

PART III

VISUAL METHODOLOGIES

Professor Alexandros Paraskevas

Visual representations in the form of illustrations, maps, models and diagrams have been widely used to describe complex systems and network structures and are well-accounted for as knowledge-elicitation methods in complexity science. The visualization of complex systems and structures offers a high-level abstraction which enables the understanding of the interdependencies and interactions of the various components of these systems from the agent (micro) to the aggregate (macro) and can provide the basis for understanding the behaviour of the entire system. This section presents three different approaches to visual representation of complexity.

Julian Burton and Sam Mockett's chapter first, describes how art can be used as a research tool for a 'Visual Dialogue' process that simplifies abstraction and jargon and enables the creation of a reflective space that can be used for the development of meaningful and focused conversations about change and the facilitation of interventions within an organization.

Central to this process is the concept that change emerges out of a constant flow of interactions, conversations and negotiations between people within the organization which is, on its own, a complex living social system. Since the quality of these conversations enables or constrains change, the 'Visual Dialogue' process is designed to positively enhance the way employees and leaders interact and relate to coordinate their activities. Barton shows how the insights from complexity thinking have influenced the development of 'Visual Dialogue' to bridge the gap between *strategic plans* and *local solutions* and to support change in large organizations.

The main components of 'Visual Dialogue' are, primarily a big picture that captures the shared story of the organization (new strategy, new structure, change programme) and, of course, the facilitation of a dialogue between groups that will enable all parties involved to make sense of this big picture. The author explains the purpose, use and benefits of each of these components (picture/dialogue) and describes step-by-step of how they are implemented in the 'Visual Dialogue' process.

The chapter ends with a real-life case study where the author illustrates main points of how this process was implemented and offers interesting insights of the people involved in the form of direct quotes.

Kate Hopkinson, in her chapter, uses the 'Landscape of the Mind' (LoM) methodology to visualize and explore the 'inner complexity' of a mind and to measure the inner skills and thinking styles that we need to live, work and play in today's complex world.

'Inner Skills' is the term that the author uses to describe a whole range of factors that affect our behaviour such as thinking, imagination, knowledge, intuition, past experience, feelings and values and so on. Hopkinson distinguishes three types of skills: *convergent inner skills* that underpin working with what we already know and understand; *evaluative inner skills* that enable us to make decisions; and *divergent inner skills* that enable out-of-the-box thinking and facilitate creativity and innovation. She uses the LoM globe to visualize the different kinds of inner skills which can be brought to bear into their three dimensions separating them in two modes, which she calls 'cool' and 'warm' (head versus heart – detached versus emotionally engaging).

The author describes in a very good level of detail the profiling process providing diagrams and illustrations and offers a number of case studies and examples to illustrate the method. This mapping of inner skills offers a situational analysis in terms of the inner skills in play at a particular time which can be used as a basis for planning and agreement for improvements in behaviour. Ultimately, the LoM visualization technique helps the participants understand their inner skills preferences and, although it is relatively unlikely that they will change their preferences over time, they can change the choices they make and the behaviours they display depending on the needs of the task or project in hand.

Whereas simple networks can be easily represented visually with mind maps and concept maps, the visualization of the structure of complex networks is far more challenging, given their large scale and their interconnected nature. In their chapter, Kurt A. Richardson and Andrew Tait argue that there is a need for tools (both mathematical and computational) that can help us make sense of these massive structures. They suggest that Dynamic Network Analysis with a focus on the simulation of dynamic networks is the preferred approach for researchers seeking to unveil the secrets networks hold. They distinguish static network topology, which does not account for the information flows around the network and how information is processed by the network nodes, from the actual active network structure that emerges when a dynamic nonlinear network follows a range of different attractors.

They use a simple Boolean 'Small World' network to demonstrate that a purely topological analysis of the original network 'graph' does not have the capability to capture all of its structural properties. This shows that studying even relatively simple dynamic networks proves to be a huge and very challenging task and that when designing network interventions, just seeing who or what is connected to who or what is not enough to gain a complete understanding of the network. Although they broadly agree with Cilliers (1998) who said that complex systems are irreducible, they propose a methodology in which they employ Power Graph Analysis (PGA) and succeed in reducing/compressing the complexity of the network without losing any information that would inhibit reliable insights and understanding of its dynamic structural properties. Clearly, the benefits of visualization by employing PGA will be more apparent in the analysis of much larger networks, since the degree of compression can be considerably higher. However, the authors also propose an alternative methodology aiming to 'slice' the network based on the Shannon Entropy (SE) of each node operating within each attractor basin. The network can therefore be layered by grouping the nodes based on their SE or activity, thus facilitating its visualisation, whilst also offering a way of obtaining an information-based network signature.

Finally, in their chapter, Göktuğ Morçöl and Sohee Kim demonstrate how they use two methodological approaches, Network Text Analysis (NTA) and Social Network Analysis

(SNA) in order to analyse complex governance networks. They define complex governance networks as collaborations among multiple governmental and non-governmental actors who are self-organizing but also dynamically interrelated and interdependent and aim at solving complex social problems. Although much progress was made in the methodologies that explore and describe complex systems, the authors argue that none of these methods can project an accurate picture of their structural properties and the nonlinear, dynamic relationships among actors. They highlight the limitations of Agent Based Simulations (ABS) before presenting the advantages and limitations of Social Network Analysis (SNA) and its tools.

The analytical tools presented in this chapter are: Automap, a network text analysis tool based on the semantic network analysis approach which assumes that a model of networks of words and relations can be developed by extracting knowledge and language in a certain text context; and ORA which analyses the networks extracted by Automap. In essence, AutoMap develops meta-networks by linking actors and their knowledge, resources, actions, or tasks, whereas ORA analyses these meta-networks by coding the complex relationships as actors and their resources, actors and their locations, actors and their actions, and so on. This type of analysis enables researchers to visualize the structural properties of the complex governance networks and the relative positions of the individual, organizational and institutional actors who operate within them.

The authors offer a range of case examples where they have used these tools highlighting challenges they have faced in many of them. They close by maintaining that this methodology can be used longitudinally to identify the evolution of the most central actors in urban governance networks and evaluate how the hypothetical removals of the central actors could impact some of the structural properties of these networks.

REFERENCE

Cilliers, P. (1998) *Complexity and Postmodernism. Understanding Complex Systems*. London: Routledge.

