Paper Submitted for the Consciousness Reframed Conference
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Backwell, J., & Wood, J., (2008), Mapping Network Consciousness: syncretizing difference to co- create a synergy-of-synergies, Paper presented for the Consciousness Reframed Conference, New Realities: Being Syncretic, Vienna, Austria, 3 July – 5 July 2008, University of Applied Arts Vienna

Mapping Network Consciousness:
syncretizing difference to co-create a synergy-of-synergies

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ABSTRACT

The paper describes a new approach to 'ecological design' that uses metadesign practices to enhance the potential of humanity, nature, techné and language. This cultivates mutually beneficial 'synergies' to avoid the parsimonious image of some 'sustainability' discourse. Synergy naturally pervades across all levels, including the interactions within collaboration. Our research has shown that, in order to achieve a high level of creative synergy within teams of specialist designers, it is important to select members who represent a sufficient diversity of cognitive styles, linguistic structures, knowledge bases, viewpoints and experiences (cf. Belbin, 1993). This is because 'difference' is the fundamental basis from which new ideas are generated, bisociatively. But because heterogeneous teams are highly complex and emergent they are extremely volatile and sensitive, and thus are averse to hierarchical, top-down modes of management. Ideal creative teams would probably conform to Arthur Koestler's (1967) definition of 'holarchy', in which a given 'whole' is governed by its parts. The paper outlines some mathematical tools that were designed to encourage, map or sustain (albeit on a temporary basis) what we call 'network consciousness', which seems important for creating holarchic teams.

Introduction

This article is one of the outcomes of 3 years of AHRC-funded design research at Goldsmiths, University of London – the 'Benchmarking Synergy within Metadesign' project. The main assumption behind this initiative was that eco-design has failed, and that society needed a new design methodology in order to avert the ecological dangers. The transition from an industrial 'end-of-pipe' mindset to a more holistic approach to business will require significant changes within culture, politics, society, education and the way we perceive, and organize teams. It may, for example, require designers to collaborate much more closely, and creatively with a range of other experts. At present, the economic system routinely reduces the designer's role to that of a mercenary specialist. This is symptomatic of industry's (Taylorist) tendency to look for 'efficiencies' at one or two points in the cycle of production and consumption. While this may deliver leaner production, it usually reduces synergies at the grander social, or ecological scale. For example, by scaling-up to maximise its profitability, organizations easily lose the cooperative and creative adaptability that initially made them viable. They see no option but to standardize roles and procedures when they expand, thus losing the creative interplay of local adaptability and common sense.

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The Need for Holarchy

Where the principle behind 'economies of scale' may apply to simple mechanical systems, nature works more within 'ecologies of scale' (Wood, 2007:1 – also, see Ashby, 1946). Our research team considered this principle when designing (i.e. 'casting') our metadesign teams. We conducted practical experiments and sought to theorise them, using simple mathematical models. This paper focuses on the latter. We hypothesised that an ideal creative community would correspond with the idea of 'holarchy' (cf. Koestler, 1967) Koestler coined the term 'holon' to represent the fact that individual parts of one 'whole' may also function as 'wholes' at another level. Whether a given 'holon' appears to be a whole or a part will depend on whether the observer views it 'upwards' or 'downwards', in hierarchical terms. Unlike hierarchies, however, holarchies usually emerge gradually from the bottom up. In terms of a team, player, or agent, within a given 'whole' (or 'holon') must be able, at least for short segments of space and/or time, be able to feel more accountable to the common weal (whole) than to their immediate, or individual self-interest. In developing a practical system for creative teamwork we coined the term 'network consciousness' as a way to account for different states of collective knowing. Here, for practical reasons, the word 'consciousness' is defined using Marvin Minsky's (1988) reductionist model of self-awareness.

The Idea of 'Network-Consciousness'

Holarchies co-evolve; therefore effective holarchic design organization may require society to work towards a multiplicity of co-creative synergies. This poses some methodological challenges for researchers. 'Network consciousness' describes a field of shared knowing that, in human terms, is beyond simple atomistic description. Before the advent of digital discourse, human understanding probably resembled fields of co-knowing, rather than matrices of atomistic facts or quantities. (See Bert Hellinger, in Udall, 2008). However, in the quest for an expedient technological framework Marvin Minsky refuted the idea that humans are highly conscious, declaring that consciousness is merely a 'low-grade system for keeping records' (cf. Horgan, 1993). This offers a practicable, albeit clumsy means of auditing the way that holarchies evolve. We use Leonhard Euler's (1707-1783) famous schema for mapping 'agents' and their relations uses dots (vertices) and lines (edges). This enables us to represent agents, or attributes of agents, by nodes, and their relations as lines. It enables us:

a) To measure the 'distance' or 'relational weight' (e.g. level of communicational inconvenience between nodes
b) To measure the ratio of structurally coupled nodes to others
c) To check the delays between their exchanges
d) To check the intensity of their exchanges
e) To evaluate how 'out of phase' ('off the beat') they are
f) To check the number of ongoing interactions undertaken by a given node at any given time?

Our research team developed its first consciousness-mapping prototype (Backwell, 2007) , based on an analysis of the properties and interactivity of individuals, entities, agencies and/or artefacts etc that were found to coexist within earlier experimental group studies. Such a tool may help to identify missing, redundant or antagonistic nodes in the quest for synergy. The system does not yet record the lifespan of synergistic phenomena, although this is likely to be vital to the way that holarchies evolve.

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The prototype comprises three key development phases:

Phase 1 – Isolating the nodes and defining the group.

Agent selection

- Setting conditions aimed at testing for synergy
- Providing the environment for establishing the nature and form of both the group and its internal nodal 'partnerships'.

Phase 2 – Describing internodal relationships in terms of:

Simple Interactional analysis

- Recording transactional relationships – *matrix analysis*
- Strength and quality of relationships - *vectors and scalars*
- Competitive & cooperative behaviours – *linear programming*
- Simulated holistic performance – *multi-agency game theory*

Complex Interactional analysis

- Working with the imprecise – *crisp and fuzzy logic*
- Macro to Micro-view (sub-groups and sub-nodes) - *self-similar functions*

Phase 3 – Utilising emergent auspicious patterns

Seeking 'synergy predictive' tools

- Establishing preferred matrix profiles and families
- Functions that define specific relationships
- Defining game-play rules

Example (from Phase 2):

Simple Interactional analysis - recording transactional relationships

The initial aim was to determine and record whether a relationship, x↔y, exists between members or agents in the network. We used a simple arithmetic to calculate how many mutual relationships (R_m) a given number of agents (n) could afford:

$$R_m = \frac{n(n-1)}{2}$$

When extended to view x→y and y→x as distinct relationships (R_d), then:

$$R_d = n(n-1)$$

Where the 'self-reflexive' element, x→x, is to be considered a relationship, (R_s), then:

$$R_s = n^2$$

Figure 1 represents the presence of each node's 'need' for an unspecified unit of resource, as perceived by the others. This approach is inspired by the 'relonics' methodology devised by Vadim Kvitash (cf. Kvitash & Gorodetsky, 2003). In our system, all 'needs' are mapped as equivalent values, whether or not they can be met within the system.

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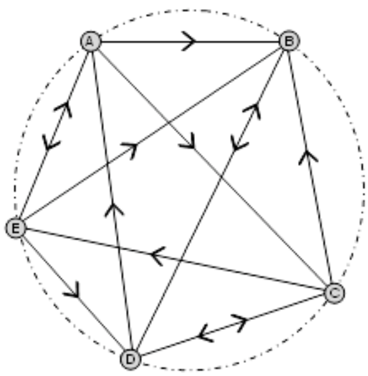

Figure 1

The map provides a holistic sketch of needs/demands that enables us to input particulate data and make relevant inferences. Note that 'demand' here refers to the level of demand upon a resource experienced by the potential supplier. Mapping it as a circle with nodes on the circumference makes it easy to read, but difficult to compute. When the number of nodes increases, the ratio of nodes to (possible) relations among them rises exponentially. Instead of a circle we used a matrix format that facilitates systematic analysis using digital tools such as a computer spreadsheet. As before, each relationship in the context of the group is identified as transactional in the sense that each node is defined, to some extent, by its 'need' for other nodes. This can be specified precisely, irrespective of a response that might signify the existence of a reciprocal relationship (whether benign, or otherwise) between those nodes. Thus a relationship diagram of a network or team focuses largely upon the nodes and depicts levels of neediness and intensity of demand (see Figure 2).

N_s =

Has need of	Is demanded of: A	B	C	D	E	need matrix
A	1	0	0	1	1	3
B	1	1	1	1	1	5
C	1	0	1	1	0	3
D	0	1	1	1	1	4
E	1	0	1	0	1	3
demand matrix	4	2	4	4	4	

Figure 2

This enables us to map all possible configurations that link any agent to any other.

It also records the number of output/input channels i.e. need/demand relationships respectively. Thus the matrix offers three interpretive views:

i) A numerical holistic profile,
ii) A distributive needs profile

iii) A distributive demand profile.

Importantly, where the circle map does not easily show self-reflexivity, the matrix does, because it registers each player twice, with 'needs' in the horizontal axis and 'resources' in the vertical axis. Self-reflexivity is a vital aspect of complex systems. Maturana and Varela's notion of 'autopoiesis', for example, implies that, to some extent, living systems create themselves. Also, post-Socratic understandings of the 'self' have increasingly emphasised the importance of self-awareness, or self-consciousness. For this paper, analysis is illustrated using Ns only, although the same principles apply equally well to N$.

Each matrix provides for the extraction of column and row summations, need / resource matrices respectively. Transposition of the *need* matrix enables a need/resource profile matrix to be derived as shown in Figure 3.

$$nd_s = \begin{array}{c} \\ n \\ d \end{array} \begin{array}{c} \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{bmatrix} 3 & 5 & 3 & 4 & 3 \\ 4 & 2 & 4 & 4 & 4 \end{bmatrix} \end{array}$$

$$n/d \quad [0.75 \quad 2.5 \quad 0.75 \quad 1 \quad 0.75]$$

Figure 3

Yet another distillation provides 'resource drain' (n/d) distributions for the group. The table below considers value combinations and provides four potentially useful nodal coefficients. Note also that the inverse provides a 'contributory' indicator (d/n).

$$nd_s = \begin{array}{c} \\ n \\ d \end{array} \begin{array}{c} \begin{array}{ccccc} A & B & C & D & E \end{array} \\ \begin{bmatrix} 3 & 5 & 3 & 4 & 3 \\ 4 & 2 & 4 & 4 & 4 \end{bmatrix} \end{array}$$

$$n/d \quad [0.75 \quad 2.5 \quad 0.75 \quad 1 \quad 0.75]$$

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The trial group presents four possible states of the 'players', one particularly strong and one potential 'syphon'.

The Need to Understand How Teams Work

There are many factors that are important to the success of a creative, commercial, cooperative network, or team. These include their openness as systems, their responsiveness to change, the level of trust that pertains within them, and the appropriateness of their scale (Bussracumpakorn, 2006). Moreover, different specialists are likely to use different specialist languages for the same problem. In our project we wanted to convert these possible lines of disciplinary demarcation into a viable basis for creating entirely new horizons of possibility. In trying to develop methods that would work in a western context we postulated that synergy can be increased (cf. Nieuwenhuijze & Wood, 2006), when the following four capabilities can become co-dependent and, or integrated:

1) When Agents Can Acknowledge Their Individual Autonomy
i.e. When each agent is sharply aware of, and can 'steer', his, or her own identity, viewpoint and capabilities.

2) When Agents Can Co-Create Interpersonal Relations
i.e. when agents are sharply aware of the emerging, and iterating relationship/s between, or among them. This is roughly equivalent to the emergence of 'structural coupling' (cf. Maturana & Varela, *)

3) When Teams Can Acquire, and Sustain Network-Consciousness
When the sum of inner/inter-active relations of the team/group are strong enough to enable it to manage itself as a whole

4) When Network-Consciousness is Sufficient to Perform External Tasks
When the collective agency transcends its focus on self-identity to become able to facilitate purposive innovation beyond its boundaries.

Lynn Margulis (1998) challenged the established Darwinian emphasis on competition, showing that the logic of evolutionary development also advanced through co-operation, interaction, and mutual dependence among organisms.

This type of argument is usually illustrated as paired relations, as though isolated from other such relations:

- *Mutualism* describes the relationship between different (e.g. species) individuals that benefit both.
- *Commensalism* describes a similar relationship, but where one benefits and the other is neither harmed nor helped.
- *Parasitism* is where one party benefits at the expense of the other.

Each is thus depicted (as above) as a single relationship that can be interpreted from two perspectives. However, using the mathematics of Euler (1751) as interpreted by Fuller

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(1975) we find that, by combining two such paired systems we may create six times the possible outcomes, with 12 perspectives (Wood, 2007; 2007:1), thus reflecting the more complex set of conditions of a real habitat, or milieu. The next stage of our research will be to design a generic matrix format that can be used as a fractal to metadesign the whole system. Designing the fractal form will be a decisive step in setting up a holarchy, and in seeding the emergent outcomes that it might afford.

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<Legends:>

Figure 1

2-D holistic map of the '*Needs and Resource demands*' determined within an experimental test group. Arrow indicates 'Has need of", thus: i) **A** needs something that might be supplied by **B**; ii) **C** and **D** each needs something that might, in principle, be 'suppliable' by the other.

Figure 2
Matrix representation of the 2D holistic map (Figure 1)

Figure 3
Profile matrix of 'need' (of resources held by others) with the 'demand' (from others upon own resources)

<Table)

	'Supplier'	**'Syphon'**	**'Player'**	**'Ghost'**
Need 'engagement' (n)	0 (residual)	mean / high	Mean	0 (residual)
Demand 'engagement' (d)	Mean / high	0 (residual)	Mean	0 (residual)
n/d factor	v. low	v. high	near 1	0 (residual)
Nodal profile	• Low group affinity • External agent?	• Resource drain • Low contributor • Group dependency	• Potentially a highly interactive component • Strong group member	• Non-participant • Can be seemingly extracted from group without effect