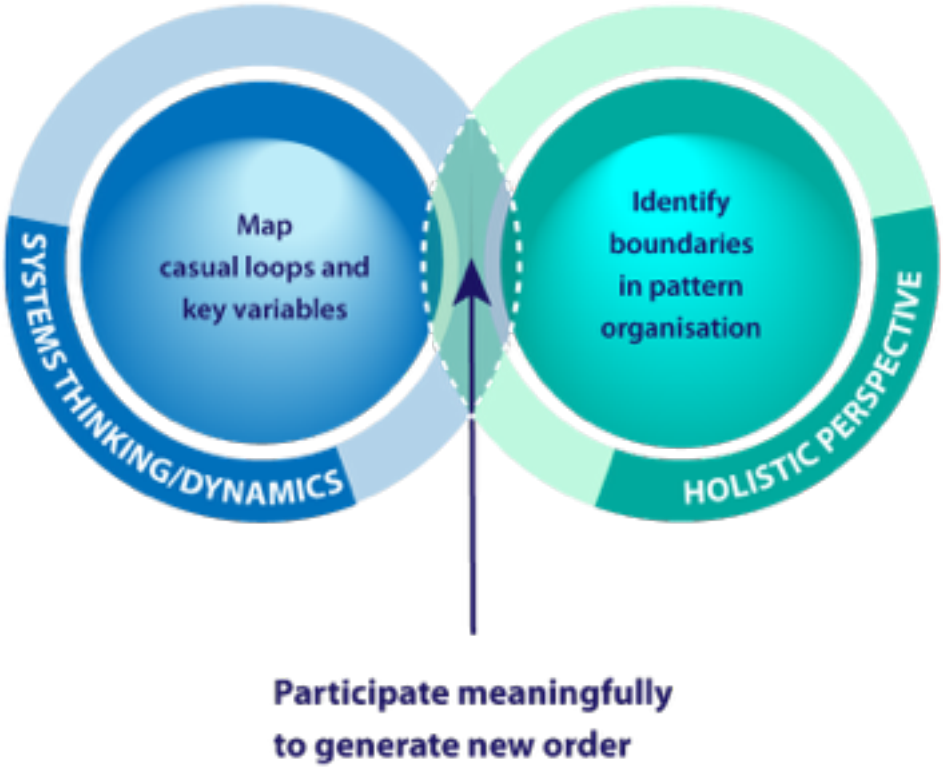

Image 2: Practitioner opportunities in the STD/HP interstice

7. 'Edge of Chaos' - Bridging Epistemology/Ontology

The concept of the 'edge of chaos,' situated between order and disorder, is essential in understanding how complex systems function and adapt. Here living organisms strike a balance between stability and evolvability, as highlighted by Kaufman (1991). For holistic systems practitioners, engaging with the 'edge of chaos' is crucial to move beyond the idealised modelling of a sustainable future world and foster the emergence of regenerative cultures rooted in dynamic, place-based holistic coherence.

'Edge of chaos' is where life thrives, and it's also where the problems of living systems are found. Straying too far into order or disorder can lead to system failure. This principle guides adaptive problem-solving and informs design decisions. Many contemporary problems arise from attempts to maintain

excessive order, resulting in the introduction of high levels of disorder. When systems thinking is rooted in mechanistic metaphor, there's a propensity for an overemphasis on order. The lack of understanding inhibits effective action within the realm of living systems that naturally operate at the 'edge of chaos.' In contrast, holistic systems thinking and practice embraces living systems as functioning in this dynamic zone and structures actions accordingly.

Fortuitously systems thinking/dynamics has evolved into complexity theory, offering a new scientific lens through which to perceive the world. It demands more than logic and reason. Goodwin (as cited in Wahl, 2001) emphasises that when working with complex systems, practitioners must engage their intuition and feelings as essential components of intelligence for comprehending and sensing the dynamics at play. The concept of 'living on the edge of chaos' implies experiencing the world as an ever-evolving process. While predicting precise outcomes is impossible, sensitive practitioners can still discern the general direction of movement.

Meadows (2008), known for her predictive work on limits to exponential growth, as influenced by Forrester's system dynamics, calls for careful system analysis (identifying causal loops) to pinpoint potential 'leverage points.' Yet the underlying metaphor of 'leverage' remains rooted in the mechanistic paradigm. Advocating for a shift from mechanistic modelling and disruptive intervention to co-evolutionary organismic participation, holistic systems practice embraces the insights gained from the concept of the 'edge of chaos' to seek more subtle opportunities for sensitive adaptation and emergence.

In recapitulating, in the context of holistic systems practice, systems thinking/dynamics can offer valuable insights into potential areas of agency, empowerment, and influence. 'Edge of chaos' underscores the need to balance flexibility and stability, especially in the context of design, to prevent structural failure in complex adaptive systems.

8. Applying Systems Thinking/Dynamics in 'Edge of Chaos' Conditions

'Edge of chaos,' situated between order and chaos, is the fertile condition that allows for the right balance of openness and structure, creating an environment conducive to autopoeietic adaptation. Autopoiesis, described by Maturana and Varela (ibid), refers to the ability of living systems to actively seek conditions for their own thriving. In this condition, even interactions among specific elements that connect with only a few others can have cascading effects throughout the system due to non-linear direct and indirect feedback loops,

including energy and information exchange with the larger environment. Without the coherence enabled by subtle autopoeitic adaptation, these interactions push the system into a far-from-equilibrium state, which can lead either to system collapse and disintegration, or the emergence of a new order.

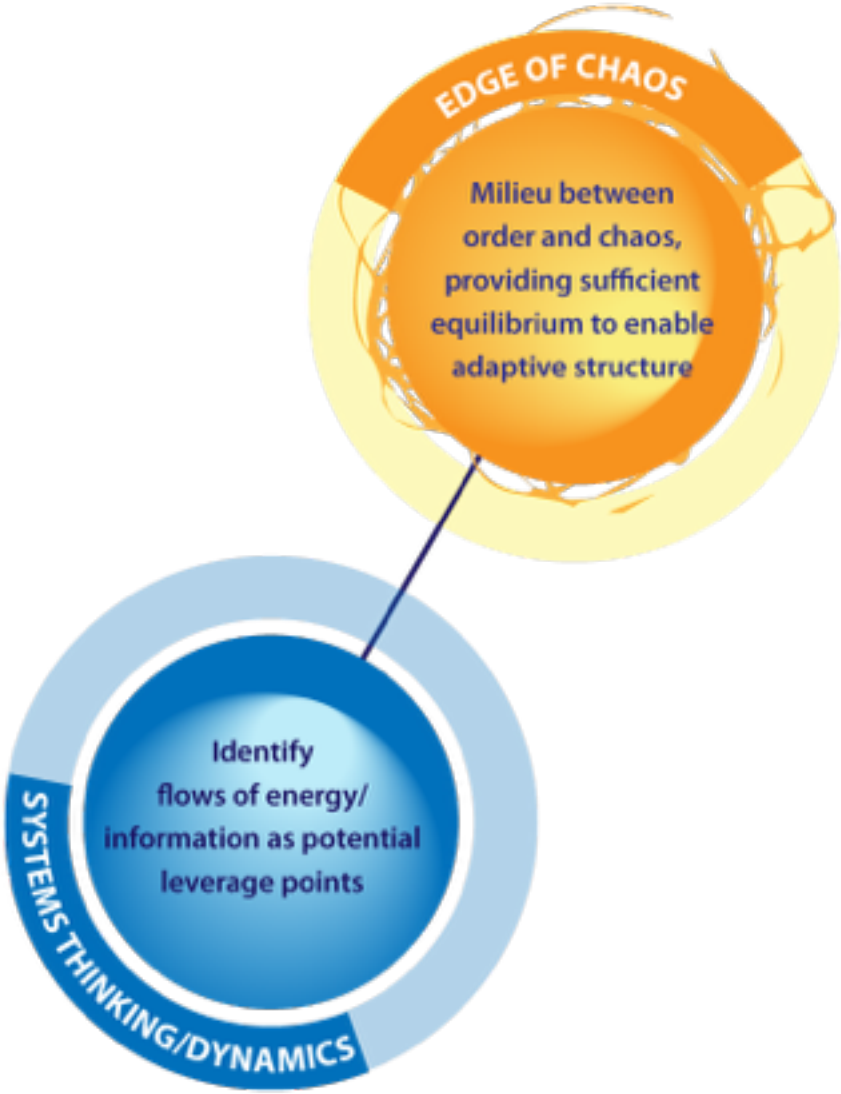

Image 3: Applying systems thinking/dynamics (STD) in edge of chaos (EoC) conditions

In 'edge of chaos' (EoC) conditions, systems thinking/dynamics (STD) is the requisite tool for recognising causal loops and key variables, enhancing the capacity to identify potential areas for intervention or collaboration. (Image 3 above) This recognition empowers agency. The dynamic and fluid nature of the 'edge of chaos' provides the conceptual framework for understanding emergence. By helping to identify the flows of information and energy within the system, practitioners can assess potential areas of influence to be engaged with through sensitive probing and intervention (Image 4 below).

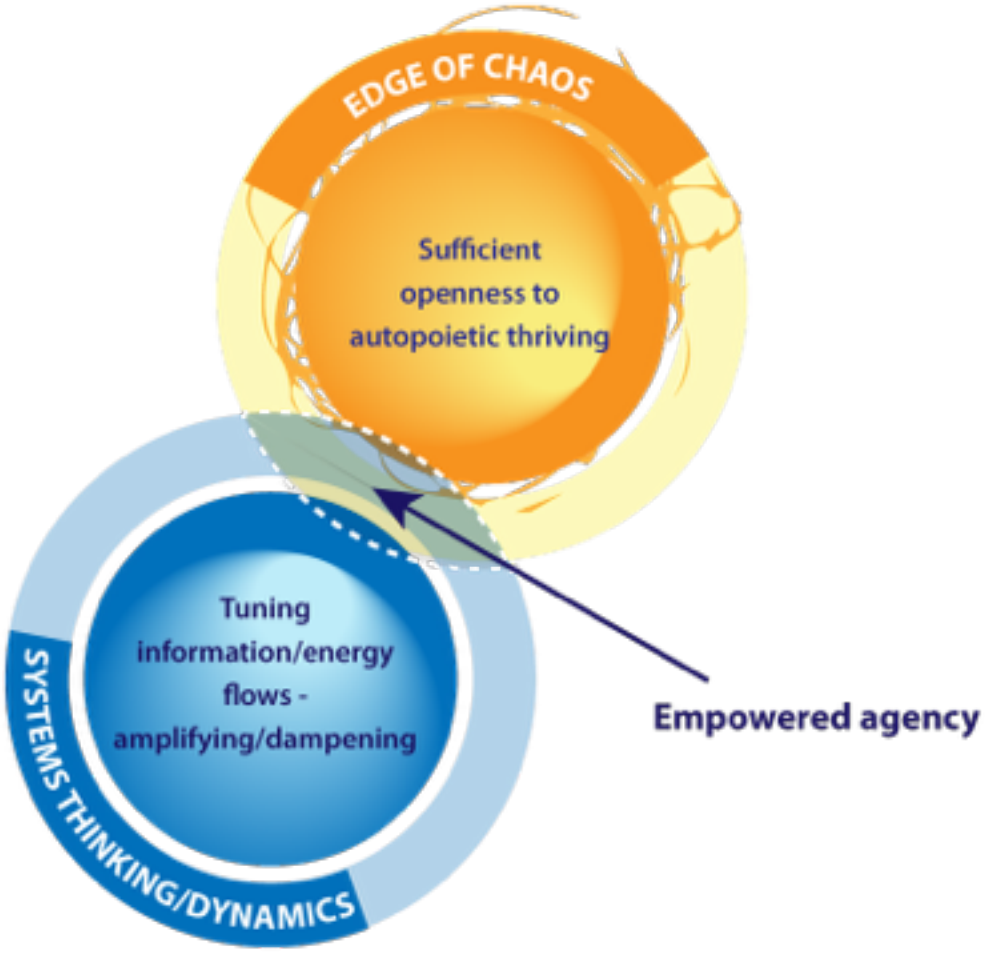

Image 4: Opportunities for practitioners in the STD/EoC interstice

9. Uncovering Opportunities in Dynamical Holism

A critical dynamic identified by Cilliers (ibid) is that complex systems possess memory distributed throughout the system. Consequently, any complex system has a history that significantly influences its behaviour. Holistic systems practice calls for a deeper immersion and sensitivity with such 'memories' to access the underlying intelligence and purposiveness of localised systems. 'Makana' demonstrates that efforts can be redirected toward accessing and collaborating with perspective and agendas within systems to enable their further evolution.

This opportunity of engaging with the reality of multidimensional nature of institutional memory has bearing when considered within the broader context of transitioning to a sustainable world. It inevitably brings uncertainty which needs to be navigated by fostering effective participation. That is why Wahl (2016) argues that the notion of achieving sustainability is not enough. He proposes that holistic practice should aim to enable regenerative cultures.[10]

[10] https://designforsustainability.medium.com/sustainability-is-not-enough-we-need-regenerative-cultures-4abb3c78e68b

Hence, holistic systems practice, embracing ‘edge of chaos’ can enable the development of such regenerative cultures. In the interstitial space between systems thinking and holistic systems practice, enriched with insights from the 'edge of chaos,' a conceptual bridge can be found to transform practice through an organismic perspective. In recapitulation this perspective emphasises adaptive living interactions and helps identify the functional 'whole' (ecosystem) under consideration. It also reveals the complex flows of energy and influences that shape the system's structure and patterns.

10. Integrating 'Edge of Chaos’ (EoC) and Holistic Practice (HP)

Of vital significance is that the interstitial space between the 'edge of chaos' and the holistic perspective helps practitioners anticipate potential bifurcation conditions. As recognised by Kaufman (ibid), these conditions can lead to new order or disintegration (Image 5 below). Thus, informed by holistic systems practice, enhanced agency can contribute to the generation of more coherent order. It is considered that this factor of emergent new order, albeit a temporary phenomenon of dynamical wholeness, drives evolution. It includes, as will presently be shown, the potential for an increased regenerative agency within human consciousness.

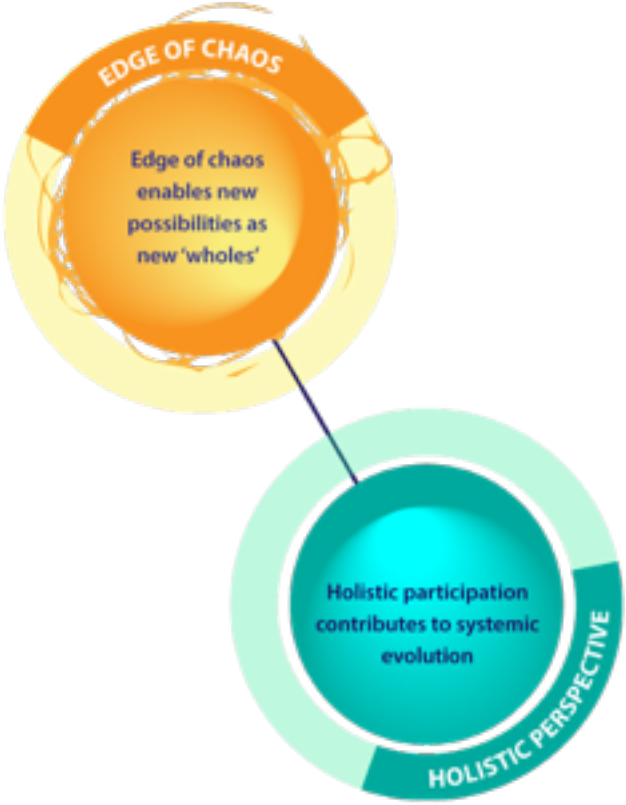

Image 5: Insights into Edge of Chaos (EoC) from the holistic perspective (HP)

Conditions that enable new order or disintegration include understanding that wholes in nature are emergent possibilities that behave differently. The holistic perspective, provides the conceptual space to understand and anticipate potential bifurcation conditions. This deeper understanding enhances the ability to engage with and influence the dynamics of complex systems in ways that promote coherence and positive evolution (Image 6 below).

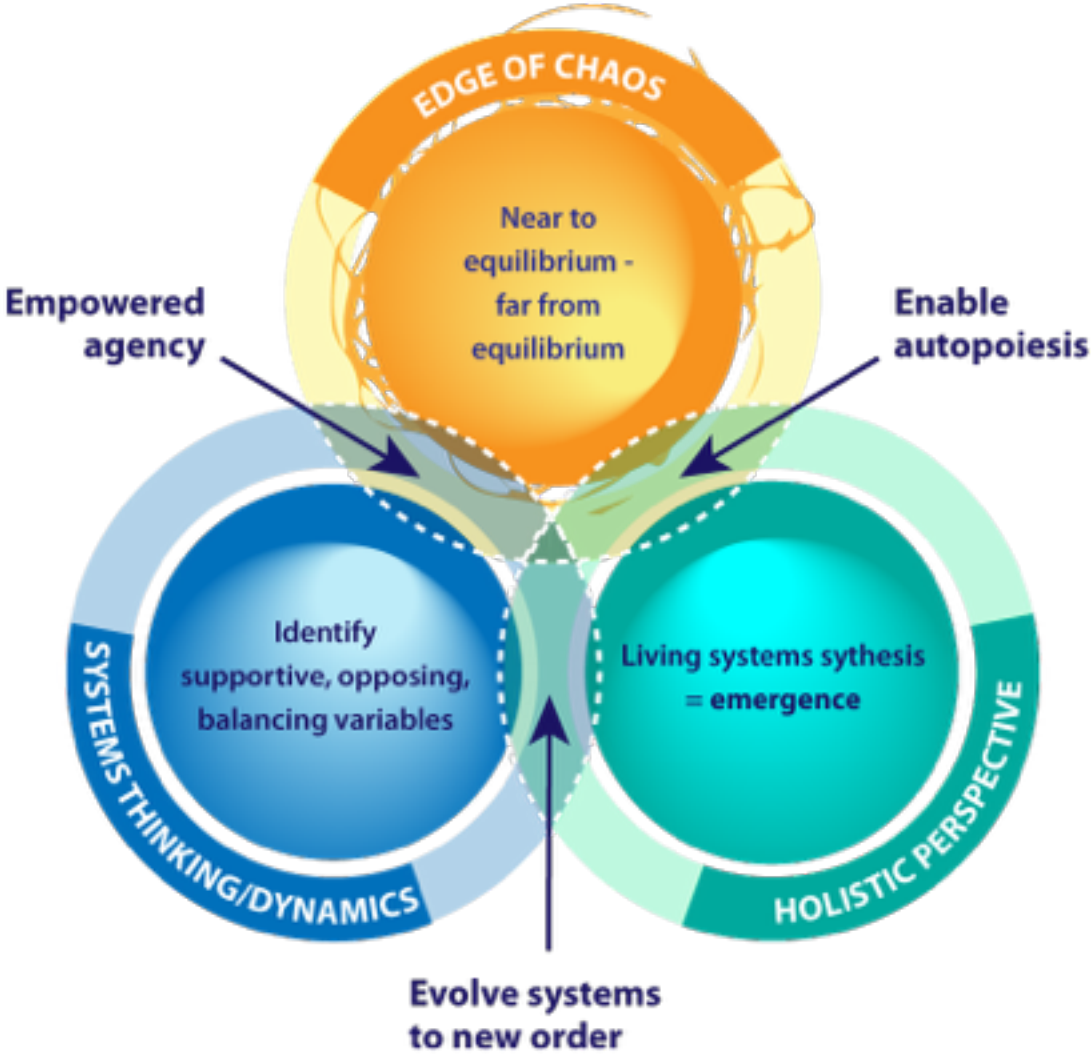

Image 6: Unveiling a trinity of hidden opportunities in Holistic Practice

11. Holistic Systems Practice and the Role of Complex Reflexive Adaptive Intelligence (CRAI)

The challenges posed by the impending 'seismic shift,' has been shown to call for leadership at all levels to prepare for a new era and actively shape it. Complex Reflexive Adaptive Intelligence (CRAI) offers a way to engage with complexity and emergence in a more holistic manner. This phased approach places the problem-solver at the centre of the problem-space, fostering

adaptability, creativity, and intuitive intelligence. It aims to empower communities to address local challenges within the larger wholes in which they are embedded, particularly to cope with those that arise on the 'edge of chaos.' Proposed by van Wyk (2020), CRAI rests on the complexity principle that all living systems possess autopoietic qualities and adaptive intelligence. The eight phases of reflection in CRAI involve (i) sensory-specific identification of the problem-space, (ii) identification of enabling meta-outcomes, (iii) differentiation between 'complicated' and 'complex' issues, (iv) adoption of the problem-solver's perspective, (v) mapping of the problem space in terms of agencies and feedback-loops, (vi) exploration of collaborative opportunities, (vii) generation of multiple scenarios, and (viii) curation of insights.

With the problem-solver at the centre, CRAI enables a responsive approach to sensing and recognising subtle emotional signals accompanying the experience of dysfunction. Values, beliefs, emotional states, and motivational stances, as emphasised by Bilder and Knudsen (2014), are considered in the causal loop 'mapping' and identification of variables. The holistic systems practitioner applies reflexivity to question own stance. In this way CRAI coevolves with an emergent mental framework to support holistic systems theory and practice. This has bearing on Schumacher’s (ibid) distinction between epistemology (what we can know) and ontology (what actually exists) as we move ‘higher up the chain of being’. The increased complexity, ‘higher up the chain of being’ implies increased uncertainty. The empowering view is that the embrace of uncertainty serves to recreate a functional space between Korzybski’s (1933) ‘map’ and the ‘territory’. Thus, CRAI empowers the response awareness for holistic systems practitioners to more effectively navigate complex systems and assist others in doing so. Especially reflexivity, evaluating own contribution, informs process-oriented, responses. CRAI is thus essential in balancing flexibility and stability — critical when human subjectivity is involved. Integrating social and ecological dynamics, as argued by Martin and Schluter (2015), presents challenges due to differing paradigms, analysis levels, temporal and spatial scales, and data availability.

A crucial aspect of generative holistic systems practice is understanding that complex systems can unexpectedly exhibit significant degrees of new order, as recognised by Kaufman. This capacity underpins emergence and development of life on Earth. The concept of path dependency, or the herd effect, within complexity theory demonstrates how positive feedback loops can generate emergent order. It is postulated that with the practitioner’s sensitive immersion in whole systems, a greater awareness of the underlying intelligence and purposiveness of these systems can emerge. The practitioner becomes a co-creative agent in the emergence of more coherent order.

Moreover, studies in cognitive science find applications of 'edge of chaos' in cognitive processes and brain activation states. It accounts for trends, fads, and other manifestations of collective psyche. In individuals it accounts for the cognitive ‘breakthrough’ moment, and ultimately it accounts for ‘culture’. This has particular relevance to creative cognition. Accordingly Bilder and Knudsen (ibid) specifically emphasise that approaching the 'edge of chaos' necessitates a shift from linear deterministic approaches to those that encompass emotional, cultural, and spiritual intelligence. What this challenge hints at is a deeper shift with holistic systems practice from typically advocated enhanced interpersonal skills, to Hanh’s (2017) insight of *‘interbeing’* as the deeper experience of wholeness. This quality of awareness can better support the delicate balance between structure, flexibility, and innovation, especially in managing complex projects. Embracing uncertainty and harnessing society's potential for adaptation and innovation, holistic systems practitioners, access their ‘complex reflective adaptive intelligence’.

12. Discourse: Unpacking Interstitial Spaces and the Paradigm Shift

In the face of momentous pending global disruption it has become evident that our current approaches are ill-suited to confront the looming challenges as we step into a new era. Against this backdrop, our central focus in this discourse has revolved around the intricacies of transitioning towards a sustainable world, amidst the swirling currents of uncertainty and turmoil. At its core, we've probed the question of how we can foster a holistic systems perspective to better grapple with the urgent issues at hand. We’ve shown that computation does hold promise in tackling complexity, yet proponents of holistic perspective argue that true progress hinges on a profound shift in human consciousness.

In our quest has been to identify the barriers that hinder humanity's contribution to this endeavour. We have pinpointed the lack of a comprehensive holistic understanding, one grounded in the principles of living systems and organismic thinking. A deeper comprehension of this perspective will radically reshape our approach to sustainability. By empowering the emergence of regenerative, place-based cultures, a broader societal paradigm shift through localised efforts can be fuelled.

In grappling with the complexities of our world, our approach to systems thinking has come under scrutiny. We've presented the case that to engage with the inherent uncertainty of complex systems, systems theory must embrace the transformative epistemological framework that fully embraces 'edge of chaos.' We’ve suggested this state, akin to the conditions in which regenerative living

systems thrive, allows us to engage with the concept of 'emergence' — a concept of profound importance in a world teetering on the precipice of either disintegration or the emergence of new order.

In our endeavour to transition from systems thinking to holistic systems practice, we've discovered valuable insights in the interstitial spaces that lie between systems thinking, the 'edge of chaos,' and the holistic perspective. This interstitial space, as enriched by the insights of 'edge of chaos,' serves as a conceptual bridge that transforms practice through an organismic lens, emphasising adaptive interactions within living systems. This integrated approach aids in identifying the functional 'whole' or ecosystem under scrutiny, shedding light on the intricate flows of energy and influences that shape the system's structure and patterns.

Crucially, systems thinking, including the tools of system dynamics, identifies key variables to inform ontologically sound design. By shifting focus from static 'solutions' to the nurturing of regenerative cultures, we empower ourselves to align with the innate synthesis and dynamical coherence within living systems. In addition the interstitial space between the 'edge of chaos' and the holistic perspective provides insights into anticipating potential bifurcation conditions — either a descent into disintegration or the emergence of new order. Whereas chaotic situations could lead to either outcome, enhanced agency, informed by holistic practice, can contribute to the generation of more coherent order. This, in essence, fuels evolution, including the evolution of human consciousness through increased regenerative agency.

Armed with insights gleaned from our exploration of 'edge of chaos,' we stand on the brink of creating a more harmonious and self-sustaining emergent order. We cannot overstate the importance of cultivating a heightened state of consciousness, one derived from enhanced 'sensing' and 'presence.' This entails recognising the significance of both process and structure in the development and maintenance of systems within specific contexts, a pivotal aspect in nurturing regenerative cultures. This concept is inherently tied to specific places, marked by their own complexity, dynamism, and unpredictability. As places are intimately intertwined with human agency, the scale of feedback loops becomes critical for meaningful and impactful human actions. Engaging with a place implies a fundamental interaction with nature, either in a de-generative or regenerative manner. Hence, the holistic perspective continually underscores the dynamic and participatory nature of our roles. Developing the reflexive capacity to identify effective practices in local conditions for future application, adjusting as necessary, or transforming them, lies at the heart of place-based regenerative cultures. This calls upon individuals and communities

to cultivate open perceptual filters, attentively listen to the subtle signals within, and gain a profound understanding of feedback loops and other systemic relationships.

Finally this discussion inherently touches on resilience, the capacity to rebound from temporary breakdowns or crises by preserving interconnected patterns that strengthen the entire system. From a systemic perspective, sustainability revolves around safeguarding these interconnected patterns within our complex eco-psycho-social system. In recapitulation, our path forward requires embracing appropriate participation, rather than the futile pursuit of prediction and control. That is why through deeper immersion and heightened sensitivity, we can unlock the underlying intelligence and purposiveness of localised systems. Then our efforts can be redirected towards collaboration with and within these systems to facilitate their continued evolution.

13. Conclusion: Pioneering a Regenerative Future

While the aspiration for a sustainable world remains an apparently desirable goal, it is evident that sustainability, in and of itself, is not sufficient. Beyond merely maintaining the status quo, the true objective is to safeguard the fundamental essence of vitality, adaptability, and resilience that enables all life on our planet to coexist harmoniously. This perspective opens up new horizons, envisioning a human culture that not only sustains but regenerates—a culture that nurtures our planet and all its life forms, recognising that this is the surest path to a thriving future for humanity.

The essence of achieving this transformative paradigm shift lies in the cultivation of heightened consciousness and presence, which in turn, is empowered by Complex Reflexive Adaptive Intelligence. By nurturing this innate capacity, individuals and communities can respond with greater agility to the ever-shifting and unpredictable landscapes that we face. This, in turn, fosters increased engagement, collaborative efforts, and resilience, all rooted in the wellspring of collective wisdom, creativity, and ingenuity. With these emergent manifestation of ‘interbeing’, humanity not only has the potential to embrace a generative and purpose-driven approach to tackle the profound challenges and opportunities that lie ahead, but also to catalyse our own evolution.

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