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Adaptive Intelligence - catalysing an evolutionary economic transformation

Claudius van Wyk

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Systems Thinking and the Circular Economy

Executive Business Centre, Bournemouth University

Title:

Accessing Complex Adaptive Intelligence for a Circular Economy - a Meta-Perspective.

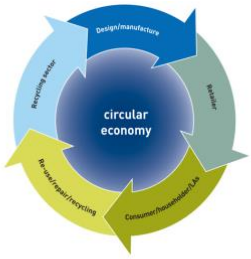
Abstract:

This multidisciplinary meta-perspective offers complex adaptive intelligence (CAI) as a holistic approach capable of integrating epistemology and ontology with behavioural and evolutionary economics to assist the implementation of a circular economy. We propose (CAI) as an inherent capacity of all living systems at different levels of evolutionary development. By modelling the structures of subjective experience humankind can re-access this capacity. This will help fast-track the epistemological shift required to transform prevailing economics from the extractive practices degrading our life-sustaining milieu, to sustainability.

We address the dichotomous tension between epistemology and ontology in economic theory from a phenomenological perspective. As such 'experience' unifies subject and object and accesses CAI by enlisting the motivational role of emotions, as energy seeking purpose.

The ontological view embraces evolutionary economic practice to challenge prevailing assumptions embedded in economic epistemology. The incremental social and economic impact arising from those assumptions emphasises the need for a shift from a mechanistic and linear, to an organismic and non-linear viewpoint. Autopoiesis, as self-organisation, characterises living systems and, as such, ultimately defines 'complex adaptive intelligence'. This insight will be able to inform a new economic narrative to support sustainable approaches, such as the circular economy.

In accessing CAI we differentiate 'complicated' from 'complex' situations and recognise our personal contribution to the problem-space. Thereby we enhance the capacity to 'map' multi-dimensional and complex dynamics.



Key words: Complex adaptive intelligence (CAI), circular economy, economic epistemology, ontology, phenomenology, autopoiesis, self-organisation, coevolution

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Introduction

The distinction of epistemology (what we can know) and ontology (what actually exists) becomes significant as we move higher up the Chain of Being" - E. F. Schumacher

The circular economy aims to address the economic challenge to human and planetary sustainability. The challenge is to introduce change on scale sufficient to impact the problem-space. We consider Schumacher's challenge on epistemology namely, what we can know, and ontology namely, what has come into existence, as being relevant to economic theory. Beinhocker (2007) in highlighting flaws in conventional economic theory and drawing insights from complexity theory especially focuses on economic non-linearity. This suggests that changing economic praxis will also demand a fundamental reformulation of underlying economic assumptions. The gap between designing economic models, and proactively changing the status quo, presents an additional challenge. Gladwell (2005) shows how behavioural economics embraces the reality of the embeddedness of human habits in economic behaviour. 'Nudge theory', Thaler et al (2008), endeavours to address this by influencing collective human behaviour. Consequently in this paper we respond to Morin's (2008) challenge of *'developing an epistemology of complexity appropriate to the knowledge of human beings'* .

Schumacher's ontological challenge applies both in respect of economic momentum, the deep institutionalisation of its praxis, and economic evolution, its emergent nature. Whilst Thorsten Veblen (1898) originally introduced evolutionary economics, complexity thinkers such as George Rzevski (2012), describe the emergent stages of economic evolution and their technological platforms from the industrial revolution to the digital knowledge economy. Currently economic theorists in striving to address the challenges of the so-called fourth 'artificial intelligence-driven' industrial revolution, might still be trapped in a materialistic perspective.

The successful implementation of a the circular economy, with its aim of rebuilding overall system health, could represent such a further economic evolution. We correlate 'health' to 'wellbeing, and link that in turn to the drive to coherence, as autopoiesis. The transition demands more than reducing the negative impacts of the extractive materialistic economy. It must promote a systemic shift that embraces the contributory principle of interdependency to build long-term resilience, generate economic opportunity, and provide environmental and societal benefits.

Any fundamental transformation requires an accompanying epistemological shift to provide the broader enabling context. Amrine (1946), interviewing Einstein on his oft-quoted observation that *"…a new type of thinking is essential if mankind is to survive and move to higher levels",* found the comment was directed at the use of nuclear energy. Now we contend that with the growing ecological threat presented by our economic activity, the cultivation of CAI would be that 'new type of thinking'. By assisting individuals and communities to greater awareness it could better inform 'safe-to-fail' experiment on the micro-scale with new economic practice. Senge, commenting on Zohar and Marshall' (2004), identifies the challenge of perspective in any such systemic shift:

'…science today understands that living systems are very special systems with unique qualities that distinguish them from most non-living systems…the search for the qualities of full human intelligence must slip sideways into…the realms of complexity theory and the complex adaptive systems that it describes.'

Systems thinking and the circular economy

The circular economy intends to reduce the environmental impact of conventional methods of production and consumption and drive greater resource productivity. Systems thinkers consider how the circular economy can address future resource security and scarcity issues. Fioramonti (2017) regards the concept as redefining growth to focus on positive society-wide benefits, decoupling economic activity from the consumption of finite resources. The question for systems thinking will be whether striving to design waste out of the system will be addressed from a materialistic or organismic perspective. Jan Smuts in his 1931 Presidential Address to the British Association for the Advancement of Science, addressed the ontological question by predicting the impact of the new physics:

"Materialism has…gone by the board, and the unintelligible trinity…matter, life, mind…has been reinterpreted and transformed and put on the way to a new monism."

Thinkers like Capra and Luisi (2014), whilst contending that conventional economic theory has lagged behind praxis, refer to the current phenomenon of the '*dematerializing of our productive economies'*.

Cook (2004) promotes 'the natural step' approach to be an alternative 'sustainable' economic model informed by thinking based on systems theory and a scientific approach to complex issues. This demands a new whole-systems science. In the foreword to the book, Robert identifies the epistemological problem. Contrasting the desire to *"…help decision-makers put sustainable development into action"* with the challenge of the *"…seduction of comforting and familiar habits"* he warns:

"Science…follows a similar reductionistic pattern and does not help us to see the wider picture or the wider consequences of our actions" .

For Cook, getting a better view of the whole system needs improved knowledge of what is going on 'upstream' where the problem begins. A science-based dialogue that addresses complex issues like the human generated system conditions that break the cycles of nature is proposed.

Whilst we recognise the value of systems thinking in striving to model all the relevant factors, we assert that dealing more effectively with the complexity of human generated system conditions requires accessing CAI to address subjectivity. Beinhocker (2007) describes 'economy' as a complex adaptive system, as he puts it; '*a teeming evolutionary stew'.* The processes of economic evolution; differentiation, selection and amplification, are driven by the complexity of the biosphere which, in turn, drives the growing order and complexity of '*the econosphere'*. CAI also embraces this complex whole system perspective.

Spinosa et al (1997) refer to post-structuralism when identifying the underlying cultural dynamics and emphasise the growing importance of relativism versus formalism when considering institutions. Dewey and Piaget with their constructivist formulation lay the groundwork for a more focused inquiry into the cultural dynamics to be addressed in transforming economic systems. Post-structuralism claims that the ontological thesis, what appears to be 'natural', is an effect of social processes and practices; and that the epistemological thesis, knowledge of social phenomena, is itself socially produced. It asserts that with the methodological thesis the investigation of the social construction of reality needs to take priority over other methodical procedures. By exploring CAI we will endeavour to address this requirement to assist a change in economic behaviour.

A glaring example of such an epistemological challenge is encapsulated in Margaret Thatcher's TINA acronym that *'there is no alternative'* to the market economy. Spinosa et al (1997) by implication confront such a limiting view when they declare:

'Human beings are at their best not when they are engaged in abstract reflection, but when they are intensely involved in changing the taken-for-granted, every day practices in some domain of their culture…'

By embracing subjective experience CAI strives to address the drivers of the problem-space of institutional, individual and collective economic behaviour. Ormerod (2012) considers this challenge through the lens of network theory. Network effects can now be more effectively employed to influence human behaviour. The 'nudge theory' of Thaler et al (2008) offers incentivization of 'good responses'. Ormerod adds a cautionary of our compelling human tendency to imitate each other. He considers bringing together these two factors of employing incentives and the tendency to imitate. (The Chinese 'social credit system' could represent a more recent application of 'nudge' theory.)

Human emotion

With behaviour being geared for adaptation, CAI accepts present behaviour as the best available choice, and emotion as the energy driving that behaviour. The application of CAI would thus refrain from blandly considering emotions, such as economic appetite and aversion, to be problematic. They are regarded as potential signals of a deeper need to engage in the on-going drive to coherence. Autopoiesis, as originally described by Maturana and Varela (1980), is the process of re-establishing coherence. We can therefore potentially calibrate our core value assumptions, the sets of criteria that inform our behaviour, with a state of coherence Since this view can help enhance our dynamic engagement with the drivers of economic behaviour, emotion-driven values become an important functional agency to be mapped in complex systems.

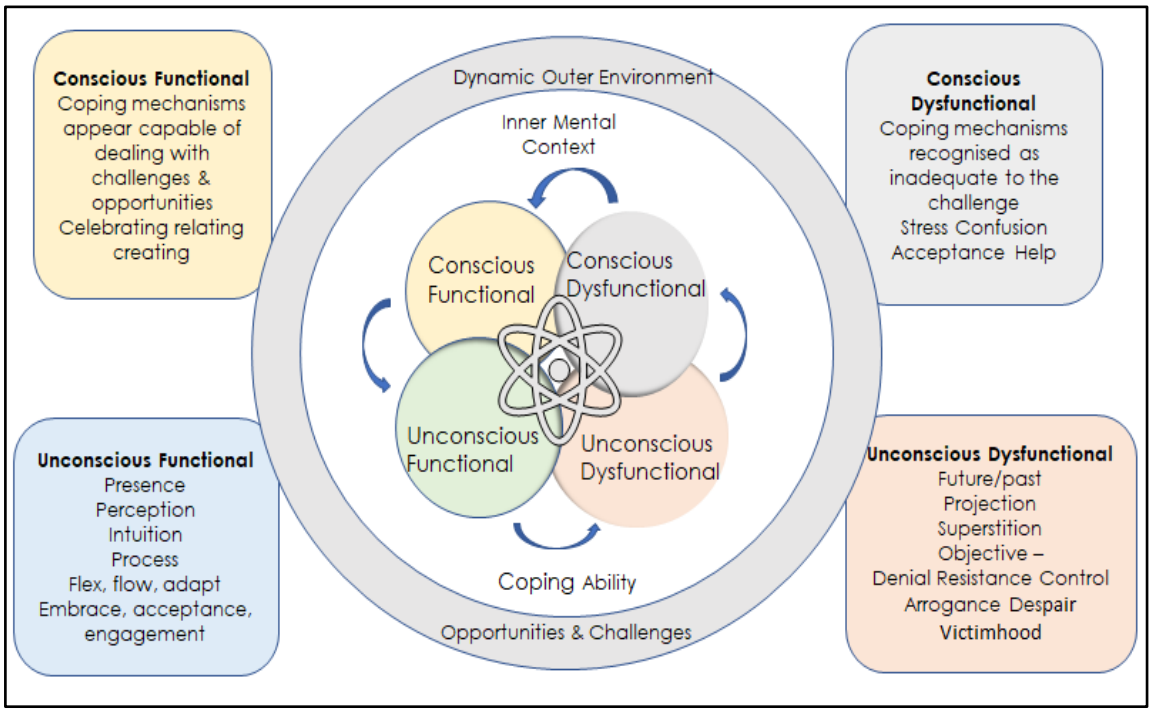
When applying the CAI approach experience often reveal the identified problem-space as the ripple on the surface of deeper undercurrents. We discover that we ourselves are active contributors to our perceived challenges. In accepting the apprehended problem-space as surface evidence of potential deeper dynamics, we recognise the key contribution of our emotional state. Emotions are evidence of a disturbance of coherence and thereby signal the development of a problem-space. Whilst emotional attachments can aggravate a problem-space, rather than suppress them, they not only offer potential new awareness, but provide the energy to address it.

Problem-solving and the phenomenological stance

In the '*Process and Emergence Tool'*, van Wyk (2012), a change in the living context results in a previously 'unconsciously functional' response becoming 'unconsciously dysfunctional'. Since a typical response is to externalise the problem, circumstances might need to become sufficiently uncomfortable before we recognise our behaviour as being consciously dysfunctional. At this juncture we can introduce Borthoft's (2012) phenomenology perspective on the nature of first person experience, and hermeneutics, on the process of interpretation. Contrary to the notion that all we can accurately map is the behaviour, emotional 'state' is the more effective indicator to apprehend and comprehend the tension between the dynamic context itself and our interpretation of it. A shift in perspective occurs when we willingly embrace emotional responses.

With CAI frustration, anxiety, deprivation, or aversion, as signals of disturbed coherence, can serve to prompt the response of re-evaluating and adapting behaviour. The conscious personal recognition when behaviour becomes dysfunctional enables a willingness to experiment with new responses. This accords with the contention of Spinosa et al (ibid) about *'history-making'* as '*…changing some everyday taken-for-granted activity'*.

In considering requirements to implement a circular economy, we can now recognise that whole sets of behaviours will of be challenged. As suggested new opportunity is unlocked with personal insight into the contribution of our economic behaviour to social and environmental degradation. Recognising the systemic and institutional challenges to be addressed, it requires a structural reorganisation in consciousness, individually and collectively. A collective sharing in both the 'pain' and 'responsibility' for the world invokes a personal 'evolutionary transformation'. The challenge is that unconscious responses, are deeply ingrained habits. This is the 'culture' as addressed in post-structuralism. A conscious response requires a shift from 'reactivity' to 'responsibility'.



Functionality versus dysfunctionality

In a 'slower' world accepted practice, including that considered 'evidence-based' with the accompanying logics, will continue to work well and represent conscious or unconscious functionality. We habituate response into unconscious functionality - 'good' individual or societal habit. In a 'fast-paced' world of change the once functional habit has a shorter life-span and easily slips into unconscious dysfunctionality - a 'bad' habit. By accessing CAI individuals and organisations become aware when responses become dysfunctional. More sensitive responses to subtle signals (both sensory and intuitive) helps indicate when commonly accepted praxis is dysfunctional. In a complexifying and interrelated world we, the problem-solvers, can no longer be positioned external to the problem-space. This perpetuates the subject/object dichotomy whilst we as 'observers' continue to address challenges with so-called tested and 'evidence-based' strategies *"…the seduction and comfort of familiar habits"* described above by Robert, in Cook (2004).

The subject/object dichotomy challenges practitioners of systems and complexity theory who might still operate from a materialistic perspective to learn not only model, but also to experience subjectivity . When employing CAI to address economic behaviour the 'experiencer' of the problem-space is thus positioned at its centre.

We have been guided by the contribution of two seminal thinkers who anticipated such a phenomenological approach. Smuts (1926) saw 'experience' in his holistic thesis as unifying subject and object, thereby bridging Descartes' matter/mind dichotomy. Einstein's 'relativity' demonstrated the real action of the universe not to be constituted by 'parts' but by the complex interactions of energetic entities. With this insight we recognise our actions are embedded in a greater field of wholeness, thereby having a direct bearing on economic behaviour. Zohar and Marshall's (2006) put it eloquently:

"Holism in science is a defining quality of both quantum and complex adaptive self-organising systems … the relationship of the different parts of the system help to define not just the system itself… but to give final form to the parts themselves…the emphasis is on 'stakeholder value', where stakeholders include the human race, present and future, and the planet itself".

In applying CAI to a problem-space we focus on those core elements that can be positively influenced to redirect the involved agencies to the desired outcome. In a six-phase process we -

- identify the deeper undercurrents of the problem-space
- differentiate between simple/ complicated, and complex/chaotic situations
- focus on individual and collective contribution to 'map' the significant agencies
- identify ways to influence key actors and enablers
- integrate the learnings.

Coupling a transformed epistemology to the change process

We have suggested 'autopoiesis' the principle of self-organisation, as a potential key to assist in introducing a transformed epistemology. The growing universal access to information and the rise of social media focusing on our human and technological ecological impact, might bring us closer to a collective shift in consciousness. New physics writers, Currivan (2017) and Davies (2019), emphasise that the shift must be from the materialistic and mechanistically linear, to a non-linear living systems and information-based viewpoint. For us the comprehension of autopoiesis, especially when experienced in oneself, can open the window to new perspective. As Smuts (1926) explains:

"…Self can only come to realisation…of itself, not alone and in individual isolation…but in society, among other selves with whom it interacts in social intercourse[1]… The function of the ideal of freedom is to secure the inward self-determination…[2]"

The deeper implication for CAI practitioners will therefore be to willingly seek out and re-interrogate our own assumptions.

[1] Holism and Evolution p. 245
[2] Holism and Evolution p. 314

Adaptive qualities

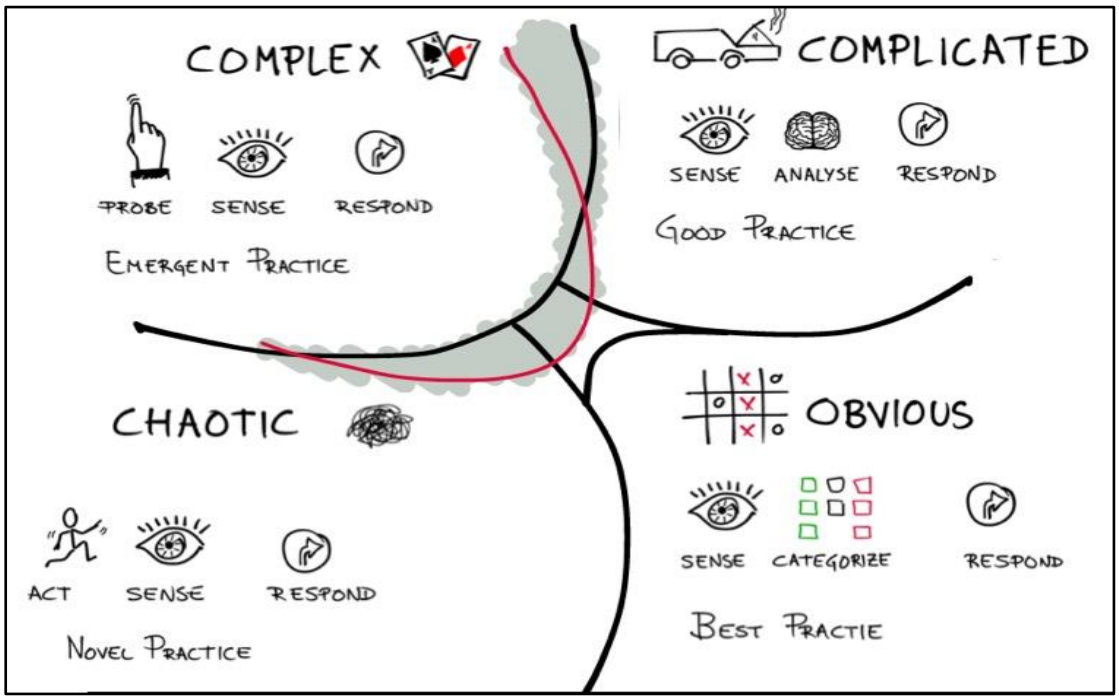
Graves' study of emergent consciousness (in Cowen and Todorovic 2005) concluded that the next evolutionary transformation of consciousness might re-access previous intuitive human adaptive qualities. We consequently consider that as we co-evolve with the technological advances changing our economic, political, and social landscape, an enhanced intuitive capacity might become the pre-eminent factor in enabling and developing CAI. This becomes even more important with the rampant hi-tech exploration of biosynthesis and genetic manipulation driving the fourth industrial revolution. There is a danger of programmers inadvertently embedding outdated assumptions in the algorithms of artificial intelligence. This can be perpetuated in AI self-learning. Re-accessed human intuition might yet become the vital counter-measure.

CAI in practice

The six-phase process below, considered against the described context, elicits a deeper understanding of the human factors involved in the economic problem-space.

Phase one: Examining the nature of the economic problem with a specific focus on experience, we recognise the symptoms of our personal difficulties, and their further impact on the greater enabling milieu. We identify the personal and systemic drivers of economic behaviour. We investigate our involvement in the problem-space and why we consider it important to change it. We recognise the wider general impact and re-evaluate previous attempts at redress in order to harvest the learnings. With a better understanding of the deeper dynamics involved we see how simplistic attempts with piecemeal solutions exacerbate matters.

Phase two: We differentiate between simple/complicated and complex/chaotic situations. When applied to implementing the circular economy this offers the opportunity to learn how to discern the challenges that require appropriate 'best practice' applications, and those that demand a new approach. We find Snowden's (2007) 'Cynefin' approach useful in making this differentiation.



'Rational' approaches to problem-solving typically tend to employ statistics to identify the generalities of a situation and then apply evidence-based methodologies. In simple and complicated problem-spaces where all the relevant factors can be identified and linear causal relations tracked, these are helpful. In non-linear complex dynamical situations however, CAI will seek to track emergent patterns in a moving landscape and identify opportunities to influence the dynamics of the direction.

The subjective nature of the experience of a problem-space must be included and adds a significant additional dimension to the consideration whether the problem-space is complicated or complex. Our subjective 'stance', the emotions we experience, affect how we cope with the problem-space. What is a straightforward issue for an expert, might turn out to be a complex situation for us.

CAI and leadership

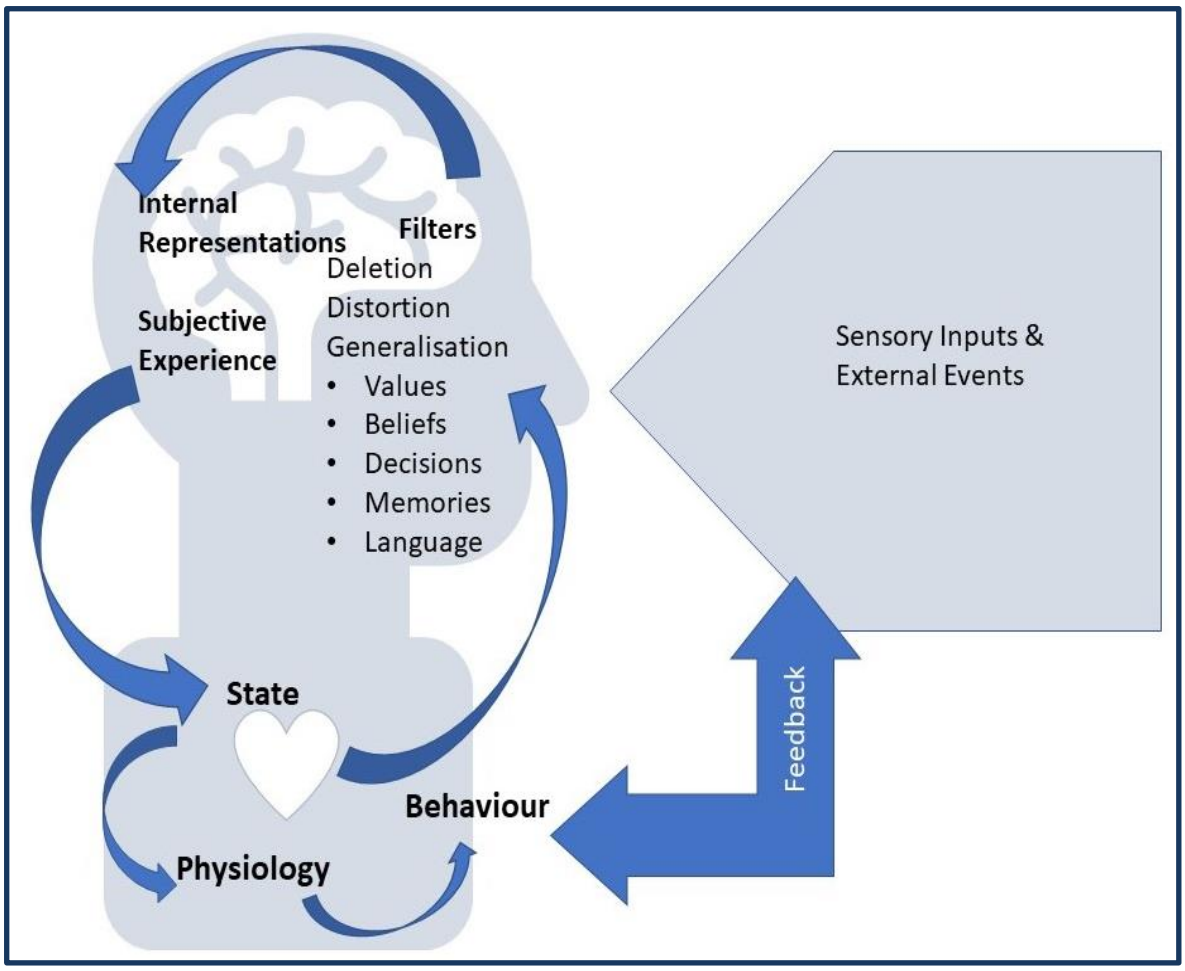
Comparing Snowden's *'Cynefin'* model with the *'Process and Emergence Tool'* we can conclude that a degree of conscious dysfunctionality inevitably accompanies the act of addressing a complex problem-space. We have a typical and natural preference to reduce complex problems to simple, or at least complicated ones. This helps us feel more competent and in control. However when we apply misdirected 'good-practice' solutions that fail, we might be inclined to fall into self-doubt, with the temptation to redirect blame externally. That is because the shift from unconscious dysfunctionality to conscious dysfunctionality typically generates a degree of discomfort. Developing tolerance both with ourselves and with others involved invites nurturing leadership. McKergow (2009) describes this as 'host leadership'. Shifting to the interface between conscious dysfunctionality and conscious functionality calls for courage with a willingness to experiment. Inspirational leadership is now required. Snowden's 'catalytic probe', is a subtle intervention to test responses and detect or intuit potential patterns. With approaches such as 'nudge effect' we can then experiment with amplifying the positive and dampening the negative tendencies.

"I look at the future from the standpoint of probabilities. It's like a branching stream…, and there are actions that we can take that affect those probabilities or that accelerate one thing or slow down another thing. I may introduce something new to the probability stream." Elon Musk

Phase three: With the complexity of the problem-space assessed we examine our individual and collective contribution, honestly assessing the role we as problem-solvers play in perpetuating the challenge. In this phase, when applied to implementing a circular economy, we would also focus on identifying the systemic and organisational contribution to the problem-space, and the accompanying constraints presented by that context. Our generalised perceptions, our unconscious assumptions, beliefs and values, could represent a significant factor in the perpetuation of a problem-space. Smuts, in his 1931 Presidential Address reminded us of this:

"Our world view is closely connected with our ultimate sense of values".

Tad James' representation of Grinder and Bandler's (1982) 'communication model' here below illustrates the structures of subjective experience and perception, and the key role of values.



Korzybski's (1933) phrase *"The 'word' is not the 'event' it describes - the 'map' is not the 'territory'"* establishes that the way we experience and communicate about the world, as a function of our internal subjective representation, is not an accurate description. When we compare the 'map' concept with Bateson's reference to 'epistemology', and the 'territory' to his reference to 'ontology', it serves to further illuminate Borthoft's hermeneutic and phenomenological perspectives. The key issue is the modelling of the world and what is going on in it, and how that is converted into language and concepts. The question thus is how 'modelling' (epistemology) can better keep pace with rapidly changing conditions (ontology). Hermeneutics in turn; the way we interpret, informs phenomena; the way we experience. This serves to amplify Beinhocker's (2007) insights into the drivers of the growing order and complexity of '*the econosphere'*.

Key lessons can be highlighted relating to coherence. Antonovsky (1979) identified essential requirements for maintaining 'a sense of coherence' as 'comprehensibility', manageability, and 'meaningfulness'. Comprehensibility reduces the mass of potential stimuli to which we are increasingly exposed to useful information. We then project recurring patterns into future response to enable a degree of the 'manageability'. Neuroscience shows that our perceptual filters 'delete' the information we consider unnecessary or irrelevant. We 'distort' information to fit our pre-conceptions. We generalise information into assumptions and beliefs. These are then encapsulated in our language; how we 'label' events and entities in our structures of communication. Our subjective responses, the mental and emotional states, are thus not a direct response to the world itself, but to the way we have learned to interpret information. The activities that direct our behaviour follow from those mental and emotional responses.

Since conventional theory presupposes rationality in economic behaviour, the recognition of subjectivity becomes especially important when considering economics Ormerod, Beinhocker, and others when pointing out the fallacy of the rational choice assumption, then also challenge the accompanying principle of linearity. This mitigates against fixed economic laws. More recent writers in physics go further and question the validity of the so-called objective scientific method, especially when related to living system responses.[3] As Smuts pointed out, the importance we attribute to information is a function of the way we apportion values; the sets of criteria informing our responses. They are a function of our life experience. It thus helpful in accessing CAI to understand how we individually delete, distort, and generalize information in interpreting the nature of our problem-space. The human and ecological challenges generated by our prevailing economic activities that the circular economy strives to address, are thus perpetuated either through our conscious wilfulness, or inadvertent complicity.

The economic praxis of neo-liberalism clearly fails to 'map' to critical system dynamics. This relates especially to the 'momentum', as a function of unconscious economic drivers, we identified earlier. At a deeper level, both ideologies remain rooted in mechanistic materialism. This observation applies equally to socialist economic approaches with the founding principle of dialectical materialism.

With a more informed understanding of our personal and shared values, we ought to be able to get to a better understanding of economic behaviour. This is about how we, in the business of exchanging goods and services, delete and generalize information, especially about the consequences. Such a further clarification of our economic values will also serve to address Antonovsky's requirement of 'meaningfulness' as we strive for a greater sense of coherence in bringing about economic change.

Engaging emotion in the exploration of the problem-space

Bateson (ibid) suggests that whilst we might believe we 'think our thoughts', our thoughts are 'thinking us'. Similarly, we conclude, our emotions drive our perception and behaviour. The emotional state affects the way we comprehend the problem-space, hence considering 'emotion' as 'energy-seeking-purpose'. Our challenge in accessing CAI is how to engage with the structures of emotion. Our research follows Eckman (2010) with six, and Plutchnik (2017) with eight basic emotions. We initially adopt those four basic emotions researched by Jack (2014). They are 'fulfilled' (glad), 'frustrated' (mad), 'deprived' (sad), and 'anxious' (scared). We added a fifth emotion, namely, 'averse' (loth) since it recognises the importance of the experience where our values are affronted.

Values as emergent structures of information processing

The 'communication model' illustrated the filtering function of values in our subjective experience. This is unpacked in Cowan and Todovoric's (2005) description of the bio-psychosocial model of adult values. Graves showed how we scan the environment to select information relevant to our physiological, psychological, and social needs. With emotional and psychological maturation we will begin to embrace a broader spectrum of information in space and in time. An alternation between the 'expressive' focus on self and the 'sacrificial' focus on community drives our values evolution. It has bearing on economic behaviour.

[3] It is significant to note that proponents of the new physics, such as Lazlo (2006), Davies (2017) and others, warn against the tendency to scientific abstraction. This 'subjectivity' extends they assert, to the so-called objective empirical method

We therefor offer Graves' values-based worldviews in nine archetypes to provide further insight into economic behaviour. It provides an understanding and empathy for the agents and organisations in the economic problem-space. By identifying agents' values stance, and with a fuller personal understanding of our own, we get a better insight into potential conflict areas and are more able to apply appropriate strategies.

The Caveman: I scour the environment to find food and shelter in order to survive. I rely on instinct and am drawn to others like me. Core value: Survival. Economic behaviour: Scavenging - hunter gathering.

The Clansman: We group together for safety and security and accept the authority of the bravest and strongest who protect us. Values: Loyalty - conformity - trust - sacrifice. Economic behaviour: Sharing - herding.

The Hero: I want to be in control and enjoy the experience of power. I take authority since I am the bravest and strongest. Values: Courage - daring - authority – pleasure. Economic behaviour: Controlling - monopolising - self-enriching.

The Gatekeeper: We establish rules and procedures so that all can behave in a disciplined way. We find virtue in recognising and obeying the rules. Values: Order - obedience - trustworthiness - honesty - integrity - consistency. Economic behaviour: Ordering and rationing,

The Achiever: I want to be seen to be successful in life and enjoy the fruits of success. I enjoy working creatively to develop new opportunities. Values: Energy - commitment - entrepreneurship - risk evaluation - innovation - achievement - future-focused thinking. Economic behaviour: Multiplying - innovating - growing - beneficiating.

The Humanist: We believe that all should have equal opportunity and be treated with dignity. We find value and fulfilment in consensus, levelling the playing field, especially for the disadvantaged. Values: Consensus - equality - dignity - compassion - love. Economic behaviour: Equalising - distributing.

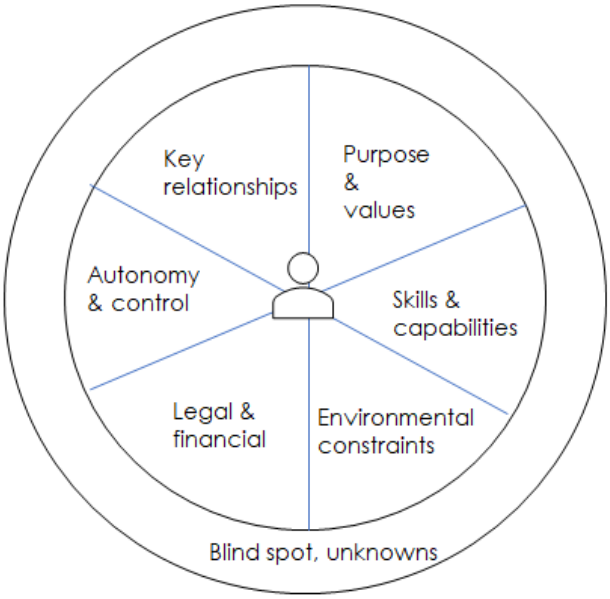
The Strategist: I employ systemic thinking to deal more effectively with daily challenges and opportunities in the complex and dynamic world. I adapt my behaviour to enable on-going human advancement. Values: Flexibility - principled pragmatism - information networking - adaptive intelligence. Economic behaviour: Networking - integrating.

The Universalist: We transcend self-interest in order to embrace the requirements of dynamic wholeness as an emergent property of sustainable coherent diversity. Values: Coherence - self-organisation - evolutionary progression - planetary views and integrative complex whole-system responses. Economic behaviour: Harmonising with natural cycles.

The Shaman: I resonate with integrative structures and self-similar fields and respond to signals of synchronicity as representing the deep information of cosmic intelligence. Values: Wholeness - unity. Economic behaviour: Life-enriching interchange of energies.

Phase four: This 'maps' the relevant dynamics, identifying the complex agencies - the actors and factors involved who enable or disenable solution-finding. With their rich interactions individual issues cannot be addressed in isolation.

Six categories are provisionally offered to help newcomers to methodologies of complex mapping to begin to group the enabling or dis-enabling 'agencies'. They are:



1. *Purpose and value* - this category helps locate factors of motivational importance. *What are the reasons for wanting a successful outcome?*

2. *Environmental constraints* - this category helps establish geographic /technological considerations. *What are the various factors that might stand in your way?*

3. *Key relationships* - this category helps identify important collaborators/ partnerships /interested parties. *Who are the people or institutions than can enable or dis-enable your project?*

4. *Autonomy/control* - this category helps establish the degree of self-control versus authority. *Whose permission/agreement must you get in order to progress?*

5. *Skills and capacities* - this category helps evaluate requisite competence/ experience/ knowledge. *How able are you to do what is necessary - what skills do you need - or what help/expertise do you need to acquire?*

6. *Legal and financial* - this category helps identify issues related to money/contract/ the law. *What are the legal constraints, existing financial commitments, laws, etc.?*

7. *Additional* - in mapping the problem-space there could be many more segments on the chart. We are reminded to explore further potential categories relevant to our unique problem-space.

Agents that are tightly linked are positioned closer to the centre. We link enablers that are interdependent or co-dependent and map the flows of engagement. Finally we identify the values-archetypes of the key enablers on the map.

Phase five: This accesses greater creativity, identifying new innovative approaches, especially to influence enabling agents in the economic problem-space. CAI promotes a collaborative and generative co-coaching methodology to enhance creative thinking.

Phase six: This integrate the learnings of every endeavour, whether successful or not. It guides the harvesting and systemic internalization of the learnings. It incentivises the learnings for transformed future responses. With the 'antifragile' notion, Taleb (2012) shows how the ability of robust living entities and systems to bounce-back in the face of stress can be further transformed into becoming stronger and even more resilient. That is the CAI intention of learning.

Discussion:

With the focus on individual subjectivity we have also emphasised that an attempt at implementing a new system, such as the circular economy model, will encounter a challenge of any meta-system. This is the tendency of vested interest to perpetuate the institution itself. Perpetuation becomes the overriding concern. As Shirky (2010) puts it: *"Institutions will try to preserve the problem to which they are the solution."*

This rigid and mechanistic institutional paradigm is also contrasted with the principle of self-organisation which we have identified as the central idea of a transformed paradigm as the distinguishing feature of any vital living system. Materialism limits autopoiesis in lower forms of sentient expression to adaptation to change in the environmental in accordance with principles of natural selection. The holistic new physics is beginning to detect purpose in existence even at basic levels. For Smuts the drive to wholeness through self-organisation was not just about survival, it was an evolutionary process of universal self-realisation. With the view of materialism teleology is restricted to the study of objects with a view to their aims or intentions. There is no purpose in the process enabling the entity. The observer imbues objects with purpose. In the holistic view purpose is seen as an universal phenomenon functioning throughout all the subtle processes of self-organisation. Smuts put it this way in his 1931 address:

"Life is not an entity…it is a specific principle of central or self- organisation."

Aristotle used '*entelecheia'* to describe the organising function of purpose embedded in a living organism. In a broader sense that can be seen as *'…the set of circumstance in which a potentiality can become an actuality'.* Systems thinking and complexity theory see the actualisation of potentials as emergence - it is an 'emergent property'. Those invisible processes that facilitate dynamic wholeness, as systemic coherence, can now be re-evaluated as a underlying subtle factor that includes us humans. Smuts named that 'holism' and Bohm (1980) referred to it as the *'implicate order'* The holistic view might thus become the 'imminent telos' and eminent emergent property of a circular economy. The circular economy in turn can represent autopoiesis in economic evolution. As such its implementation can support a paradigm shift.

Conclusion:

The current economic paradigm functions in a neo-Darwinian perspective viewing emergence as a random phenomenon and self-organisation as a stimulus/response survival mechanism. The holistic perspective sees a deeper creative function at work. At higher levels of conscious expression, self-organisation evolves to conscious design. In the Anthropocene era we have become nature's instrument of on-going evolution. With 'complex adaptive intelligence' we will be able to co-evolve with the technological advance affecting economic, political, and social structures. It will be in resonance with deep ecological principles. This will help us transcend Schumacher's ontological and epistemological dichotomy since as 'reality' informs 'knowledge', so too 'knowledge' transforms 'reality' in the continuous co-evolutionary unfolding of our existence. That specifically includes our economic mode of existence. 'Complex adaptive intelligence' will enable us to restore the relationship between human culture and nature to an autopoietic dance that recognises our embeddedness in nature and its embodiment in us. The implementation of a circular economy would be an eloquent expression.

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