The Cybernetics of Self-organisation

Guest Editor's Foreword
Special Issue of Kybernetes Vol 42 Nos 6/7
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July 2015

Self-organisation is a fact in the world we live in. This is a relational world in which agents' natural asymmetrical complexities are warped by the Law of Requisite Variety. For as long as these relations remain requisite variety will assert itself mostly through self-regulation and self-organisation. This was the intended theme of the Sixteen Congress of the World Organisation of Systems and Cybernetics (WOSC 2014). WOSC 2014's title highlighted "Our Self-organising World: From Disruption to Reparation". WOSC together with the Universidad de Ibague, Colombia, organised this Congress in October, 2014. This was a most successful event with more than 200 participants from all over the world. Dr Alfonso Reyes, Rector of the University, supported the event with resources, care and quality; the activities and Proceedings of the Congress are documented in the website http://wosc-congress.unibague.edu.co.

Participants were invited to submit manuscripts for publication in this journal. After a thorough process of double refereeing twenty two papers were accepted; these are the papers published in this double issue of Kybernetes.

With this publication WOSC is fulfilling its purpose of fostering international collaboration in Systems and Cybernetics towards a deeper appreciation of the management of complexity in today's troubled society. Contributions range from global to local issues. Their epistemologies go from the constructivist approaches of second order cybernetics to the positivistic approaches of mathematical modeling. Some of them offer scalable transdisciplinary knowledge that supports today's global concerns of mankind as well as the pressing local problems of particular communities. This issue brings together authors with experience in a wide range of global issues, from energy policy, sustainability of natural resources and cities to the governance of eco-systems and the digital regulation of societal processes. Their encounter in the conversational space provided by the Universidad de Ibague increased the opportunities for sharing methodologies and overcoming intellectual fragmentation, indeed, through this publication WOSC is contributing to the dissemination of systems thinking and cybernetics across the world.

WOSC 2014 provided a rich context for conversations. We are living turbulent times; whether it is the impact of climate change, the conflicts in the Middle East, the geo-political problems in Eastern Europe, or the many local problems that we all experience in our communities, humanity is confronting pressing disruptions that need of our attention and reparation. These are all large and small problems currently taxing us. They trigger different forms of self-organisation through a wide range of tacit and explicit strategies to manage

conflict and collaboration and all forms of relational complexities. These are disruptive and reparative processes that affect for the bad or the good the world we live in. Understanding these processes and offering tools for reparation are concerns of cybernetics and systems thinking. This was the challenge for WOSC 2014.

The Congress aimed at holistic thinking and the epistemology of second order cybernetics. The challenge penetrated, as far as the participants' competencies permitted, the complexity of this interrelated world; we wanted to offer paths to overcome disciplinary and operational fragmentation and take advantage of the scalability of natural and social phenomena. Related concepts, models, tools were WOSC's concerns.

Culture, history, communication, information, complexity, modelling, organisation, learning, technology, change and transformation were some of the key ideas discussed in the Congress. In a technological world it is increasingly necessary to consider the braiding of people, organisations and technology in valuable transformative processes. To what extent is humanity in the hands of destructive self-organisation? The ideas of guiding and enabling self-organisation for the good are particularly relevant in a highly complex world in which blind interventions and inflexible blue prints seldom produce desirable emergent outcomes. Guiding the alignment of resources towards common purposes/ policies and enabling the coordination of actions of the multiple agents contributing to the emergence of social systems are challenges to policy processes and self-organisation. Multiple agents may coordinate their actions through simple rules of association, like gauging traffic distances with the support of technology to facilitate the flow of vehicles in a city. Beyond this example, at a more general level, Gerschenson's paper in this issue "Requisite Variety, Autopoiesis, and Self-organisation" offers a conceptual framework for guiding self-organisation.

Multiple resources -people, institutions, technological systems and others- may learn overtime effective forms to relate to each other to pursue shared purposes. Overtime they may produce viable organisational systems. But unguided and poorly enabled self-organisation may produce undesirable outcomes or, at best, take too long to produce desirable outcomes. This makes it necessary enabling increasingly effective communications among agents. Coordination of actions, through communications and technology can be major variety operators of individual and social complexity thus increasing the chances of aligned processes and good policies. Espejo's contribution "Good social cybernetics is a must in policy processes" addresses, supported by policy vignettes, how in practice society has failed at the local and global levels meeting this challenge of good cybernetics.

Situations as frequent as those of disempowered citizens living in isolation in crowed communities often prove difficult to manage. Fragmented institutions and processes, rather than integrated organisational systems, make intractable their problems. Help may come from enabling the emergence of organisational systems focused on citizens' problems. Unfortunately, however much a holistic approach may be acknowledged as a solution, incompatible ethos and cultures make difficult institutional communications. For community problems particular social functions such as police, health, social services, and other special provision of services need bridges to overcome their different cultural codes and produce

integrated organisations and shared meanings. The challenge of integrating several functionally specialised systems into organisational systems focused on services is a tall order. Guided self-organisation may help processes towards building this organisational system. However, enabling self-organising processes in communities often leads to uneven developments, supporting the best prepared at the expense of the less prepared and strengthening unfairness. This issue is discussed by Mendiwelso-Bendek in her paper "Community-based Research: Enabling the Civil Society's Self-organisation". Indeed much more needs to be done to support effective self-organisation.

Stafford Beer's work offers a powerful paradigm in this context of disruptions and required reparations. His masterful contribution - the Viable System Model (VSM)- is a powerful model to guide self-organisation and his equally powerful Team Syntegrity (TS) supports constructed conversations. The VSM is a recursive heuristic for communications and coordination of actions at multiple structural levels to produce desirable organisational systems. Leonard in her contribution "Stafford Beer and the Legacy of Cybersyn: Seeing around the Corners" offers insights about the VSM and TS from the privileged position of having worked with Beer for many years. Sagalovsky in his paper "Organising for Lean: Recursion, Autonomy and Cohesion" discusses, supported by the VSM, requirements for lean, fit to purpose, structures. He successfully connects 'lean' tools and methods to the organisational structure proposed by the VSM. These are structures that improve self-organisation. As for Team Syntegrity Perez Rios and Velasco's "The Application of Organisational Cybernetics and ICT to Collective Discussion of Complex issues" offers preliminary empirical results of using Team Syntegrity together with internet and ICTs in the structuring and debating of complex issues. They show, supported by a limited application of TS, that virtual and face-to-face conversations together achieve higher quality outcomes than face-to-face conversations only.

Beer's work in Chile -the Cybersyn Project- offered a platform to discuss in this Congress big data and the internet of things. It is apparent that today's digital technology allows for huge data collection and that those using these data are not always aware of their social, individual, and organisational implications. Aspects such, abuses of privacy and power, infringements of autonomy, hierarchical management and others are instances of poor algorithmic regulation. Medina's paper "Rethinking Algorithmic Regulation" reflects on this Project, which took place in the Chile of the early 1970s, and offers a number of lessons to make algorithmic regulation today more respectful and effective. Cybersyn offered, in an explosive political situation, hope for good cybernetics in government which applies today as much as it did in the past.

Second order cybernetics, as proposed by Heinz von Foerster decades ago, offers a powerful epistemology for policy-processes. In WOSC 2014 this epistemology was highlighted by several contributors (Wene, Espejo and Bula). In particular for energy policies it was proposed by Wene as an alternative to economic approaches to assess energy technology learning. Economics uses feedback of features, events and processes to project learning curves but does not consider the reflexive interactions between operationally closed situations and their environments. It is through this reflexivity that double closure is achieved; firstly

through environmental feedback and secondly through self-reference. It is in these communications that the agents' appreciation of the situation evolves within the system. Double closure assumes operational closure; a topic open for further research. This is the argument presented by Wene in his contribution to this issue "A Cybernetic View on Learning Curves and Energy Policy".

The cybernetics of observing systems; observers observing their relations and participating in their production, has profound implications for value co-creation between environmental agents and organisational actors. This issue is elaborated in Espejo's paper "Good Cybernetics is a must in Policy Processes". A similar emphasis arguing for a change from the cybernetics of the observer, which observes situations as black boxes, to the cybernetics of observing systems, which emphasises the observer as 'participant and observer' of these situations is illustrated by Bula's contribution "Towards a non-trivialising Education".

A most significant relationship of self-organisation is that between human activities and the Earth's ecosystems. The increasing impact of these activities in global climate, energy resources, water management, agriculture and so forth has triggered awareness of our responsibilities to leave a habitable earth to future generations. This is a cyber-systemic challenge that is making us increasingly aware of today's governance reductionist approaches. Though mankind is responsible for this changes the self-organising complexity of this relationship has been running away of our control for some time. This is a major threat that requires a deeper appreciation of the Earth's self-organising processes and also a much less fragmented approach to global and local policy processes. The latter is indeed our responsibility. It implies a deeper understanding of human activities and governance processes. WOSC 2014 focused an important part of its debates on the governance and sustainability of human activities. Four contributions to this issue reflect these debates; Ison and Schlindwein's "Navigating through an ecological desert and a sociological hell: a cyber-systemic governance approach for the Anthropocene", Schwaninger's "Organizing for Sustainability: A Cybernetic Concept for Sustainable Renewal", Espinosa's "Assessing Governance for Sustainability: learning from VSM theory and practice" and Panagiotakopoulos, Espinosa, and Walker's "Integrated Sustainability Management for Organizations".

Ison and Schlindwein argue that the governance of the relationship between humans and the biophysical world has been based on a paradigm characterized by dualistic thinking and scientism. This has led us to the Anthropocene or the age of a blind and often disruptive human impact in the Earth's ecosystems. In their paper they argue for the need to reframe human-biosphere governance in terms of a "cyber-systemic" paradigm, driven by second order cybernetics and holistic thinking.

Schwaninger, Espinosa and Panagiotakopoulos et al papers accept the challenge of a cyber-systemic framework for governance; they propose Beer's Viable System Model for that purpose. Schwaninger, using Beer's VSM binds together research in the form of case studies made during two decades and involving systemic interventions at different structural recursions. He argues that the VSM would be a powerful means for bringing about

worldwide sustainability, opening questions about the relation between "viability" and "ecological sustainability" that still need further research. These questions are also relevant to the next two papers. Espinosa's emphasis is on self-organisation and structural recursion. She reports ongoing research using the VSM as a meta-language to facilitate long-term sustainability in business, communities and societies. The paper uses a bottom up 'Methodology to support self-transformation', by focusing on ways to learn about governance for sustainability in three situations. Finally, the aim of Panagiotakopoulos et al's paper is to propose the Viable System Model as a model to base the study of organisational sustainability. It is specifically proposed as a model to integrate the various sustainability standards (ISO26000, ISO14001 and ISO14044) as the basis for designing a unified Sustainability Management System.

For as long as agents maintain their interactions processes of self-organisation will be in progress. Expectations about the outcomes of these interactions, derived from myriad values, whether interests, philanthropy or whatever, will drive their efforts to maintain them. However, alienation and other forms of defection are common in societies, to the cost of people and organisations. Often people are involved in chaotic relations where they lack clarity not only about their purposes, but also about what they would consider desirable relational outcomes. These are situations in which people experience disturbances for which they have inadequate responses. These are situations of relational imbalances, driven by chaos, unilateral dominance, injustice, unfairness and in the anthropocene by eco-system abuses. All these situations demand learning and transformation to achieve good rather than destructive self-organisation. Chaotic strategies to manage interactions are costly and ineffective. As for situations unilaterally controlled by one part at the expense of the other they may make them more stable in the short term but at the cost of destroying resources or inhibiting the capabilities of the weaker parts. An evolutionary strategy for these relations requires balancing disturbances and responses at a satisfactory level of performance. This is a driving reference for good self-organisation.

The paper "Decentralisation and Heterogeneity in Complex Adaptive Systems" by Gonzalez-Rodriguez and Hernandez-Carrion simulate computationally the performance of different bacterial interactive configurations under different constraints. These simulations show bacterial colonies increase their adaptive efficiency to dynamic environments through decentralisation and heterogeneity. In general terms these results confirm their hypothesis that group adaptation to dynamic environments is better when societies are varied and distributed than when they are homogeneous and centralized. They name this modelling, using Complex Adaptive Systems, 'bacterial-based algorithms'. For its part, an example of increased collective performance by technology enabled interactions is offered by the paper "Collective intelligence: Analysis and modelling" by Suarez, Bucheli, Zarama, and Garcia. This is a valuable illustration of the performance implications of crowd sourcing a university based problem solving course and more generally of modelling the network interactions of a collective in a problem situation. The results of the course and the model are contrasted with a random network baseline model. Both the course and the model show the dynamics of cognitive accumulation and complex adaptive behaviour beyond chaotic behaviour. These last two papers relate our understanding of the VSM to complexity modelling for adaptive strategies for better performance.

Complexity based modelling of behaviour is the contribution of Villalobos and Vargas "Towards a Simple Dynamical Model of Citizens' Perception". They propose a minimal

dynamic two-dimensional map for the relation between citizens' perception of quality of life and their perception of city mayors' management abilities in four Colombian cities. With local data they test the hypothesis of linear positive correlation between these two perceptions and give evidence that they are not linearly correlated and that they reproduce non-trivial and unsynchronized relations between them.

Information and communications technologies (ICTs) by their very nature produce and shape social interactions. If well designed, for instance adhering to the variety management principles of the VSM, they can facilitate interactions and support adaptive strategies in which disturbances and responses match each other at higher levels of performance. This theme is discussed in Espejo's second contribution "Performance for viability: complexity and variety management". It is also discussed by Medina's paper with reference to the Cybersyn Project and its relevance for algorithmic regulation today. The paper by Perko, Primec, and Horvat "Sharing business partner behaviour" is an instance of using cloud technology to facilitate interactions . In this paper they discuss first, the technical feasibility of providing a secure, effective and inexpensive sharing environment, second, they assess the direct and indirect positive business implications of this approach to facilitate operational interactions between agents over time. Third, they examine legal aspects of sharing information and finally they examine the ethicality of the proposed business practice. Altogether this is an innovative proposal to speed up the self-organisation of agents interactions. In the same direction of actors' interactions in organisations is the paper "The influence of moral sensitivity on organizational cooperation" by Terán, Sibertin-Blanc, and Benoit. The originality of this contribution is introducing into the representation of actors' interactions a moral sensitivity parameter beyond their instrumental capabilities. They propose that such a parameter allows modelling its effect on organizational regulation, and to define quantitative measures of actors' emotions. Finally, in this theme of relational performance, Khakbaz, and Hajiheydari's paper "Proposing a Basic Methodology for Developing Balanced Scorecard by System Dynamics Approach", contribute with a popular systemic methodology to assessing the relational performance of an Iranian public transportation company with its stakeholders.

WOSC 2014 was mainly focused on organisational effectiveness but it also received papers focused on mathematical tools to model complex decisions and economic complexity. Two valuable modelling papers are included in this issue of Kyberntes: one by the Polish authors Jozefczyk and Gasior "Utility-based Models and Decision Making Problems for Selected Network Processes" and the other by the authors from Kazakhstan Ashimov and Borovskiy "Testing One Developed Model by the Parametric Control Theory Methods".

WOSC's identity is being shaped by the interactions and relationships between scientists and practitioners interested in the application of cybernetic and systems thinking to mankind concerns today. Cybernetics as applied epistemology can contribute to constructing a new political epistemology and hopefully to shaping politicians' thinking towards a holistic and socially responsible discourse and practice. This epistemology is already creeping in one way or another into people's thinking today, but it is the responsibility of cyberneticians and systems thinkers and practitioners to catalyse the necessary learning to shape the responses to today's global and local issues. This publication is presented as a contribution of a group of thinkers and practitioners in this direction.