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Institutions, Nations, Enterprises and Distributed Organisation (the Westphalian Dilemma)

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ABSTRACT

This paper offers insights about the management of policy issues such as COVID 19, climate change, sustainability, terrorism and many more emerging from an increased globalization of local problems in society. It discusses this management with the support of the Viable System Model -VSM-, assuming that the reader is already familiar with Beer's work and also with Espejo's work. Its focus is an extension of the VSM -the Enterprise Complexity Model- to improve relationships in organizational system. It discusses international relations making reference to the Westphalian Treaty of 1648, but only as an origin of fragmentation in public structures. At a most fundamental level it is about the management of complexity in organizational systems through the application of recursive structures that the paper develops in some depth.

KEYWORDS

Enterprise complexity networks; policy issues; recursive organizations; Viable System Model; Viplan Methodology

Introduction

Global institutions, such as the United Nations (UN), the World Health Organization (WHO), the International Energy Agency (IEA) and several more (Bula 2022 Wene 2022), underpin global policy issues with the participation of many countries or nation-states^{1,2}.

Interactions between nation-states and institutions, at varied structural levels, need attention to avoid isolated efforts and overcome conflicts and fragmentation. Avoiding fragmentation toward achieving shared purposes is necessary as a strategy to improve policy processes. This paper discusses some of the challenges that are constraining institutional and state responses to global problematic situations. The Westphalian treaty of 1648

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¹Bula (2022) in his contribution to the journal *Cybernetics and Systems* "Some notes and reflections about the institutional context to study the Westphalian dilemma" uses the concept of nation-state as a signifier of the characteristics of contemporary states, without prejudice to the fact that today most of them are multi-ethnic, many are multinational, and many combine both conditions.

²Wene distinguishes in the same journal nation states, meta-states and empires in the context of soft powers. See figure 4 in his contribution "Can Double Closure Explain Behaviour of Westphalian nation state?"

(Peace of Westphalia - Wikipedia), fostered the creation of nation states in Europe in the context of the preexisting protestant and catholic nations. This paper does not discuss the treaty itself. The main purpose is to recognize that the treaty was the origin of states of different sizes and with different resources, some of them with the capacity to solve locally their problems, yet others with the need to operate in more global contexts. Naturally the requirements for problem solving vary from country to country. Issues such water and energy resources may cut across local boundaries and have a regional context yet others like a pandemic or climate change may need to recognize a global context. Furthermore, with a societal perspective, for a country the management of a particular problem, such as education, may not be good enough in isolation of other countries. Possibly, even if problems are solved locally, their impact will cut across the boundaries of other countries, making their local management insufficient. It is necessary to have conceptual and methodological contributions to improve problem solving across and between countries. Clarifying these contributions is the purpose of this paper.

As for relationships between nation states we distinguish, from a *cybernetic perspective*, autonomous and independent countries. This distinction makes necessary to say a few words about forms of governance in our societies. Autonomous nation-states have operational closure *within* the context of a larger organizational system³. Being autonomous implies belonging or being contained in a larger organizational system⁴. On the other hand independent nation states are those that may have operational closure in their own right *without necessarily belonging to a larger organizational system*. For instance the United States of America, as an independent nation-state, contains autonomous states but it does not belong to any larger system. As for South American countries they are by and large independent, and not formally contained in any larger State. The situation in Europe is less clear; countries within the European Union (EU) maintain a large degree of independence, however, efforts are in progress to make them increasingly autonomous within the EU supra state (Wene 2022).

In these situations democratic and participatory values emerge from people's interactions in challenging environments. People operate at varied structural scales, from communities, regions, nations, to global institutions.

³As proposed by Wene (2022): "Operational closure moves the focus from transfer functions of linear input-output machines to the distinction and self-organization of a system that provides its own internal structure and observable behaviour. This has one unique consequence. The closed network of operations constrains outcome and forms invariants that are observed as Eigenbehaviour". The emerging of Eigenbehaviour is referred to as the cybernetic closure theorem: "Operationally closed systems develop Eigenbehaviour" (von Förster 2003, 321)."

⁴Organisational systems are produced by a closed structure of components with their own decision-making capacity (Espejo and Reyes 2011).

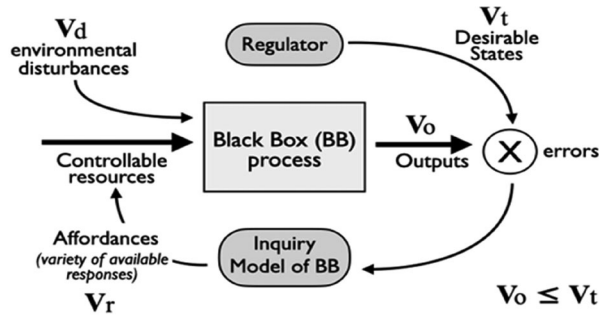


Figure 1. Requisite Variety as represented by a Black Box description of an organizational system (after Espejo and Howard 1982).

Interactions may happen in spaces that either foster their independence or their autonomy. These are structural issues shaping their problem solving capabilities and possibly increasing the challenges they have to deal with to contribute positively to global problems and to a more sustainable humanity. For instance, in the context of COP26, the Glasgow meeting late last year (2021), with participation of a large number of mostly independent countries, countries were faced with a particular decision toward reducing significantly CO₂ emissions by the mid of this century. Countries had difficulties articulating commitments toward subsuming their independent policies within a global policy which required agreeing enforceable regulations. Increasing the feasibility of successful agreements toward collaborative autonomy in a wider global context, to avoid independent policy fragmentation, is of central concern to societies today. Equally, maintaining the independence of nation-states to avoid the unilateral dominance of the more powerful nations, such as China and the USA, is a matter of concern today.

There is no doubt that policy makers and researchers need to reflect upon better futures to deal with the current difficulties of nation-states collaborating in a context of global institutions within a systemic context. It is necessary to argue for a more collaborative world. Organizational actors in nation states, and their agents beyond them, are aware of the pressing needs that today and future generations have to deal with to accept both ecological challenges and ethical requirements.

The Law of Requisite Variety (Ashby 1964) is a key conceptual tool to discuss these issues of autonomy and independence. This law helps understanding how to balance environmental and organizational complexities and in particular it supports *self-organization* to improve the management of high variety situations. In Ashby's terms the variety or complexity of a black box situation has to be matched by the variety of its regulator (see Figure 1). It is necessary to balance the complexity of environmental disturbances (V_d) to this situation with the organizational responses (V_r) as

shown in this figure. In other terms to achieve adequate performance, the complexity -variety- of the situational outputs (V_o) has to be less or equal than the variety of the desirable states (V_t). The practical use of this concept is *correcting variety imbalances* between actors in the BB and agents in the environment through self-organization.

Requisite Variety “V” stands for variety and $V_o \leq V_t$ is a condition for requisite variety, that is, the variety of outputs, should be less or, at the most, equal to the variety of the desirable states.

Next, it is important to make the distinction between independent and autonomous nation states. In situations of two independent nation-states, the self-organization of one nation-state is independent of the self-organization of the other independent nation-state: it can be said that their self-organization processes *do not affect each other*; on the other hand in a situations of two autonomous systems embedded in a *larger system* their self-organization *is guided* by the policies and directives of this larger system, and is collaborative in nature. Understanding this collaboration is the contribution of Beer’s Viable System Model (VSM) (Beer 1979).

The VSM provides a powerful heuristic for balancing an enterprise’s huge number of possible states to the even larger number of possible states of its environment. Its self-regulatory strategy is containing collaborative autonomous parts; this is called, as discussed later, structural recursion. Accounting for this balancing helps to respond effectively to challenging environments. In this paper the Enterprise Complexity Model (ECM) is a methodological extension of this model focused on problem solving rather than on the viability of an enterprise. It is a guiding model of the enterprise’s need to manage the environment’s ever increasing complexity through the autonomous collaboration and coordination of its parts, rather than by attempting to go alone as a single formal enterprise.

It is in this context that the Viplan (Cybernetic) Methodology (Espejo 1993) plays its role. Its purpose is facilitating the use of the VSM as a modeling tool to deal with situations that require flexibility, creativity and adaptability. To do this the situation needs to overcome its fragmentation and understand how to use its resources as a cohesive system with capabilities to deal with environmental challenges. This problem solving requires strengthening its organizational competencies and increasing its appreciation and understanding of the environment.

Toward Systemicity with the Viable System Model: recursive Organisation Structures and Policy Issues

The Viable System Model as proposed by Beer (1979) suggests five necessary and sufficient systems for organizational viability; he calls them the

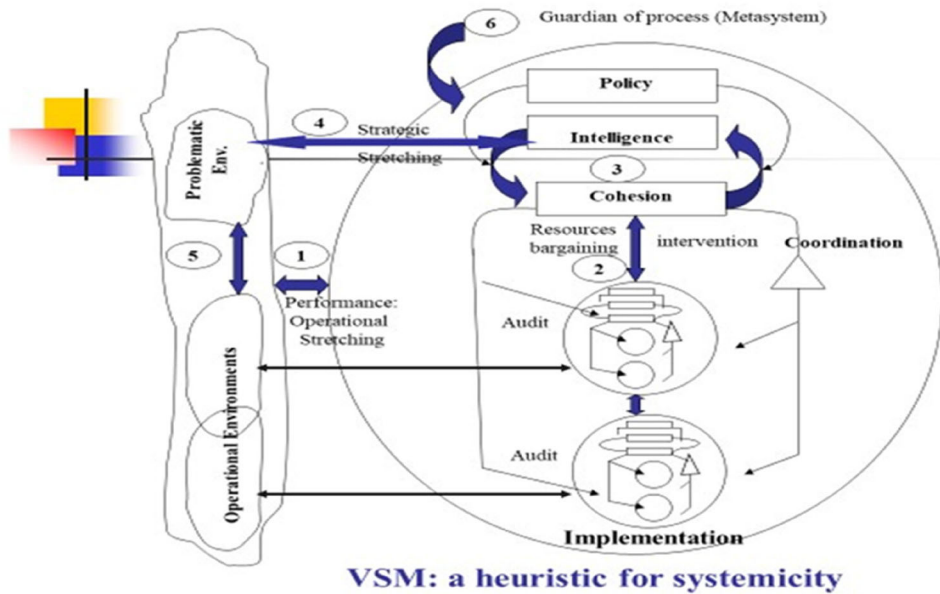


Figure 2. The VSM as a heuristic for systemicity (source Espejo 2008).

systems 1, 2, 3, 4 and 5 of the viable system. From a functional perspective these five systems can be summarized in three systemic functions; *creating, regulating and implementing the organization's policies*. In Figure 2, policy, intelligence and cohesion, *relate to policy creation*, cohesion and coordination *to policy regulation and autonomy* within autonomy *to policy implementation* (Espejo 2008, 2020, Espejo and Reyes 2011). These are three necessary systemic functions for viability.

Often we find that institutions and nation-states have one or two of these functions but not the three required for viability. Of course they may have the three, thus with the potential to constitute a viable system. Furthermore, viable systems have a recursive structure, with autonomous viable components in its implementation; it may be expected that each of them is constituted by policy, regulation and implementation and that self-organization is the effort of embodying resources toward constituting these three interrelated systemic functions. However, *institutions* contributing to the constitution of organizational systems may create and regulate policies but not implement them, thus lacking necessary mechanisms for operational closure (Espejo 2020; Wene 2022). Equally if an institution is mainly regulatory, lacking capacity to create and implement particular social policies, it will lack communication mechanisms for operational closure. A recursive structure is at the core of the Viable System Model (Beer 1979). This structure emerges from the collaboration of multiple embedded autonomous, largely self-organizing, units in an organizational system. They are related by communication mechanisms that produce cohesion

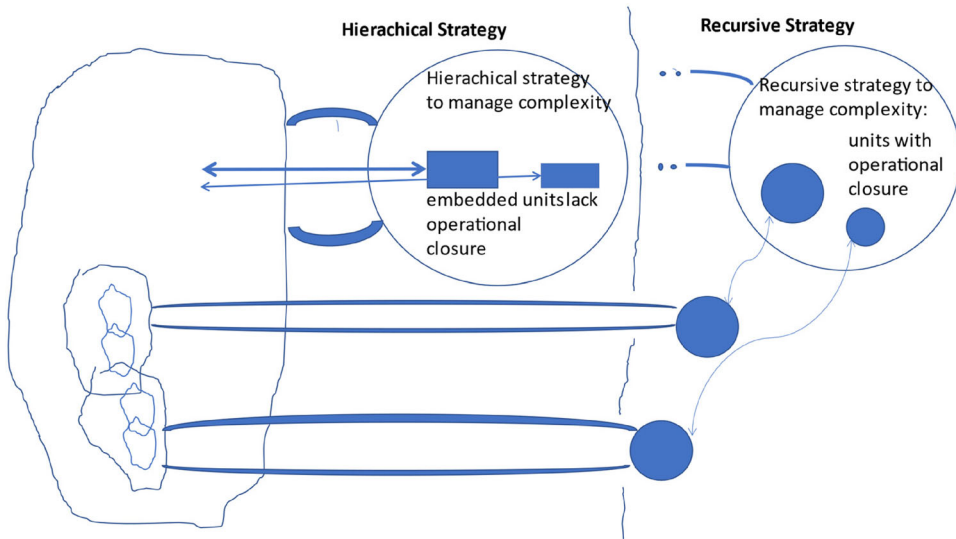


Figure 3. Hierarchical vs recursive structures.

and adaptation. A recursive behavior is one emerging from communications between parts in interaction, producing stable distributed meanings. As already explained, self-organization is a condition for autonomy. Only when the components of a system are embodied with policy, regulation and implementation we may expect a recursive structure and autonomy within autonomy.

The challenge is managing situational complexity through recursive structures; that is, through the collaborative autonomy of its components matching situational complexity, mostly through self-organization, at acceptable levels of performance.

Centralization in society *has dominated the design of much complexity management in organizational systems*. The aim has been attenuating social complexity through hierarchical structures (see [Figure 3](#)). But also we find decentralization *as a strategy to implement policies*. This is a strategy to proliferate social complexity through reducing undesirable controls and assuming that *self-organization* will, in one form or another, do the job.

A hierarchical strategy, as visualized in the left side of [Figure 3](#), concentrates the system's response to environmental challenges at its top. Naturally this is a strategy that to a significant degree reduces the system's responses to environmental complexity at the local level, thus reducing its performance; responses at *local levels* are restricted by *global* decisions and weak local actions. In parallel, in the right side of this figure, it can be appreciated a *recursive strategy* based on the autonomy of the system's components to deal with the environment, that shows in more depth its

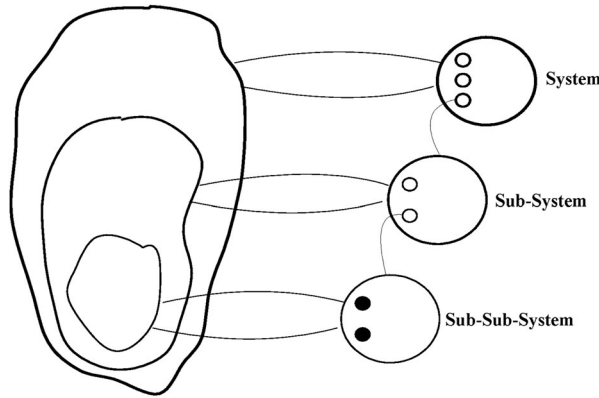


Figure 4. Theoretical unfolding of complexity (Beer 1979).

complexity, and therefore, overall, allows more detailed responses and improved performance.

Structurally, the hierarchical strategy achieves operational closure mostly at the global level, containing *components without closure* (i.e. *the rectangles within the circle in Figure 3*), while the recursive structure at the right achieves distributed organizational closure within the system (i.e. *the smaller circles within the larger circle in the Figure 3*), that is, it has components with policy capacity within themselves throughout the system, each with autonomous amplification of aspects in need of response capacity. It is apparent that this recursive structure is capable of generating far more complexity to deal with environmental challenges than the hierarchical structure.

While a recursive structure, such as that proposed in [Figure 4](#), with autonomous units contained within autonomous units, all with operational closure, aligned with the purposes of the containing system, is highly desirable, it may be operationally difficult to achieve.

As described in [Figure 5](#) below, however much operational closure within operational closure is desirable to increase the organizational system's response to its environmental complexity, in practice this embedment may be replaced by self-determining resources looking for their own interests unaligned with the global purposes of the global organization (i.e. *the larger circle in this figure*). For instance this larger organizational system (i.e. *circle*) could be the nuclear energy system in a region, with unconnected resources, such as a research and development enterprise or a university investigative department, which are described as independent rectangles or squares in this figure, structurally independent of the nuclear system (*one unconnected within the circle and the other outside the circle*). These are resources *fragmenting the nuclear energy organizational system*. Similarly, circles or organizational systems focused on other forms of

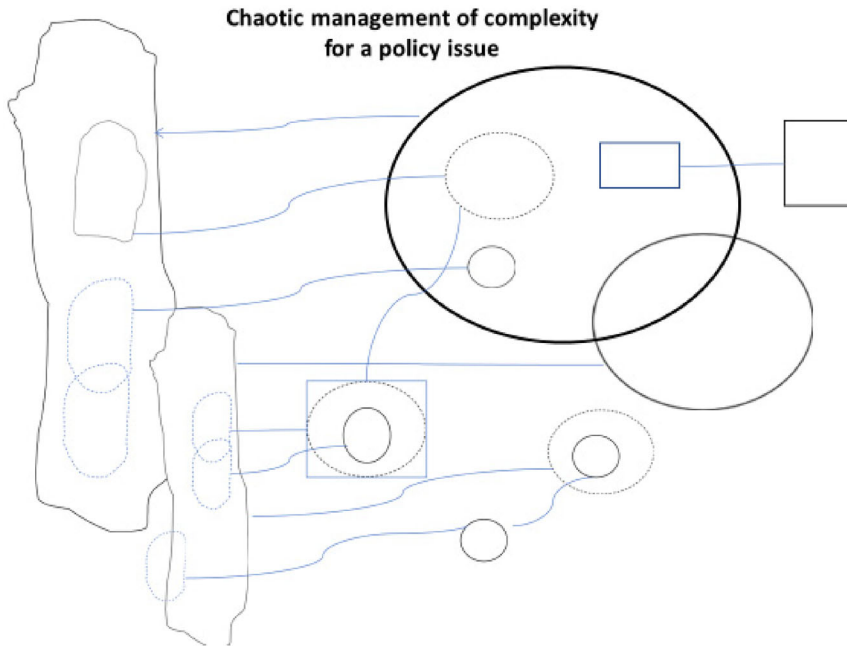


Figure 5. Chaotic complexity unfolding focused on one policy issue (represented by the large circle).

energy and with weakly related purposes are not included in the larger circle, and may be fragmenting the global energy organizational system. In practice, this figure illustrates the difficulty to achieve structural recursion.

A “*chaotic unfolding of complexity*,” with circles and rectangles as shown in [Figure 5](#) is the most common situation in reality. An autonomous system, large circle including smaller circles, and these circles with either weak relations to the main purpose of the larger circle or outside the system altogether, may develop independent self- organization. In practice, in top-down situations, one way or the other, some form of fragmented complexity unfolding will happen, because the system’s interactions with environmental agents will be unable to cope with the situational complexity, triggering some forms of fragmented responses. As for bottom-up situations, organizational complexity grows locally mostly through the self-organization of independent units (detached smaller circles in [Figure 5](#)), that emerge from the coordination of components, overcoming poor collaboration and synergies. The rectangles in [Figure 5](#) are resources, possibly contributing to policy formulation and regulation, but as the situation is, are either independent or constituting weakly connected regulatory systemic functions to the organizational system. More about this diagrammatic representation is explained later with reference to the Enterprise Complexity Models ([Figure 6](#)).

The largest black circle in Figure 5 intends to show an organizational system's global complexity in the environment focused on a particular policy issue. It is a graphical expression of the hazy structuring that the relevant components and resources make of the situation. The most likely situation is that there are many of these circles, making apparent that there are several possible structurations of the policy issue. The larger circle is a depiction of the main complexity of the policy issue; it is a statement of the overall meaning of the issue as created by a group of policy-makers and implemented and regulated by other actors. It is more than a declaration of intention; it is the embodiment of the resources producing and regulating the policy issue. The global circle is in interaction with agents and resources in its environment. Other circles in Figure 5 are partially embedded in the global system and contribute to the creation, regulation and production of other not fully integrated policy issues. The driving conceptual framework for this purpose is that of the VSM, which offers a heuristic for systemicity.

From the perspective of policy issues, such as, for instance, the UN 17 Sustainable Development Goals (<https://www.un.org/en/sustainable-development-goals>), a challenge is matching the complexity of institutional and organizational resources to the environmental demands of policy issues. The challenge is to improve the distribution of complexity through effective organization. *As the situation moves toward an effective unfolding of complexity the chances are that responses to challenges will achieve better performance. A fundamental structural proposition, from the perspective of managing problem solving, is to increase the quality of complexity unfolding, to match more environmental complexity with less resources. The VSM gives a heuristic to improve the organizational structures backing the management of policy issues.*

Toward Autonomous Nation-States

The Viable System Model (VSM) helps improving the systemicity of policy situations, that is, helps removing fragmentation and increasing performance. In complexity terms this requires improving the recursive structure of the organizational system. This is necessary to overcome situational fragmentation and increase the resilience of individuals and social enterprises, that is, increase their capacity to deal with environmental complexity.

It is in this context that Westphalia is brought back as an example of a structural dilemma. It gives an insight to deal with conflicts between local and global management of resources. The Westphalia Treaty (1648) established the independence of nations at the expense of their cohesive belonging to wider institutional settings, in which historically they had been

autonomous components. This autonomy had been accompanied by wars and conflicts, such as the thirty years war.

The *dilemma* is that wealthy independent states are more concerned with their own interests, than with their contributions to regional or global policies, such as countering climate change or improving global education or directing more resources to poorer countries. However, for better chances of success an *institution* responsible for the cohesive development of a global policy, needs to propose policies that trigger the collaborative support of related nation-states. Unfortunately independent states may be more interested in their own local policy implementation, for which they have resources, at the expense of collaborative efforts with other nation-states. These independent responses are achieved at the expense of an integrated higher performance implementation of the global policy. This dilemma was proposed by Espejo (1989) as a *control dilemma*; the more cohesion is necessary to achieve collaborative policies the more likely is that nation-states, following their own interests, will focus on balancing their own varieties with their local environments, at the expense of reducing the efficacy of the global policy. *For these particular policies, cybernetically, improvement requires moving in the direction of recursive structures with autonomous rather than independent nation-states.*

This dilemma was recently recognized by Gordon Brown (2021), who explored the mismatches between global and local problems in his recent book “Seven ways to change the world”:

“there is a mismatch between the global nature of the problems we face and our capacity- or willingness- to resolve them as a global community. Instead, we continue to work within a predominantly national framework.” And adds “... why, in the face of such glaring need, national governments seemed so ineffective and international institutions seemed so powerless to act” (Brown p2).

Today, it can be argued that the European Union (EU) is encountering these dilemmas of *independence and autonomy* in situations like Brexit, where the UK prefers independence at the same time that nations belonging to the EU Superstate prefer moving toward autonomous states. Similarly, in the context of the UN Climate Change Conference (COP 26), hundreds of mostly independent nation-states were required to accept autonomy, rather than independent behavior within the global policy framework of reducing carbon emissions. To respond to the climate crisis, it was wiser to build up collaboration with structural recursion, knowing that their responses needed requisite variety at multiple structural levels.

Beyond climate change, policies as varied as nuclear waste management, energy resources, health issues, education and so forth are illustrations of these dilemmas. These are policies in situations of high complexity and clear purposes integrating global and local sustainability.

A sustainable future requires overcoming *ineffective* nation-states and *powerless* global institutions. There is a need to *correct variety imbalances* between nation-states and their local environments in the context of global institutions responsible for the larger environment. The driving force to match the demands of situations like COVID 19, climate change and others is communications with high performance at multiple structural levels. From a design perspective, improvements require *self-organization within guiding contexts*, that is, autonomy, or self-organization that makes it possible the use of human, technical and other resources to improve nation-states and institutional interactions with their environments over time. In the end, starting from the large number of people affected by these problematic situations, policy-makers, experts, politicians and in general stakeholders can add to our understanding of issues such as sustainability in recursive environments. The Viplan (Cybernetic) Methodology (Espejo 1993) is offered below to discuss policy processes to overcome the shortcomings of independent nation-states in the benefit of globally sustainable development goals. Practically, global institutions need to implement autonomous recursive structures, with the capacity to overcome the self-centered approach of nation states in the benefit of global policies. *This is a methodology to overcome the Westphalian dilemma*. The main direction to improve global issues is developing the relationships between networks of independent nation-states toward their autonomy.

For design purposes, along the lines of the Viable System Model, policy-making relationships are discussed next toward the inclusion of nation-states within larger institutions. The idea is moving increasingly toward a systemic world that overcomes, for sustainable development goals, institutional fragmentation and aims at a cohesive autonomy of the relevant nation states, beyond the independence and the destructive dominance of the powerful; in short, how to expect the evolution of social relationships toward a more sustainable future?

Complexity Management between Structural Levels

The Enterprise Complexity Model (ECM) with the support of the Viplan Methodology offers methodological support to achieve effective recursion for policy-issues (Espejo 2015, 2020). The ECM is a reflexive interactive approach that improves situational communications in such a way that people can contribute more effectively to *correcting variety imbalances* at their own structural levels; it is a methodological aid for self-organization (Espejo 2020).

Organizational systems have multiple problems toward managing their structural complexity. We are aware that problems such as democratic

rights are related to several structural levels, from the global to the local. For instance a nation-state like the USA, concerned with maintaining its democratic values may be challenged by autonomous states enacting local legislation which potentially may limit the democratic rights of its citizens⁵. These problems, whatever their scale, require appropriate organizational responses to reduce the chances of situations out of control, potentially creating instability and conflicts.

Nation-states with varied complexity, large and small, can be related to the Westphalian dilemma. This dilemma fosters nation-states with the power to maintain their boundaries and manage independently their resources. They can make their own decisions, under the assumption that a state's sovereignty would be respected by other nation states. This situation could trigger inequalities among the organizational capabilities of nation states. *Requisite organizational structures* are necessary to handle shared problems together. Current global economic practices support to different degrees requisite cohesive nation-states, but often they *fail to draw the practical conclusion that to protect themselves locally, they have to act globally*.

The status of institutions such as the World Health Organization, the International Energy Agency, the World Trade Organization and many more need to be revised in order to see opportunities to strengthen their roles toward global, regional, national and community collaboration.

The required cohesive forces for the participation of nations in global situations does not assume that they should be components of a global system of government. Today the challenge is considering global and regional issues under the umbrella of shared values and ethical guidelines, overcoming the unilateral dominance of institutions. These are organizational structures beyond the dominance of institutions to overcome social, economic and ecological fragmentation. This is an aspect that is discussed next in the light of Enterprise Complexity Models.

Today we need politicians, institutions and nation-states with systemic sensibility to recognize relevant organizational systems and workable cohesion mechanisms. We want nation-states capable of producing desirable meanings to avoid unintended ecological and political consequences at the same time of supporting collaborative frameworks and organizational designs beyond centralized structures. It is necessary to understand not only how nation-states create and produce meanings and policies but also how they develop mechanisms to align these meanings and policies with those of guiding institutions without forcing them to be subsumed within

⁵The Economist of 20th January, 2022 reports that Mr Biden and his Democratic Party are failing in their attempts to pass a voting-rights bill to limit local state powers to restrict minorities voting rights, which underpinned Trumps' attempt to declare illegal the results of the 2020 Presidential elections.

these institutions. They have to learn to overcome the Westphalian dilemma.

The problem is that nation states to respond to significant challenges need their embedment in organizational systems enacting learning structures, that may not coincide with institutional and political centralized structures. Policy learning in the context of particular nations and enterprises, beyond the limitations of weak political and global institutions, may offer desirable policy guidelines. This requires enacting processes that, as is explained in the next section, consider networks of nation-states under the umbrella, but not dominance, of global, regional and specialized political institutions.

For instance, the proposal is *not to force institutions such as the International Energy Agency (IEA) to produce within themselves the structures of viable systems, with capacity to create, regulate and implement their policies. The proposal is to make key policy issues viable, such as, for instance, sustainable energy, in the interests of society at large. For this purpose a network of enterprises and institutions are necessary.*

A global institution such as the *International Energy Agency*, helps us to visualize these networks. This is an institution more likely to be focused on *creating and regulating energy policies* than on *implementing them*, aspect that is left to the resources of nation states and other institutions (see [Figure 6](#)).

Since the IEA aims at reducing CO₂ emissions worldwide, for policy implementation it depends on the structural recursion of the nation states, with embedded energy plants, whose activities produce CO₂ as well as research and investigative institutions, which together create, regulate and reduce the production of CO₂.

One nation-state may relate to a policy issue and have the resources and relations to make it viable, however, if this is not the case, and the origin of a policy is an institution in collaboration with other independent nation-states, they together should work toward policy viability through virtual and operational networks. This is an Enterprise Complexity Network⁶. Together the institution and the related countries will need to *learn through collaboration, to produce operationally closed systems and self-organization processes.* Clas-Otto Wene has developed further this idea of operational closure focused on energy policy; “Operationally closed systems develop Eigen behaviours” (Wene 2022) provides a platform for policy learning, aimed at strengthening global policies, such as reducing CO₂ for climate control.

⁶The idea of an enterprise complexity model/Network is developed in the article “The Enterprise Complexity Model: An Extension of the Viable System Model for Emerging Organisational Forms” (Espejo 2020), which clarifies the idea that an enterprise complexity model is a network of enterprises and institutions not constrained by the boundaries of formal enterprises. In fact enterprise complexity models can be better referred as Enterprise Complexity Networks.

It is necessary to learn much more about the forms and difficulties for structural recursion in organizations and institutions. For instance, in the current pandemic, the legal structures for a significant number of decisions remain within the nation-state, something that makes global policy adaptation more difficult. Beyond the nation-state their containment in larger systems is not easy. Often nation states do not coordinate their policies; only if they do, they may think in an international level, to find solidarity or sense of international community.

It is necessary to learn much more about coordination and collaboration of institutions like the IEA, WHO, WTO, and others that cut across nations, and have significant implications for problem solving.

The Viplan Methodology as explained next is proposed to deal with these problems. The challenge is discussing recursion in situations that do not offer neat forms of containment of units within units. When this is the case, policy issues cannot be described in traditional recursive structures. *Double closure helps for self-organization and recursivity* (Wene 2022)⁷. Together we are talking about learning situations, underpinned by operationally closed systems producing eigen behaviors (von Förster 1984). For energy policy, operational closure can be an important contributor to reduce the CO₂ emissions of the related *organizational system*.

Similarly, for many other policy issues such as the balanced use of limited water resources between countries, or building up a socially fair educational systems, or in general, contributing to structural aspects of the UN sustainable development goals double closure should help their management. Eigen behaviors emerge as outcomes of operationally closed systems that *cut across nation states*, toward achieving the necessary structures and economies for socially acceptable global policies.

The next section offers directions to make progress in policy making. Among other aspects, it is necessary to learn more about overcoming hierarchies, improving actors' relationships and overcoming misuse of power in societies and organizations. We need to explore in more detail whether recursive structural solutions are practically possible and how to achieve cohesion of policy issues dominated by the Westphalian dilemma of independent nation states.

⁷*Double loop learning*, from my perspective, is the outcome of two feedback loops between a system and its environment; the first learning loop is the outcome of the observed responses of the environment to the system's actions. These are responses to the system's strategic development and not necessarily to its operational closure. The second learning loop is the outcome of the organisational system structural transformations to maintain its adaptability in its environment. The two loops are complementary the first takes place in the domain of strategy and information, while the second takes place in the operational domain of the organisational system (Espejo 2020). These two learning loops are accountable for the self-organisation of the system.

Conceptual Drivers for Recursive Structures

The “Enterprise Complexity Model -ECM” (Espejo 2020), organizational learning (Wene 2022) and the Viplan (Cybernetic) Methodology (Espejo 1993, 2020), are three conceptual drivers for recursive structures. They challenge some of the most common structural aspects limiting the viability of policy issues.

An Enterprise Complexity Model (ECM) allows us to start from a particular global policy issue, such as reducing carbon emissions (CO₂), *toward coordinating resources for policy making, regulation and implementation*. Global institutions, nation- states and enterprises may come together to respond to a policy challenge. The already discussed case of the International Energy Agency (IEA) is an instance that encompasses nation-states and enterprises for carbon reduction and is illustrated in [Figure 6](#) above. Responses need to be *embodied in coordinated resources, with the aim of dealing systemically with carbon reduction challenges*. The ECM helps building up networks of resources with requisite variety to extend their viability beyond policy-making institutions, whether private, public or mixed. ECMs help considering enterprises and nation states beyond their immediate viability to focus on policy-issues such as climate change or sustainable energy, encompassing resources from nations, institutions and possibly private resources (see Mazzucato 2018).

von Foerster autonomous systems producing eigen behaviors is at the core of double closure for organizational learning as developed by Wene (2022)⁸. It is about self-organization of resources around specific policy issues. To reduce carbon emissions the problem is creating improved conditions for the operational closure of an organizational system, as this closure is the platform for developing eigen behaviors to reach a 20% learning rate which is the largest *sustainable* learning rate for policy issues over time (Wene gives empirical evidence for this learning rate in 2022).

The above two ideas, ECM and double closure, apply to a wide range of institutions and policy issues, which go beyond nation states and legal restrictions. The Enterprise Complexity Model relates institutions and organizational resources to recursive structures. As illustrated by [Figure 6](#), these resources, from institutions including R&D, innovation and manufacturing may constitute the resources for policy, regulation and implementation of the policy issue of concern through the Viable System Model (Espejo 2020).

Methodologically the challenge is learning process toward the systemicity of recursive structures. As argued before lacking contained autonomous

⁸Autonomous systems with operational closure produce eigen behaviours and double closure is necessary for effective learning (Wene 2022)

units within autonomous units from the global to the local is likely to underpin a significant number of policy situations. The challenge is to support a learning process which starts from inadequate recursive structures (as those shown in [Figures 5](#)) and supports the evolution of policy issues toward recursive structures (as shown in [Figure 6](#)). This is what the Viplan Methodology allows us to do as is explained in [Figure 7](#).

In this Methodology:

- The cybernetic inner *black loop* contributes to improving the structures of the organizational systems dealing with the policy situation. It aims at developing the structures and improving the quality of conversations and communications producing these systems. These are the communications that deal with policy, regulation and implementation processes of related nation-states and institutions. These are the organizational systems whose performance requires building up good structural conversations, or good cybernetics to handle effectively these policy issues. The cybernetic inner-loop is meta to the distributed problem solving of stakeholders' modeling of their interactions in the outer *white loop relevant to the particular policy issue*, for instance understanding how to control CO₂ emissions in a situation of climate change, or more generally for the purpose of any in depth modeling of a policy issue. Starting from this modeling the purpose is embodying communications, relationships and conversations emerging in the context of societal and organizational purposes. The organizational structure of the resources in the black loop may either facilitate or inhibit, to different degrees, the problem solving processes of the stakeholders in the white outer loop. The purpose of the cybernetic -inner- loop is to promote a good cybernetics, that is, to make organizational conversations and communications as effective as possible, through processes of self-organization. An improved cybernetics opens the space for including relevant stakeholders in problem situations, in particular in the discussion of multiple viewpoints. A detailed discussion of these conversations toward recursive structures for nuclear waste management in Sweden was illustrated in Espejo and Lepskey (2020). In that paper it is argued that improving the quality of viewpoints conversations offer a platform for better recursive structures and democratic processes.
- In the learning - outer loop- participants take advantage of the enabling structures of their inner loop, to engage in modeling processes of continued conversations and learning about the particular policy issues of their concern, and in general of relevant local and global situations in need of collaborative efforts. Starting from double loop learning to improve decisions, from technical and technological perspectives, which

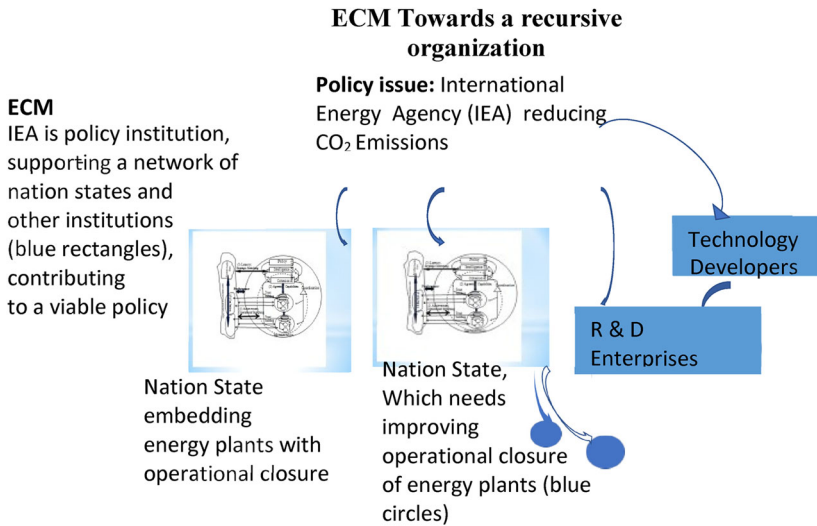


Figure 6. Relates a policy issue (e.g. carbon emissions) to resources at several recursive structural levels. Shows two viable nation-states and two enterprises (rectangles) - a Technology Developer Enterprise, and an R & D company¹⁰- contributing with intelligence to the viability of a policy issue rather than of the IEA.

do not necessarily imply the operational closure of an autonomous system, the challenge is to move in this direction and furthermore to move in the direction of organizational closure⁹. The focus is on correcting variety imbalances affecting responses at the right structural levels. We are talking about participants engaged in interactions to improve societal responses to challenging situations through recursive structures. This outer loop is focused on facilitating, for particular policy issues the self-organization of the myriad resources that need stronger appreciation and better communications.

- The two loops are reflexively related (dotted line in [Figure 7](#)) in the sense that as the cybernetics of conversations in the inner loop improve the cybernetics of the relevant organizational systems, the stakeholders' appreciation of a policy issue in the outer loop, becomes more coordinated and sophisticated, triggering *reflexively* changed conversations and structures in the inner loop. This reflexive towing and frowning between structure and policy develops the Enterprise Complexity Model for the policy-issue from where improved recursive structures should emerge. In either case the aim is building up self-organization toward correcting variety imbalances at several structural levels. This is a

⁹As already said, operational closure is the one achieved by the autonomy of the emerging organisation, which is necessary for organisational learning. Organisational closure is about the adaptive learning of the autonomous system, and is grounded in double closure (Wene 2022).

¹⁰The source for this figure is Espejo (2012) in "Reflections on the Governance of a Global Energy System", Syncho Ltd, unpublished paper.

Viplan Methodology, Policy Issue, Towards Recursive Structures

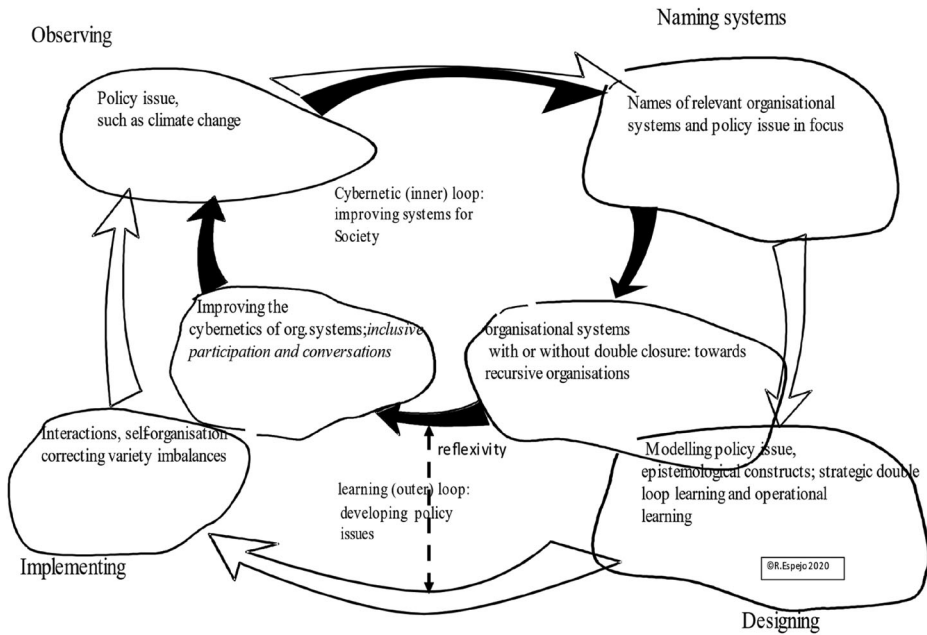


Figure 7. The Viplan Methodology.

fundamental learning process toward moving in the direction of operational closure for policy issues of societal significance. This is a means of producing eigen behaviors with the capacity of improved learning in those key issues that society needs to deal with.

Coda

The nation-states that emerged from the Westphalian Treaty triggered structures and resources inadequate for effective responses to social problems, let alone to the demands of challenges that humanity is confronting at the global level; the Westphalian dilemmas. Global institutions lack resources, strength and power to deal effectively with these challenges. Improving the structures toward recursive structures to deal with these challenges has been the argument of this paper.

While the theme of local-global problems is well recognized in the literature, particularly in Gordon Brown's book (Brown 2021), use of conceptual tools such as the Viable System Model, the Enterprise Complexity Model, Organizational Learning and the Viplan Methodology, are less advanced, however they offer new perspectives to deal with them.

This paper provides insights about the management of complexity, most significantly about policy learning in situations of social significance, such as for instance those of climate change and CO₂ emissions. This is the

beginning of a research program that needs more humane, organizational and technical resources with implications for policy making. This research should deal with the dilemma of independent nation-states trying to ascertain their sovereignty in global situations that require accepting global policy guidelines to achieve collaboration and success in their responses to an overloading complexity, such as that of the UN 17 sustainable development goals. Unfortunately these nation-states maintain an unchecked power, beyond the required capacity for self-organization to make possible local and global cooperation and better policies.

The powerlessness of the Westphalian nation-states has been made more marked by international institutions that lack resources and capacity to drive the embodiment of implementation processes. This dilemma is compounded by counterproductive relationships between societies striving for their independence and regional and global institutions lacking steering capacity for collaboration and participation, toward wider societies in order to enhance their capacity to deal with problems of justice, technology and socio-economic development.

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