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Relating Systems Thinking and Design
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Designing Sustainable Innovation with ‘Inward Fractalization’

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This activity will explore the concept of ‘inward fractalization’ as a means of designing sustainable innovation initiatives across a broad range of socio-technical ecosystems – to enable resilient organizations and sustainable economies. Building on the work of fractal innovation (Dyck, 2006), an approach to designing ecosystemic ‘endogenous depth’ is posited – which supports the creation of continuously sustainable value propositions. Here, hierarchical coherence and network connectivity are expanded by first a) decomposing, and then b) “fractalizing” the implicit cybernetic loops that stabilize the existing ecosystemic relationships. This approach creates additional dimensionality throughout the panarchy cycle (Gunderson, 2001) – which builds exergy (Dincer & Rosen, 2012) and enables adaptivity (Holling, 2001), while enhancing the overall ecosystemic resilience and sustainability of the associated innovation initiatives. The classical theories of economic growth tend to emphasize exogenous activity as primary means of market-space expansion and value creation. To advance this model, the ‘inward fractalization’ enables creation of internal or ‘endogenous depth’ – where innovation products and services can be viewed as systemic objects and building-blocks of experience in inter-mediated and circular economies, enabled by design research (Buchanan, 2001) and argued to be better aligned with the emerging "processual" worldviews (Baskin & Bondarenko, 2018); where even states and countries can be considered as ‘fractal actors’ (Läidi, 2002).

KEYWORDS: Sustainable Innovation, Economic Growth, Circular Economies, Resilience, Systemic Design, Cybernetics

RSD TOPIC(S): Economics & Organizations, Methods & Methodology, Sociotechnical Systems

Opening, including introductions and scene setting (10 min)

The introductory portion of the activity will consider the current notions around the feasibility of achieving continuous economic growth on a planet with finite resources. It will also introduce the concept of 'inward fractalization' – as a tool towards enabling more sustainable economies and innovation initiatives.

The introduction will include early critical perspectives such as the observations around the intrinsic fragile ecological balance of the 'spaceship earth' (Fuller, 1969), against the background to growth as posited by Özbekhan, Christakis and Peccei at the Club of Rome – who identified the '49 critical problematiques' (Özbekhan, 1970) that present continuous challenges to the sustainability of the world-system.

As one possible avenue of exploration to address the compounding challenges, a brief introduction to more recent scholarship – which has suggested moving towards 'post-rational modes of design', by engaging with and designing processes capable of generating 'wicked possibilities' (Sweeting, Sutherland & Ainsworth, 2020; Ainsworth & Sutherland, 2021) – will be performed.

The introduction will finalize by commenting that – while the intersections between the global impetus towards continuous economic growth amid the prevailing socio-technical and socio-ecological complexities has challenged the social, institutional, and organizational actors at all scales – there is a need to enable economic approaches capable of producing net-neutral or net-positive effects on the enclosing socio-ecological environments; positing that, 'inward fractalization' may be a useful conceptual tool towards enabling such approaches, as an instrument of expanding the field of 'wicked possibilities' in sustainable design contexts.

Interactive exercise (30 min)

This section of the activity will enable participants to work on reconceptualizing the possibilities of sustainable economic growth experientially and collaboratively, through a group co-design exercise.

To help the group re-conceptualize the notions of economic activity as a sustainable one, the concept of 'flourishing' within the limits to growth will be introduced – which proposes to “modify and revise our economic systems using nature as a model”; inviting us to consider “how nature uses three growth forms: biomass, information, and networks” towards achieving the aim of an “improved overall ecosystem functioning and co-development” (Jørgensen et al., 2015).

Referencing the dichotomy of 'depletion vs. innovation' as explored in Burlando and Tartaglia (2017), who posit that while “traditionally in economics the term *growth* means a qualitative increment in production without a particularly significant qualitative change” – and proposing that “the future of innovation will not be a linear extrapolation from the present” – the group will be invited to consider the notions of 'endogenous' growth.

The possibilities of endogenous growth – as described by the 'inward fractalization' concept – will be explored in co-design teams of 4 – 5 people.

Each team will then be:

- assigned a specific organization (prepared in advance)
- asked to identify the core competencies of their assigned organization
- invited to build on their ideation / insights to identify 'adjacent competencies'

Next, the teams will arrange possible adjacent competencies into thematic groupings.

The teams will then explore how the various identified 'adjacent competencies' – as associated with each organization – might contribute to the formulation of 'adjacent markets'; considered as generative spaces of possibility where more sustainable economies and innovation initiatives might be explored. The identified opportunities will showcase the concept of 'inward fractalization' – that organizations and economies may leverage as an instrument of achieving more sustainable expansion, that is endogenous in nature and more effective in leveraging underutilized potentialities.

Conclusion (5 min)

The concluding section will attempt to re-frame the possibilities around sustainable economic growth and the associated innovation opportunities as a shift from 'quantitative' to 'qualitative' – while positing additional alignment of 'inward fractalization' with the notions around 'circular economy' (CE).

A brief outlined of further possible research and exploratory opportunities will be provided to participants, including –

- Geissdoerfer et al. (2017), who argue for the “pressing need to transition to more sustainable sociotechnical systems” despite the current unknowns in research literature and practice; given that the “biodiversity loss, water, air, and soil pollution, resource depletion, and excessive land use are increasingly jeopardising the earth's life-support systems” (p. 757)
- Geng et al. (2019) note that “global demand for resources is projected to double by 2050” – where, only “6% of materials are recycled”, while arguing for approaches that include “investing in regional innovations, such as “governance and financial innovations for cities and sectors, especially water, energy, food, mobility and construction”
- systemic design approaches aimed towards enabling flourishing enterprises (Jones & Upward, 2014) via means such as flourishing leadership (Elkington & Upward, 2016).

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