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Governance for sustainability: learning from VSM practice

Governance
for
sustainability

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955

Abstract

Purpose – While there is some agreement on the usefulness of systems and complexity approaches to tackle the sustainability challenges facing the organisations and governments in the twenty-first century, less is clear regarding the way such approaches can inspire new ways of governance for sustainability. The purpose of this paper is to progress ongoing research using the Viable System Model (VSM) as a meta-language to facilitate long-term sustainability in business, communities and societies, using the “Methodology to support self-transformation”, by focusing on ways of learning about governance for sustainability.

Design/methodology/approach – It summarises core self-governance challenges for long-term sustainability, and the organisational capabilities required to face them, at the “Framework for Assessing Sustainable Governance”. This tool is then used to analyse capabilities for governance for sustainability at three real situations where the mentioned Methodology inspired bottom up processes of self-organisation. It analyses the transformations decided from each organisation, in terms of capabilities for sustainable governance, using the suggested Framework.

Findings – Core technical lessons learned from using the framework are discussed, include the usefulness of using a unified language and tool when studying governance for sustainability in differing types and scales of case study organisations.

Research limitations/implications – As with other exploratory research, it reckons the convenience for further development and testing of the proposed tools to improve their reliability and robustness.

Practical implications – A final conclusion suggests that the suggested tools offer a useful heuristic path to learn about governance for sustainability, from a VSM perspective; the learning from each organisational self-transformation regarding governance for sustainability is insightful for policy and strategy design and evaluation; in particular the possibility of comparing situations from different scales and types of organisations.

Originality/value – There is very little coherence in the governance literature and the field of governance for sustainability is an emerging field. This piece of exploratory research is valuable as it presents an effective tool to learn about governance for sustainability, based in the “Methodology for Self-Transformation”; and offers reflexions on applications of the methodology and the tool, that contribute to clarify the meaning of governance for sustainability in practice, in organisations from different scales and types.

Keywords Governance, Action research, Sustainability, Self-organization, Complexity management

Paper type Research paper

1. Introduction

Current economic and biophysical global changes have created new challenges for organisations and societies aiming to become more sustainable. Globally, businesses and governments have become more environmentally aware (e.g. by developing corporate social responsibility) but the responses they show are still insufficient to counteract the negative impact they have on the environment (Masters, 2011). Much



The author wants to acknowledge her partner Dr Jon Walker who has been co-authoring several of the previous publications the author mentioned here and also collaborated to improving and finishing this paper.

more needs to be done to encourage more sustainable businesses and societies. Here we argue that improving the capabilities of businesses and communities for self-governance is at the core of the challenges to progress towards global sustainability.

We have explained elsewhere that to progress in this direction, we first need to work on a holistic model of development, based on the co-existence of natural eco-systems and human activity, a more equitable distribution of wealth, and a focus on both human well-being and respect for nature. This requires new approaches and thus new models of organisational and societal transformations: we have suggested a way of developing Beer's theory of organisational viability (Beer, 1979) for inspiring sustainable management of complex organisations and networks; it included the "Methodology for self-transformation" (Espinosa and Walker, 2011, Ch. 3) to encourage second order learning about organisational self transformations: using the Viable System Model (VSM) as the theoretical model of organisation, and other systemic tools, it suggest six main stages in the learning process: agreeing on organisational identity and boundaries; mapping complexity levels; doing structural diagnosis (VSM diagnosis); aligning strategy and structure; deciding on transformation plan; implementing and learning from it (see more details of the methodology and its application in Espinosa and Walker (2013) and Espinosa *et al.* (2015).

In this paper we progress this research by introducing a tool to assess core issues of governance for sustainability, – based on our theoretical framework. We illustrate these ideas through reflection on three real applications of this methodology, used as a tool to support self-governance in organisations aiming to improve their sustainability. It uses the VSM as a meta-language to facilitate systemic interventions through structured debates on core issues on self-organisation and self-governance in communities or businesses. We summarise the criteria we suggested to assess sustainable governance in an organisation, as our assessment framework. (Espinosa and Walker, 2011, ch. 3)

The paper revisits three applications of the self-transformation methodology at different scales and in different types and levels of complexity of organisational systems aiming to improve their sustainability: in a socio-ecological system, in a community, and in a business. In each case the suggested framework is used to review the core issues requiring improvement, to enhance their capabilities on self-governance for sustainability. The framework serves as a heuristic device to learn about similarities and differences of inter-organisational systems and networks regarding governance for sustainability capabilities.

This paper summarises new directions for research on viability, sustainability and self-governance, based on Beer's original approach – the VSM. It offers ways to address the lack of clear criteria to define and assess sustainable governance found in the existing literature. It offers examples of insightful applications of the suggested tools in different contexts and scales; reflects on these experiences and identifies open research paths to develop the suggested tools.

2. Sustainability and governance – an understanding based on the VSM

Beer (1979, 1981, 1985) originally developed the VSM as a theory of organisational viability. Based on pioneering cybernetic and neuron-physiological developments on the workings of the brain and cognition in human beings, he explored the consequences of his studies in the context of groups of individuals, operating as purposeful organisations. A viable system is a system capable of an independent existence. It co-evolves with its niche and adapts to its changing dynamics, even by changing its internal models and structures. A viable system is a purposeful system, where a group

of agents collaborate to achieve a particular purpose, using shared resources, and following certain basic rules. It is a recursive system: a viable system contains and is contained by other viable systems. For more details on the VSM see Beer (1979, 1981, 1985), Espejo and Reyes (2011), and Espinosa and Walker (2011).

An organisational system has three elements: the operations – also called System 1 – (where products or services are developed); the environment (the socio-ecological niche where it belongs and from which it nurtures, including customers, suppliers, regulators, and competitors); and the meta-systemic management (management and technical support to operations). See Figure 1.

Meta-systemic management includes four types of Systems: System 2 to prevent oscillations between the Systems 1 and to create shared languages, information and knowledge management tools and support networks; System 3 provides synergy to Systems 1 and when necessary also intervenes to reorient behaviours that may threaten organisational viability or sustainability. System 4 leads innovation and research as well as strategy development process; System 5 keeps organisational closure, identity and policies. It represents the views of all stakeholders. Interactions among Systems 1-3 support the day-to-day operational work; Systems 3-5 interact to make strategic and tactical decisions. Systems 1 and 4 liaise with environmental actors regarding current and future trends of the market and the socio-ecological system, which may affect organisational viability or sustainability – see more details on how the VSM can support viability and sustainability in Espinosa & Walker, Ch. 2; Espinosa *et al.*, 2008, Espinosa and Walker, 2013).

The VSM has been used over the last 40 years in many countries and contexts, to guide organisational transformations, strategic management, organisational learning, and sustainable development, among others. Beer himself pioneered the use of his theory to reflect about sustainability in businesses and communities: he talks about sustainability as a function of the “total organization” of any system, which includes its capacity to learn, to adapt and to evolve (Beer, 1989). Several of his followers have developed the idea of using the VSM in the context of sustainability, at the level of theory, methodology and applications.

Lewis (1997) used the VSM in several UK businesses analysing principles of business sustainability; Espejo and Stewart (1998) explained the relevance of principles embedded in VSM theory such as embeddedness and cohesion, that are fundamental to explain the way a business network, aiming to function sustainably, would develop.

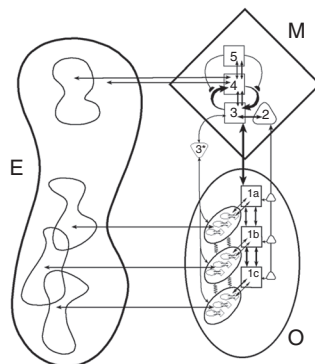


Figure 1.
The Viable
System Model

The work of M Schwaninger has also been inspirational in this emerging research field, starting with his original suggestion to combine VSM with simulation models to discuss ecological management by focusing on issues such as the trade-off between short and long-term decisions (Schwaninger, 2003). Later, he suggests the idea of “evolution by design” and explains how the VSM can be instrumental in supporting organisational and societal development (Schwaninger, 2004). He also discusses the need for actors to engage at multiple levels, and the convenience of using the VSM to explain complex relationships between multiple actors (Schwaninger, 2006). Along similar lines, Grabher *et al.* (2000) developed an application of the VSM to model three regions and to analyse core issues of sustainability and regional development. Leonard (2007, 2008) has also theorized on the way in which communities foster adaptations to environmental changes, at three levels: the household, the neighbourhood and the city.

Panagiotakopoulos and Jowitt (2007) used the VSM as a theoretical model to support the comparison between several sustainability standards including the triple bottom line, the natural step, and the ecological footprint. Knowles (2011) suggests a methodology to support environmental management in a business, consistent with VSM theory. Cardoso (2011) proposed a toolkit to support self-organisation in communities aiming to become more sustainable, based on the VSM and Social Network Analysis. It was used at the ecovillage case study referred to later – see Espinosa *et al.* (2011). Perez-Rios (2012) summarises the different aspects in which the VSM and Team Syntegrity support business viability and sustainability, including identification of organisational pathologies.

We have described elsewhere the theory of viability and its implications for rethinking sustainability, from a structural point of view: we assume that viability is a necessary condition for sustainability, so sustainability requires long-term viability – see (Espinosa *et al.*, 2008; Espinosa and Walker, 2011). Considering governance as “the system by which an organisation makes and implements decisions in pursuit of its objectives” (ISO 26000), our developed VSM theory offers a sound theoretical model to explore core issues of governance for sustainability.

In our research, we have explored the application of the VSM not in the interests of greater profits and shareholder return, but of creating sustainable institutions which function in balance with the natural systems in which they are embedded. It assumes that a viable system operates within a set of policies which are concerned with the now familiar triple bottom line: the organisation must be financially viable, in balance with its ecological environment and must enhance the well-being of the people it employs and the communities within which it functions. Sustainable governance involves the design of recursive decision-making spaces including participation of stakeholders at each level, responsible for designing and implementing sustainable strategies and actions.

In order to put into practice this way of understanding organisational viability and sustainable governance, we have designed and used the “Methodology to support self-transformation” – for more details see (Espinosa and Walker, 2011, Ch. 3, 2013; Espinosa *et al.*, 2015). The next section describes our suggested tool, the “framework for sustainable governance” to assess specific needs to develop capabilities on self-governance for sustainability.

3. A Framework for assessing sustainable governance

There follows a summary of the key aspects we consider important to assess, regarding existing organisational capabilities for self-governance in the context of sustainability – see Espinosa and Walker (2011, Ch. 3) and Table I for an example of the assessment tool.

Criteria	Ways of addressing the criteria/level of achievement	Poor	Good	Excellent
Co-evolution with the environment	Developing capacity to deal with core issues for sustainability at each level of organisation			
	Working out what matters			✓
	Real time information	✓		
	Closed loop information flows for effective governance	✓		
	Responding to changes in the environment	✓		
	Environments for decision making		✓	
Autonomy and cohesion	Identity and closure			✓
	Developing meta-systemic management to support autonomous communities/organisations to sustainably self-regulate			
	Enhancing operational autonomy	✓		
	Developing mechanisms to deal with conflicting interests		✓	
	To provide synergy to SIs		✓	
	To develop knowledge management systems on critical issues for sustainability	✓		
Recursive governance	To provide closure on sustainability issues	✓		
	Linking the local and the global governance issues and decisions			
	Enabling conditions for sustainable governance at each level of embedded and embedding organisation		✓	

Table I.
Sustainable
governance – the
Magdalena River
Basin (1990's)

3.1 Co-evolution with its niche

The VSM sees an organisation as a neural network like organisation: a dynamic whole that is in a continuous dance with its niche: it co-evolves with it. To assess core issues of governance for sustainability, under this theoretical lens, we need to continuously observe each organisation's skills for: focusing on what really matters; operating with real time information; using this real time flow of appropriate metrics to allow closed loop self-regulation; creating structures which ensure rapid response to changes in the environment; and operating with effective environments for decision making.

An overall assessment on how an organisation responds to each of these aspects gives us an initial idea of its capability for becoming aware of, and responding to, its niche. A sustainable, self-governing organisation must be in a continuous, co-evolving dance in which both the organisation and niche are braided together and respond to each other accordingly.

3.2 Autonomy and Cohesion

The major way of attenuating variety and managing massive amounts of complexity (i.e. in a complex organisational system) is by encouraging each of the operational units to develop their own variety so that they can manage their own decisions promptly and effectively, and deal autonomously with their own environmental disturbances. This needs to be done while still sharing the same ethos, sustainability values and strategies, and agreeing on similar criteria for sustainable performance. A pre-requisite for self-governance is to achieve a balanced mix of operational autonomy and organisational cohesion.

3.3 Recursive governance

Viable systems have recursive structures (Beer, 1979, p. 308). In a complex socio-ecological system (SES), VSM theory suggests that networked organisations need to

collaborate to respond collectively to the agreed environmental strategies. Such strategies should be aligned with those strategies decided at higher levels of recursion (Schwaninger, 2006). If we consider an industrial network, of independent businesses aiming to improve their network's sustainability (e.g. an industrial ecology chain), then such a network needs also to operate in the context of shared sustainability values, strategies and even resources and knowledge. Espejo and Stewart (1998) described the need for a clear sense of belonging and cohesiveness as fundamental criteria for progressing towards sustainability in an industrial or business network.

In our methodology we suggest the use of tools like recursive mapping to identify the embedded viable systems at different levels of recursion; once the recursions are mapped it is possible to identify the system-in-focus that needs our attention, and we use the VSM language to support the self-transformation process. After implementation, an assessment on progress on core self-governance capabilities can be done, using the suggested framework. This is shown in the following reflections from the practical use of our suggested methodology and framework in different applications.

4. Assessing governance for sustainability

4.1 Case study: environmental management from the Magdalena river basin (1991-2001)

Between 1999 and 2001 the author led a systemic intervention to redesign the National Environmental Information System (NES) in Colombia, using the VSM self-transformation methodology as the guiding framework. For about a year, she facilitated workshops with representatives from all the environmental institutions in the country (Ministry of Environment, 33 Regional Environmental Corporations (RECs) and five Environmental Research Institutes). At the beginning of the systemic intervention, NES was facing clear challenges of governance and performance.

Details of the VSM diagnosis have been published at Espinosa and Walker (2006, 2011, pp. 163-176). Originally there was not a good provision of strategic information; unavailability of data for strategic decision making, duplicated efforts to develop strategic information systems in different sub eco-regions; lack of standards to jointly develop geographic information systems to support policy decisions, poor or non-existent governance mechanisms at the level of key sub eco-regions, among others. During the VSM workshops the participants agreed on a way of mapping the NES as nested eco-regions, each one requiring meta-systemic management. This brought with it particular challenges in implementation, as existing political and administrative barriers needed to be overcome in order to implement these courses of action. We concluded that a multi-stakeholder approach to governance including representatives from government, communities and industries at the eco-regional level would need to be designed to progress implementation. This was possible as some REAs already acted in such roles in certain strategic eco-regions.

A more detailed analysis of one of these strategic eco-regions, – the Magdalena river basin – that crosses eight counties in the country-showed that they had only a weak and fragmented meta-system formed by CORPO Magdalena, (one of the RECs) and the other RECs with responsibilities for the river's health, holding sporadic meetings to agree on key issues for the entire river's health. There were no joint long-term strategic plans or environmental scanning at the level of the eco-region; each REC had control of its particular System 1 (communities and their embedded businesses) in terms of pollution control, but there were no agreements among them; there were only incipient agreements on measurement standards (i.e. pollution levels). Table I below summarises

these and other points described in more detail in the published diagnosis, as an assessment of the sustainable governance capabilities of NES at that time.

From the table: there was a clear decision to focus on keeping the river basin healthy for the benefit of all communities and industries (“excellent” in line 1, Table I). There were, however, clear limitations in the way of dealing with key sustainability indicators across the sub-eco-region: (“poor” marks in lines 2, 3 and 4 in this section of Table I); but good progress developing participatory mechanisms to decide on pollution goals (a “good” mark in the next line in the first section of the Table).

Regarding “Autonomy vs Cohesion”, as managers from this REA had agreed on eco-regional strategic projects, budgets and information systems, there is a “good” assessment regarding “synergies” as the emerging meta-systemic roles at the eco-region level were managing to deal with key conflicts of interest and to generate some synergies (e.g. sharing investment budgets for ICT developments); but there was still room for improvement regarding empowering local decisions, on crucial sustainability issues.

There was a positive assessment of their “recursive governance” capability, given the efforts made by NES to link sub-regional and regional environmental strategies, confirmed through the VSM workshops. They recognised the need to create proper contexts in each eco-region, for joint learning about key environmental challenges, among the emerging networks of communities and industries that were responsible for them.

4.2 Case study: the ecovillage in Ireland (2000s)

The author (with Dr Jon Walker) worked from 2007 to 2010 with an Irish eco-community, to support their efforts to create a more effective organisational structure to manage their project of developing an ecovillage. Their purpose was to build the ecovillage and to develop local businesses to make their community sustainable. They also aimed to make of it an educational project, one from which others could learn regarding sustainable building and sustainable living. Previously the community members had tried to self-organise without major success.

The project involved 25 of the 100 members of the community, who participated in the different VSM workshops and events. It included the existing “Process Group” responsible for processing the new knowledge, as well as implementation of structural and process changes. They led the internal learning process between the researchers’ visits, and helped to develop an entirely new organisational structure, agreed with the participants in the workshops, and eventually adopted by the entire ecovillage. During the three years we organised VSM workshops, initially every three months and then more sporadically. We provided the members with an understanding of the basic principles of complexity management, skills to map the complexity of their evolving organisation and to make informed decisions regarding the best ways to self-organise and self-govern in a sustainable way.

We used the Methodology for self-transformation, aiming to facilitate a process of self-organisation in the eco-community. We shared the facilitation of the VSM workshops and the production of reports for a few years. During the workshops we provided community members VSM-inspired “meta-questions” focusing on issues of sustainability and governance, and invited them to identify needs for change and implement their agreed solutions.

The first year of intervention – still the ecovillage was a development project – ended up with an agreement on re-structuring from more than 20 working groups to seven “primary activities” or systems one, and a few management support systems (board, legal support, financial management, etc.). The agreed Systems 1 (the working

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962

groups responsible for implementing the key organisational identity and purpose) included: enabling the building of individual houses, building community houses, growing green infrastructure, education/dissemination/networking, and developing services. It also resulted in clarification of the required meta-systemic management roles: e.g., a monthly “Coordination” meeting was created to look for synergies and resolve conflicts, replacing the more traditional – and hierarchical – role of the project manager existing.

Over the next few years other workshops and learning resulted in further changes to their organisation and governance structures implemented: clarification of the role of the Board of Directors – to focus on identity, ethos and policy issues, rather than on operational matters as was happening before; review and clarification of their multi-stakeholders approach to governance; new accountability mechanisms were designed and used during these meetings; and development of basic adaptation mechanisms (e.g. annual participatory strategy formulation meeting, including inputs from all members). Table II summarises our assessment of the community’s Sustainable Governance’s capabilities.

There follows some reflections on the assessment.

4.2.1 Co-evolution with the environment. As explained above, after their reorganisation, the community was dealing well with the key issues for sustainability (excellent in first line of Table II). They were progressing well towards managing with real time information and closing their loops for effective governance (at the coordination meetings they were bringing results from their activities and making decisions in real time); they implemented decision making mechanisms with high variety, so the last two lines in Table III are marked excellent.

Criteria	Ways of addressing the criteria/level of achievement	Poor	Good	Excellent
Co-evolution with the Environment	Developing capacity to deal with core issues for sustainability at each level of organisation			
	Working out what matters			✓
	Real time information		✓	
	Closed loop information flows for effective governance		✓	
	Responding to changes in the environment		✓	
	Environments for decision making			✓
Autonomy and cohesion	Identity and closure			✓
	Developing meta-systemic management to support autonomous communities/organisations to sustainably self-regulate			
	Enhancing operational autonomy			✓
	Developing mechanisms to deal with conflicting interests		✓	
	To provide synergy to SIs		✓	
	To develop knowledge management systems on critical issues for sustainability		✓	
Recursive governance	To provide closure on sustainability issues		✓	
	Linking the local and the global governance issues and decisions			
	Enabling conditions for sustainable governance at each level of embedded and embedding organisation			✓

Table II.
An assessment of ecovillage governance (2010’s)

Table III.
An assessment of
the LA multinational
governance 2012

Criteria	Ways of addressing the criteria/level of achievement	Poor	Good	Excellent
Co-evolution with the environment	Developing capacity to deal with core issues for sustainability at each level of organisation			
	Working out what matters			✓
	Real time information		✓	
	Closed loop information flows for effective governance		✓	
	Responding to changes in the environment		✓	
	Environments for decision making		✓	
Autonomy and cohesion	Identity and closure		✓	
	Developing meta-systemic management to support autonomous communities/organisations to sustainably self-regulate			
	Enhancing operational autonomy		✓	
	Developing mechanisms to deal with conflicting interests		✓	
	To provide synergy to SIs			✓
	To develop knowledge management systems on critical issues for sustainability		✓	
Recursive governance	To provide closure on sustainability issues	✓		
	Linking the local and the global governance issues and decisions			
	Enabling conditions for sustainable governance at each level of embedded and embedding organisation	✓		

Autonomy and cohesion

- The new organisation guaranteed optimum operational autonomy to the primary activity groups (excellent at this level); all the other criteria in this category show improvement so they are valued “good”.

Recursive governance

- The reorganisation placed particular emphasis on keeping the sustainability criteria at the heart of actions from the bottom level of operations to the organisation as a whole and in the relationship between the community, the town and the SES it is embedded in. So this criterion is valued excellent.

4.3 Case study: the LA multinational corporation (2010s)

In 2011 the author, together with an academic team from Los Andes Business School, led an academic consultancy in a large multinational (referred to as LA). It aimed to help them to align their organisational structure to a recently agreed five years strategy. LA is a family owned the author, together with an academic team from Los Andes Business School, led an academic consultancy in a large multi-national (referred to as business in the building sector, operates in three countries, has around 5,000 employees (1,000 on a permanent basis) and their products vary from business and residential buildings, conference centres, shopping malls, to large infrastructure projects and consulting services. Once more we used the “Methodology for Self- Transformation’ to help them deciding on their required organisational adjustments to ensure long-term viability and sustainability. See details of the VSM intervention and results in Espinosa *et al.* (2015).

In this opportunity, due to the size of the company and the challenges it represented regarding data collection and analyses, we amended some aspects of the methodology by developing semi-structured interviews, and surveys, to structure our learning about the company previous to the development of the VSM workshops. We also created a Process Group, with whom we interacted more closely all through the VSM intervention. We developed two main workshops with representatives from the different levels of organisation to agree on the key diagnostic findings and decide on strategic changes to their structure and governance mechanisms.

The main findings about required changes in the structure referred to the need to enhance the operational autonomy and governance mechanisms at both the regional and project levels. At the project level, the team prototyped a new project design based on a more “cybernetically sound” self-governance structure: it allows each project team to make more responsible decisions on a day-to-day basis without waiting for top level permissions, while learning to respond in real time for their resource and performance management. At the regional level also, the redesign project involved devolving control to the regional managers regarding some issues (e.g. certain types of purchasing and contracting; environmental scanning for new building opportunities; a more inclusive local governance structure; self-managing projects within their area of responsibility). For more details on this case study and results see Espinosa *et al.* (2015). Table III below offers a review of the main issues regarding the governance of sustainability learned in this case study and a summary of the key sustainable governance features this multinational was facing.

There follows some comments on the assessment:

Co-evolution with the environment:

- The reorganisation emphasised the need for focusing action, resources and strategies at the project level and on the key issues for viability and sustainability of the building projects, so this first criterion is marked excellent. In the following criteria there was a culture of effectiveness and responsibility that got consolidated through the VSM intervention. All the criteria in this section were graded well for LA multinational.

Autonomy and cohesion

- The family management tradition happened to work quite well regarding synergy creation. The VSM intervention suggested improvements in operational autonomy at local and regional levels, as well as in the management of conflicts and sharing of knowledge, so these criteria were rated good. There was room for improvement regarding implementation of sustainability strategies at the levels of building projects so this criterion was rated poor.

Recursive governance

- There was a lot to be learned regarding governance for sustainability at all levels, so this criteria was marked poor.

5. Lessons on governance for sustainability

A broad overview on Tables I, II, and III allows us to see some issues that were specific from each experience, and some that were common to them, regarding governance for sustainability:

- Both the eco-region, and the ecovillage case studies were exceptional regarding the decision of stakeholders to focus on sustainability issues at a specific scale

(eco-regional, community): in both cases there was a clear environmental ethos, acting as a “gluing” factor. They both scored high in issues of identity and closure (emerging System 5 roles), which are core for developing strong governance capabilities for sustainability. Lessons might be learnt regarding the cohesiveness of organisational purpose and ethos and the development of sustainable governance capabilities.

- While in the ecovillage, members implemented new governance mechanisms – through the coordination meetings and the assembly – and they were operating very well (highly rated), in the eco-region we only diagnosed the need for improving existing governance mechanisms which were good but could be improved. Designing and implementing them in the eco-region was a much more complex undertaking than in the ecovillage, as it would require changes in law, and administrative roles and responsibilities between environmental agencies and industries. This reveals a simple lesson regarding implementation of governance mechanisms: the bigger the scale of the organisational system the more impact such a design and implementation will have; and more legal, administrative, financial and other issues may need to be considered in detail.
- There was evidence in the ecovillage collected by a PhD student focused on researching and observing self-organisation in the community (Cardoso (2011, p. 255-290, Appendix 3) - to prove that members who participated in the project shared mental models of their organisation and enriched importantly their narrative about their organisational arrangements and desirable changes. Their understanding of the principles of complexity management enabled them to design more effective organisational roles, routines, information management and decision making practices (Espinosa *et al.*, 2011, pp. 16, 17; Espinosa and Walker, 2013). The new roles and mechanisms put into practice resulted in improved communications, role definitions, connectivity and performance, all of which contributed to improved viability and governance of the community (Espinosa and Walker (2013), pp. 126-128 and Appendix 3). In summary, decision making and closed loop learning were much better articulated in the ecovillage. This is a fundamental feature of governance from a VSM perspective – informing the organisational design of the ecovillage; the closer those taking decisions are to where decisions need to be taken, the more likely self-governance may happen. In the eco-region diagnosis it was clear that more could be done to improve this feature for good governance: and there was at the time a highly supportive political and structural context that allow such a proposal and implementation to happen.
- Regarding autonomy and cohesion, the eco-region diagnosis identified a lack of autonomy at the sub-regional level to make effective decisions on key issues on sustainability, (but still good at the eco-region level to generate synergies); the ecovillage case study showed excellent improvements in dealing autonomously with operational tasks, and good improvements in dealing with management, information and synergies between them. An open question opened is to what extent an emerging (complex) level of organisation – as the eco-region – would need first to consolidate some synergies among embedded System 1s, (e.g. as in this case through the need of sharing investment budgets and ICT resources); and thereafter develop shared governance mechanisms that allow them to enhance their autonomy at other levels.

- The recursive governance criterion gets an excellent assessment in the ecovillage and a good one in the eco-region. Undoubtedly, the ecovillage members have embedded the core principles of sustainability in their individual, family, work and community habits and practices, which makes their decisions fully coherent with local, regional and global criteria of sustainable development. Even if the eco-region key stakeholders were environmental agency employees – who theoretically have also embedded these principles at least in their work – not all the communities and industries living at the eco-region would share the same ethos, so decisions would always be more controversial and governance for sustainability at this level may need to be re-enforced (e.g. by design).
- The LA multinational is a for-profit driven company, very successful in the market, and has developed a culture of effectiveness and good capacity to make decisions – even if many of them were filtered by senior management criteria. Their assessment on the first criteria in Table III is good, with excellent skills for focusing on the relevant issues and responding quickly to environmental disturbances. So potentially they have a good governance installed capacity. However, their acknowledgement of key sustainability issues and their embodiment of them in their building practices was only starting so they got a poor assessment regarding recursive sustainable governance: they were still more driven by their own profitable interests than by their social responsibilities. They recognised their need for improving their sustainable governance mechanisms at the regional and project levels – which were working very successfully, in terms of the market, but could be improved regarding their social and environmental responsibility.

6. Conclusion: VSM criteria for sustainable governance

One of the first issues that becomes evident from the above case studies is that the methodology for self-transformation allows us to model organisational systems of all types and at different scales and levels of complexity. We have used examples of its application to observe core issues of viability and sustainability of a regional SES (the Magdalena River Basin); a developing Irish eco-community; and LA multinational. Each one of them had to deal with completely different sustainability and governance challenges and have found their own ways to self-organise to respond to such challenges.

The reports of the systemic interventions demonstrate the power of the VSM as a mapping tool to represent the complexity of these multiple ranges of agents and interactions with a unified language. They also illustrate the usefulness of the VSM as a language to learn about complexity management and related governance challenges in organisations of different scales and at different times and contexts. In the three cases, using the VSM to facilitate participatory model building allowed the project team to create a shared mental map of their respective socio-ecological systems, an alternative way of mapping them that offered interesting advantages over more traditional models. This process of mapping such complex systems created a learning context that favoured the emergence of collective understanding of the key aspects for viability and sustainability of the SESs.

The reflections on each experience, using this assessment framework open new questions in this research field: e.g., how do we observe and study more systematically the development and evolution of capabilities of governance for sustainability at different levels and scales – what we have called recursive governance for sustainability?

The framework so far has proven particularly useful to compare issues of governance for sustainability on case studies at different scales and levels of granularity

At the higher level of complexity – the level of the eco-region – we learnt that SES could be represented as clusters of viable systems, co-existing and sharing the eco-system services in a SES. Each organisation can be seen as an autonomous agent – within cohesive limits imposed by the health and well-being of the SES at the next level of recursion – interacting with its niche in a continuous, co-evolving dance based on tightly coupled closed loops. Taking care of the existing eco-system services is a shared purpose that will benefit the embedded agents in the medium and long term. This implies development of a shared awareness of their SES health, as well as of the local, regional and global sustainability goals and strategies.

The best way to map a complex SES is by identifying recursive, embedded organisational levels: this enables the identification of key socio-ecological concerns and actors, and therefore the design of action networks to deal with them at the appropriate level. How each organisational network manages to decide and act on key sustainability challenges in a timely way, determines their self-governance. This depends on structural, cultural and political aspects, which can be identified and diagnosed by expanding the above meta-questions at further levels of granularity. The political aspects are central to resolve issues of sustainable governance, as there will always be tensions between the logics and interests among different levels of organisation. Progressing this field of research requires a trans-disciplinary approach: latest advances in the field of eco-systems approaches and new institutional theory could be interesting to explore in combination with the VSM (Andrade *et al.*, 2012).

Finally, in the three case studies, there were differences regarding the nature of the systemic interventions: in the eco-region, the whole group was originally mapping the national environmental system, and then producing a diagnosis of the particular eco-region. The author facilitated the workshops where the modelling and initial diagnosis happened and then elaborated final details of the eco-region and governance diagnosis. In the ecovillage, the author and Dr J Walker facilitated all the workshops but the Process Group guided implementation and continued learning. In the LA multinational the authors' academic team facilitated the workshops and their Process Group has continued leading implementation. The level of detail of the methodology and associated tools for data collection and analysis had been improving in the last decade through these and other interventions.

To progress the research on sustainable governance using the suggested methodology and tools, it may be useful to include the participants from the beginning in a self-assessment of their governance skills. For the purpose of developing this paper, the author has produced the assessments but it would have been more appropriate if participants were directly involved in this assessment. A more detailed instrument to assess governance at each level of organisation can also be produced, to offer a more robust strategy for the assessment, and to make it more comparable among different applications.

This paper has summarised – and offered detailed references to previous publications where the topic has been extensively developed – how VSM criteria help to clarify the understanding of governance for sustainability. It has introduced a tool to observe the capacities for “governance for sustainability” from organisational systems of different types and scales. It has presented examples of application of this tool by revisiting published work by the author (and colleagues) on three VSM interventions in an eco-region, an eco-community and a LA multinational. By reflecting on their

assessments on sustainable governance capabilities, we have identified some initial questions that contribute to setting up an agenda for continuing this research on how can we learn about the development of governance for sustainability at different levels and scales. The issue is strategic and a priority in the global environmental crisis we are facing. This is not a unique answer but a single proposal from a rich field that hopefully could be jointly explored by our research community given the urgency to provide quick and practical solutions to the global crisis.

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