A Framework for the Application of the Viable System Model and a Taxonomy of Organizational Pathologies

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This paper presents a conceptual framework based on Beer's Viable System Model (vsm) that is designed to assist managers of public and private organizations in coping with the complexity of their institutions. The idea is to fill the gap between the conceptual depth of Beer's organizational cybernetics theoretical works and the need for a structured process to help the application of these concepts among researchers and managers. The study will also discuss various types of complexity and the most common organizational pathologies, as well as their relationship to Organizational Cybernetics and the Viable System Model.

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1. Introduction

I first encountered Raul Espejo in July 1994 at the "1994 International Systems Dynamics Conference" in Stirling, Scotland. That Conference changed my life. Its title, "*Enlarging the boundaries*", provided a clear indication of its focus. At that time, my research activities were related to System Dynamics. There, I was introduced to the field of Management Cybernetics and other works by S. Beer, among other systemic approaches. The individual responsible for this discovery was Raul Espejo. In the *System Dynamics Journal*, which was edited as a result of the Conference, one of the papers included is the one from Espejo (1994) entitled *What is Systemic Thinking?*. Some of the "methodological enlargement" announced in the conference title was clarified in that work. I am therefore extremely grateful to him.

The primary purpose of this paper is to present the fundamental elements of the methodology I have proposed (Pérez Ríos, 2008d, 2010, 2012) to facilitate the application of Organizational Cybernetics (OC) and S. Beer's Viable Systems Model (VSM) to the design or diagnosis of an organization. The approach presents specific difficulties due to its breadth and complexity. Without a specific guide for the application of this methodology, its use to the study of complex problems by managers of organizations may pose a significant challenge.

The VSM is an approach that possesses characteristics that render it one of the most powerful tools currently available to assist managers in understanding the complexity of an organization and greatly enhance the organization's intelligence (Schwaninger, 2006). In comparison to other management methodologies, it provides a conceptual framework that encompasses the entire organization and its possible multiple levels. It enables the expeditious identification of the components (functions) of its organizational and information structure. Moreover, once the conceptual elements of the VSM are understood, it provides a language that allows for the rapid communication between different managers

(or decision-makers in general) about the necessary components for the diagnosis of the organization or, in the case of a newly created organization, for its design.

The role of managers in any organization is primarily to address the complexity of the problems or situations that affect the organizations they manage (govern). Therefore, in Section 2 several types of complexity will be discussed. In Section 3, I will describe the principal phases of the proposed methodology for applying the VSM. Section 4 will be dedicated to explaining some of the most common organizational pathologies associated with the inadequate design or functioning of organizations, as identified through the VSM.

2. Complexity

As previously stated, the work of managers is mainly concerned with coping with complexity. Let us see the kind of complexities we will consider in this paper.

Of the numerous types of complexity that could be explored, I will focus on three that I consider particularly common. These are *dynamic complexity*, *structural complexity*, and *complexity in group decision-making*. First, it is helpful to define these terms.

Figure 1. Dynamic complexity
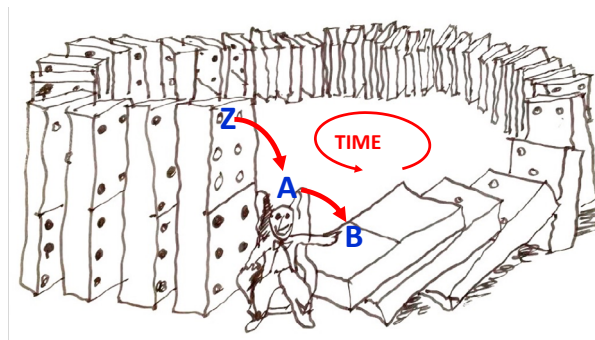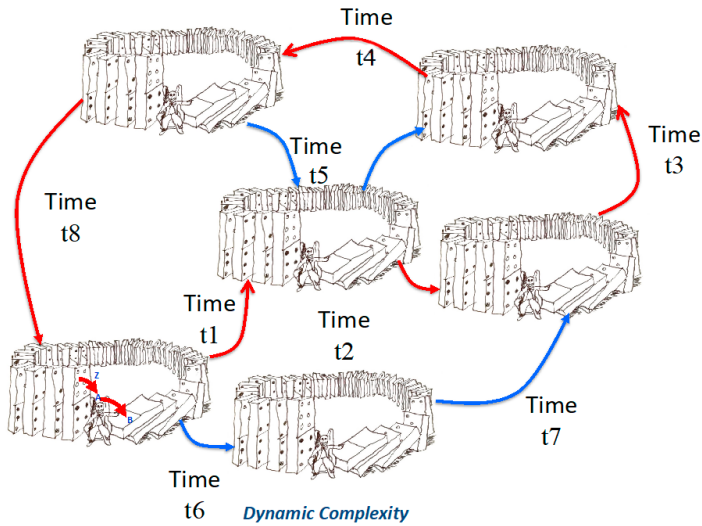

Source: (Pérez Ríos, 2018)

2.1. Dynamic complexity

This designation is applied to situations where the cause/effect relationship is not immediately apparent due to temporal or spatial distance. Figure 1 illustrates the decision-maker's decision A, which is intended to achieve effect B. However, as depicted in the image, the final effect will probably not be B, but after a time delay, it will be Z, which is also likely not to coincide with the outcome expected by the decision maker. The image depicts a typical feedback loop. Feedback loops are a crucial component of Forrester's System Dynamics (SD) methodology (Forrester, 1961; Pérez Ríos, 1992). SD is particularly well-suited to address this type of complexity.[2]

The problem generated by the functioning of the feedback loop of the figure is further compounded when what we are dealing with is not a single decision maker but multiple decision makers and many loops interacting with each other with different time delays (Figure 2). In this case, which is quite frequent, the result will be much more difficult for the decision-maker to ascertain when making decision A to achieve effect B. The last effect, Z, will be challenging to predict in advance.

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[2] Schwaninger and Pérez Ríos have proposed a combination of system dynamics and organizational cybernetics. For further information on this topic, see Schwaninger & Pérez Ríos (2008, 2010) and Pérez Ríos & Schwaninger (2008).

Figure 2. Dynamic complexity (multiple feedback loops)

Source: (Pérez Ríos, 2018)

2.2. Structural complexity

I use this terms to describe the degree of complexity derived from the existence of multiple related elements within system's structure under study. Thus, an organization may comprise several sub-organizations, sections, and departments, which may also be contained in other organizations, etc.

Furthermore, numerous of these organizations and elements may also be interconnected at different levels. A similar phenomenon occurs with their various functions. The complexity derived from this set of interrelated elements is what I refer to as structural complexity.

Figure 3. System in focus of an organization as the crossing of multiple dimensions (criteria and recursion levels)
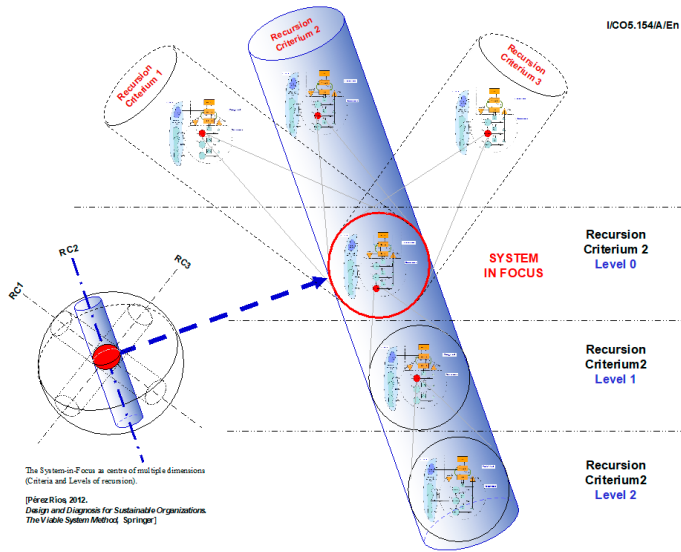
Source: (Pérez Ríos, 2012, p. 23)

Figure 3 gives an example of the structure of an organization with presence in various r*ecursion levels* and with diverse *recursion criteria*. The term "recursion criterion" refers to the criterion used to make the vertical disaggregation of the organization. It corresponds to the various viewpoints that will be used to study our organization. This term will be further clarified in the text (Section 3) when referring to the Recursion Levels-Critical Factors Matrix.

2.3. Complexity in group decision making

This type of complexity refers to the difficulty individuals experience in communicating with one another. A fundamental aspect to be considered is that the number of possible relationships and communication channels between individuals increase exponentially with the size of the group. In

addition, it is important to contemplate the design of the communication channels themselves and the cognitive filters that affect all people.[3]

Once the types of complexity described above have been considered, it is time to select methodologies or approaches that can assist managers in dealing with them. As previously stated, System Dynamics is one of the most suitable methodologies for addressing dynamic complexity. As for structural complexity, I believe that Organizational Cybernetics, in particular the Viable Systems Model, is well suited to deal with it because of its ability to visualize the whole structure of any organization, regardless of the number of levels and organizational components involved. Moreover, it provides the ability to check whether each of these organizations possesses all the required components (subsystems, functions, communication channels, etc.) as indicated by vsм for the viability of the entire organization. This approach will be discussed in the following sections. Regarding the third type of complexity, there exist a multitude of approaches that facilitate group communication and decision-making. One of them, also developed by S. Beer, is called Team Syntegrity (Beer, 1994).

We will now describe the proposed methodological approach to address the *structural complexity* through oc and vsм.

3. Conceptual framework

A multitude works and publications describe the elements of oc and vsм, starting evidently with the publications of its creator, S. Beer (1979, 1981, 1985). Among the researchers who have continued with this line of work, each emphasizing different aspects of its use, it can be mentioned A. Reyes & R. Espejo (2011). Espejo has extensive experience in developing and applying oc, having worked directly with S. Beer on the application project in Chile in 1970-73. He is also the creator of the

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[3] For a detailed review of those aspects see Pérez Ríos, 2012, pp. 51-64.

application method called VIPLAN and the methodological tool named Enterprise Complexity Model [ECM] (Espejo, 2008, 2015a, 2015b, and Espejo & Lepskiy, 2021). Other researchers are M. Schwaninger (2006) (development of intelligent organizations); Pérez Ríos (2012) (framework to design and diagnosis of viable organizations and creation of the VSMOD software for the application of OC); P. Hoverstadt (2008); A. Espinosa (2023) (sustainability); W. Lassl (2019) (viability of organizations), and M. Pfiffner (2021) (neurological dimension).

Each of them places an emphasis on different aspects when applying the VSM. Pfiffner, for example, distinguishes *three dimensions* to be considered in the VSM: *Anatomy*, *Physiology*, and *Neurology*. In addition, to the three dimensions identified by Pfiffner, I proposed a *fourth* one: *Identity*. One reason for this addition is that only after we have answered identity-related questions such as "Who am I?" or "Why are we here for?", the remaining dimensions can be studied. It should be noted that the methodological framework I present will consider those four dimensions.

3.1. Framework: Four stages

This section aims to show some of the main components of the methodological "framework" I have proposed for the application of OC and the VSM. I will provide a summary of the "framework" and describe the principal steps, the sequence in which they should be applied, and the purpose of each of them. Due to space limitations, a detailed description of the numerous elements that must be considered to "guide" the application process is not given. However, for those interested in a detailed examination of the subject, more than 200 questions with comments and justifications of their aims are fully described in chapter two of the book *Design and Diagnosis for Sustainable Organizations* (Pérez Ríos, 2012).

In essence, the framework is structured in *four stages*. First, clarify the identity, purpose, and boundaries of the organization. Second, create the vertical structure of the entire organization to cope with the relevant complexity of the environment. Third, design or diagnose each organization that constitutes the whole, in accordance with the indications set out in the VSM. Fourth, check the coherence of all vertical levels of the organization (levels of recursion). This is to ensure that the identity and purposes of each level are consistent and coherent. Let us examine them.

In the ***first stage***, the organization's identity and purpose are highlighted. This clarification allows one to get a better idea of what the organization is and what it is not (Schwaninger, 2006, p. 151) and what its goal or purpose should (or should not) be, bearing in mind that different observers may assign different purposes to the same organization (Espejo, 2008, Espejo & Reyes, 2011). The answer to these questions (identity and purpose) will help us to delimit the organization's boundaries (what belongs to the organization and what to the environment).

In the ***second stage***, the vertical structure of the organization is identified. This stage is derived from the concept of "Unfolding of Complexity," as proposed by Espejo (2008, p. 8). To assist the organization in coping with the relevant complexity (variety) of the environment, this is broken down into sub-environments, and these into sub-sub-environments, and so forth. The same is done with the organization, so each sub-organization, sub-sub-organization, and so on, will have to cope only with their respective limited environments. The outcome of this process is a set of recursion levels. This vertical complexity unfolding process can be conducted using different criteria (recursion criteria), which correspond to the various viewpoints we wish to use to study our organization. For

example, we may examine our organization from the standpoint of geographical locations or product lines, or other aspects.[4]

3.1.1. Recursion Levels-Key Factors Matrix

Once this process of vertical complexity unfolding has been completed, the next step is to identify the main elements to be considered at each recursion level. This allows us: a) to clarify the specific purpose at each level, thereby ensuring that each of those particular purposes is recursively coherent with those of the previous level and so, up to the broad general purpose of the entire organization; and, b) to identify the particular aspects to be taken into consideration at each recursion level (specific environment, stakeholders, legal or normative requirements, external agents, particular actions, etc.).

Figure 4. Recursion Levels-Key Factors Matrix

Recursion Levels-Critical Factors Matrix.   I/CO5.145e/A/En

Source: (Pérez Ríos, 2008d, 2012)

Keeping the whole structure visible should facilitate coherence between the different actions at all recursion levels. This visibility of

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[4] For a detailed explanation of the meaning and use of "recursion criteria", see Pérez Ríos, 2012, pp. 70-80.

the entire structure can be facilitated with the help of the ***Recursion Levels-Key Factors Matrix*** (Pérez Ríos, 2008d, 2010, 2012). Figure 4 provides an example of a generic matrix, wherein the recursion levels (in the rows) and the key factors (columns) pertinent to the case under study (in this example, ten) are clearly visible. The application of various recursion criteria would result in multiple matrices (Figure 5). The number of factors (in our example, 10) can be as many as necessary, and their specific content should be selected on a case-by-case basis.

The utilization of this matrix enables decision-makers to have a global view of the entire organization and to see the relevant and significant factors at each recursion level. Furthermore, it allows the examination of the systemic coherence of the purposes at each level and other elements, such as actions. It is possible that some of those factors may differ between the various recursion levels. For example, if the recursion criteria are Urban-Architectonics, the care for sustainability affects all recursion levels. This may include the urban area, the city, the quarter, the street, the house, the flats, and the behavior of their inhabitants. However, the issues to be considered at each level are, evidently, different. At the urban level, they must consider urban planning (design of roads, streets, building characteristics and location, etc.). At the building level, they must care about other issues, such as energy-related building design (roof, walls, types of heating, etc.).

The matrix serves as a unifying reference point, facilitating communication among decision-makers. Whether they are political authorities, public technicians, or citizens, the matrix provides a shared understanding of the entire system they are managing. Such a shared understanding serves to foster collaboration and paves the way for effective decision-making. Furthermore, the complexity of the matrix can increase when there are multiple recursion levels, distinct recursion criteria, and numerous interest factors. However, as Beer once said, "Do not blame

me if the world is complex." When using this matrix, users can learn to fight with the complexity of the issues at hand, rather than fighting among themselves.

Figure 5. Recursion Levels-Key Factors Matrix. Multiple recursion criteria
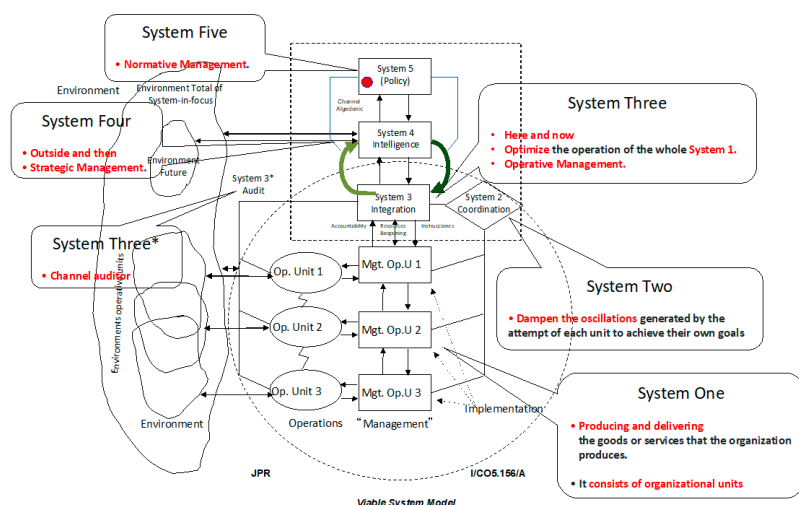

Source: (Pérez Ríos, 2008d, 2012)

The ***third stage*** involves the examination of the various vertical levels that have been created in the previous stage. At each level, we analyze the components that comprise it, namely the specific "environment" of the level chosen, the "organization" whose activities will be related to this environment, and the "management" corresponding to this organization.

Next, a detailed evaluation of the elements (named System 1, System 2, System 3, System 3*, System 4, System 5, communication channels, information systems, etc) that the vsm identifies as necessary (and sufficient) for ensuring the organization's viability is conducted (Figure 6). This evaluation serves the crucial purpose of checking if the organization has all those necessary elements, as well as verifying if all of them have what they need to perform their function. Lastly, we must ensure that all of them are indeed performing their function. A

comprehensive guide on how to conduct this analysis is presented in Pérez Ríos (2012, pp. 84-140), where around 200 questions are provided to aid in this diagnosis.

Figure 6. The Viable System Model (VSM) showing some of its main components

Source: (Pérez Ríos, 2012)

In the ***fourth stage***, we delve into the extent to which the different organizations (and sub-organizations) at the various recursion levels are linked. In doing so, we assess the coherence among all the elements while being mindful of the identity and purpose of the organization as a whole. For further details on this study process, check Pérez Ríos (2010, 2012). In Figure 7, the connections between System 5 are highlighted at various recursion levels, thereby indicating the necessity for these links to exist.[5]

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[5] To facilitate the application of VSM and this framework, the software VSMod® (available at www.vsmod.org) explicitly created for this purpose can be used (Pérez Ríos 2003, 2006, 2008c, 2012).

Figure 7. Coherence between different levels of recursion in System 5
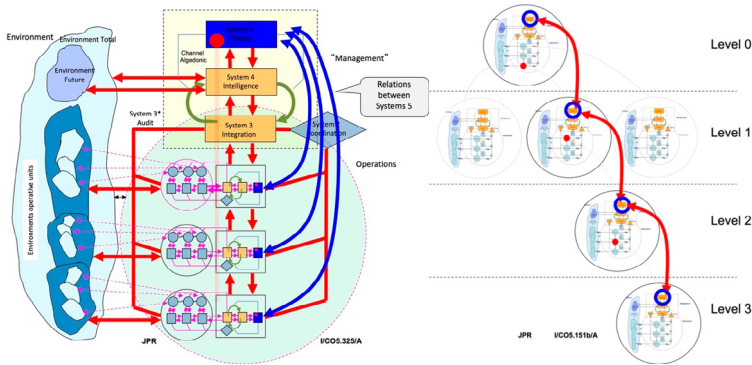
Source: (Pérez Ríos, 2012, p.60, p.136)

Once described the four main stages of my proposed framework, it can be useful to provide further elucidation of its first stage.

3.2. Identity recognition

As a first step in *stage one*, and before any other, we need to identify the organization we intend to study/create, which means making its identity and purpose explicit.

The answer to the question of what the organization or system under study is, may not be trivial. Providing a clear response to this query implies an understanding also of what is not. The responses to these two questions will assist in defining the boundaries of the organization and its environment, thereby clarifying its scope. In the contemporary business environment, where a company's multifaceted operations (research, design, production, distribution, etc.) are often decentralized and dispersed globally, to establish the limits of what the company is, that means to delimit where the company ends, and where the environment begins, can be a challenge.

A similar commentary can be made regarding the characterization of what the company is in the sense of clearly identifying its purpose. Beer's well-known statement "the purpose of a system is what it does" alerts us about the diversity of assessments of what it does, depending on the observer. Different observers may attribute diverse "purposes" to the same company or organization.

The importance of determining with the utmost clarity the purpose of an organization and its boundaries is critical, as this will determine how it is to be designed or diagnosed. To assist decision-makers in defining an organization's identity, methodologies developed in the field of what is known as the interpretive systemic approach (Espejo 2008, and Espejo et al. 1999, Checkland 1981, Checkland & Scholes1990, among others), in conjunction with a wide variety of remote collective decision-making tools utilizing the Internet (Pérez Ríos & Velasco, 2012) can be useful.

Having previously outlined the main components of the methodological approach I have proposed to facilitate the utilization of the VSM in the design of a healthy (viable) organization or in the diagnosis of the flaws of an existing one, in the following section, I will present what I consider to be some of the more frequent "flaws" called "pathologies" that may be observed in organizations and that can alert us to their vulnerabilities. Their expertise may offer decision-makers a rapid diagnostic tool to identify what may not be right in the organizations they pretend to manage. Furthermore, it provides a language (in a similar way that medicine doctors can share a sickness with other doctors in a fast way by using the name of the syndrome or the pathology that the patient is suffering from). This enables faster communication among various managers or decision-makers in general.

4. Organizational Pathologies

In this section, I will show some of the most common pathologies that may be observed in organizations. The identification of a pathology is a prerequisite to the prescription of any treatment for the diagnosed deficiency. This knowledge is useful either to diagnose an existing organization so that, once identified, we can attempt to eliminate the pathologies, or to design organizations, so they are free of them.[6,7] To help their identification, I prepared a taxonomy of "Organizational pathologies" in 2008 (Pérez Ríos, 2008a, 2008b, 2008d and 2010). A classification of 26 pathologies was conducted, resulting in the categorization of these into three main families or groups.[8]

The *first group* includes pathologies associated with the structural design of organizations and how these entities cope with their total environmental complexity by creating the necessary sub-organizations. These are designated as *Structural Pathologies.*

The *second group* includes pathologies pertaining to the suitability of the organization (at all levels of recursion) in accordance with the vsm's recommendations regarding functional subsystems and their relations. These are designated as *Functional Pathologies.*

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[6] One class of diagnostic examples found in other areas of Systems Thinking employs common structures called "archetypes" (Senge 1990), which facilitate conversation among the managers involved to speed up the process of identifying the particular problem. In the case of the vsm, there are also studies with a similar aim (Beer 1989; Pérez Ríos 2008b y 2008d, Espejo 2008; Hetzler 2008).

[7] Raúl Espejo published a similar work entitled "Observing organizations: the use of identity and structural archetypes" (Espejo, 2008). In it, he makes a very profound exposition of what "identity" is and presents "identity" archetypes (Liquid identity and Belonging archetypes) and "structural" archetypes (Unfolding of complexity, Stretching, and Policy archetypes).

[8] The books *Diseño y diagnóstico de organizaciones viables* (Pérez Ríos 2008d) and *Design and diagnosis for sustainable organizations* (Pérez Ríos, 2012) provide a detailed description of all those pathologies.

The **third group** subsumes *Information System and Communication Channel Pathologies.*

We will examine these pathologies in greater detail.

4.1. Structural pathologies

Does the design of the vertical structure of the organization is adequate to face the complexity of the organization's environment?

The four pathologies included in this group (see Figure 8) are associated with an inadequate treatment of the total complexity an organization faces. The organization and its relevant environment may indicate the necessity to divide the environment into sub-environments, and a similar process occurs within the organization. This vertical unfolding of complexity enables it to comply with Ashby's Law[9], whereby each sub-organization must deal with less complexity (variety).

In this context, the most common pathologies are related to a lack of adequate complexity unfolding, the absence of organizations for handling the complexity of intermediate environment levels, or unclear relations among organizations. The pathologies identified in this group are as follows:

4.1.1. Non-existence of vertical unfolding

The absence of an adequate vertical unfolding, when required, renders it difficult or impossible for a single large organization to deal with the total variety it faces.

4.1.2. Lack of recursion levels (first level)

Vertical unfolding is achieved, but the first recursion level remains empty, leaving part of the total environmental variety unattended.

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[9] "Only variety destroys variety" (Ashby, 1956).

4.1.3. Lack of recursion levels (middle levels)

Vertical unfolding is achieved, but intermediate recursion levels remain empty. This leaves the corresponding environmental variety to be dealt with at either the next or the previous recursion level (which is difficult or impossible) or, even worse, to be handled by no one.

4.1.4. Entangled vertical unfolding

Various interrelated level memberships. Insufficient integration/ communication between recursion levels when multiple memberships are present.

Figure 8 presents the map of the pathologies included in this group.

Figure 8. Structural pathologies
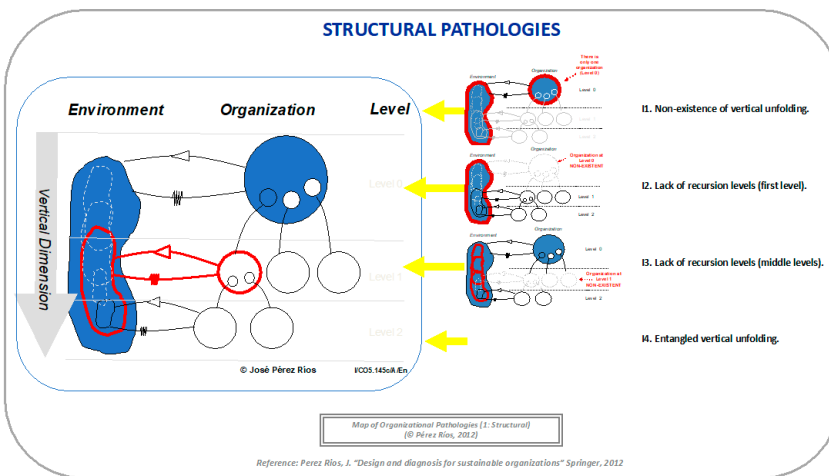
Source: (Pérez Ríos, 2012)

4.2. Functional pathologies related to system 5

Do I have a clear idea of who I am, what my purpose is, and what the boundaries of my organization are?

Regarding the pathologies associated to System 5 (in the vsm), a *fundamental question* arises*:*

- When trying to apply the vsm to design (or diagnose) an organization, if you do not know well who you are, what your purpose is, what you want to reach, etc., then how can you design or diagnose anything related to you or the organization (or issue) under consideration?

That is why, when applying the vsm, I consider it is mandatory to start (in general) by answering those questions (System 5). Probably, those are the most difficult to answer.

Several pathologies are frequently associated with an inadequate functioning or design of System 5. These include the following (4.2.1, 4.2.2, 4.2.3 and 4.2.4):

4.2.1. Ill-defined identity
Identity has not been sufficiently clarified or defined ("I do not know who I am").

4.2.2. Institutional schizophrenia
Two or more different identity conceptions produce conflict within an organization.

4.2.3. System 5 collapses into System 3 (Non-existing metasystem)
System 5 intervenes undesirably in the affairs of System 3.

4.2.4. Inadequate representation vis-a-vis higher levels
There is a poor connection between System 5 organizations belonging to different recursion levels within the same global organization.

4.3. Pathologies related to system 4
Do I know what is happening outside my organization and what the future will look like?

Concerning the pathologies associated to System 4 (in the vsm), some *fundamental questions* arise*:*
- Does the organization have a continuous activity concerned with exploring in real time what is going on outside the organization (environment: market/technologies/legislations/ etc.) and exploring what changes may appear as possible in the future related to the organization identity/purpose/viability)?
- Does the organization have an active communication/interaction system between this activity of exploring the "outside and future" with the activity of handling the "inside and present"? Obviously, if an organization does not have it, it will not adapt. That means it will die/disappear (at least as an independent organization) when the environment changes! This organ is the "**Adaptation Organ**."

System 4 (in the vsm) is responsible for observing the "outside and future" of the organization. System 4's continuous interaction with System 3 (System 4–System 3 Homeostat) ensures the timely and appropriate transmission of novelties of incorporation required by the organization for possible implementation into System 1. Similarly, restrictions imposed by System 1 are relayed by System 3 to System 4. This joint functioning (System 4-System 3 Homeostat) will facilitate the implementation of modifications in System 1 to take place on a continual and gradual

basis, thereby ensuring the organization's viability. They constitute the *Adaptation Organ* of the organization.

If System 4 either operates inadequately or does not exist, the organization will be deprived of information relating to the current and foreseeable future development of the environment (markets, competitors, technologies, the company's evolution, etc.). This will consequently jeopardize its viability.

Some common pathologies associated with an inadequate functioning or design of System 4 are as follows (4.3.1 and 4.3.2):

4.3.1. "Headless chicken"
System 4 is missing or, if it does exist, does not work properly.

4.3.2. Dissociation of System 4 and System 3
The homeostat System 4 – System 3 does not work properly. Each component system carries out its function separately but does not communicate and interact as it should with the other system.

4.4. Pathologies associated with system 3
Management style: Is the management of Operations designed and working adequately?

Concerning the pathologies associated with System 3 (in the VSM), it is of the utmost importance to make observations related to some of the fundamental principles of OC and the role of System 3:

* One of the essential principles of VSM is to endeavor to make systems (organizations) **self-regulating**. To this end, it is crucial to identify the point of decision as closely as possible to the location where the corresponding need for decision-making arises. Consequently, the

corresponding operational units should have sufficient capacity to make decisions and take actions. In other words, they should be permitted the necessary degree of **autonomy**, limited only by **cohesion** requirements for the organization as a whole.

* The principal function of a sound System 3 is to design just the right components (System 3*, System 2, and the channels of communication with each System-1 component) for the organization, which it must run (integrate) to operate almost autonomously. Its intervention should be restricted to dealing with the exceptions that those in charge of the different elements in System 1 are unable to resolve, as well as any unforeseen situations in both the environment and inside the organization on which decision-making is beyond the remit of these managers.

System 3 and System 1 are typically present in all organizations, as they make it possible for the products and services that are supposed to be provided to reach the market or the particular environment. Nevertheless, their existence does not guarantee that they will perform well.

I mentioned previously the kinds of problems engendered by a lack of communication between System 3 and System 4 and the corresponding effect on the activity of the System 4-System 3 homeostat, ranging from dysfunction to its failure to work altogether. Everything described then is also applicable to System 3.

A specific focus can be placed on the pathologies that arise from dysfunction of System 3 in its role of integrating the elements within System 1. Some of the common pathologies associated with an inadequate functioning or design of System 3 are as follows (4.4.1, 4.4.2, 4.4.3, and 4.4.4):

4.4.1. Inadequate management style

System 3 intervenes excessively or inadequately in the management affairs of System 1. For example, an authoritarian management style constrains the autonomy of System 1.

4.4.2. Schizophrenic System 3

Conflict arises between the roles of System 3 due to its simultaneous inclusion both in the system (operations) and the metasystem (management).

4.4.3. Weak connection between System 3 and System 1

The operational units composing System 1 work separately without being adequately integrated by System 3.

4.4.4. Hypertrophy of System 3

System 3 arrogates to itself too much activity, some of which should be carried out by System 3*, System 2 and System 1 directly.

4.5. Pathologies associated with system 3*

Are things done correctly, are unethical behaviors going on, and are corruption practices detected early?

The pathology most associated with this system is the result of its absence or failure to function adequately. It is now appropriate to make some observations regarding the role of this System:

* The objective of System 3*, as a supporting body for System 3, is to absorb enormous amounts of variety through mechanisms such as accounting audits, financial audits, maintenance audits, quality audits, opinion surveys, etc. In addition to complementing data reaching, System 3*

(either via System 2 or directly from System 1 components) contributes to the behavioral alignment of the members of the operational units. Examples of the utility and the potency include speed controls for motorists through mobile radars or various surveys regarding the quality of certain services.

* The implications of the absence of System 3* in an organization are evident. The proliferation of inappropriate activities may appear, as well as practices that are not aligned with the organization's different processes and operational norms, or even unethical behavior (relations with suppliers, workers, customers, etc.). The same can be said when certain elements corresponding to System 3* exist but are not applied or do not function properly.

* An equivalent of these System-3* interventions may be medical "check-ups" carried out on people after a certain age. The goal is not "intervention for the sake of it," but rather to prevent potential health issues by identifying them at an early stage, thereby facilitating resolution or even prevention.

System 3* is vital in detecting and preventing inappropriate organizational activities or behaviors. Bad practices or corruption can appear in an organization when it does not exist or work properly. This danger can affect any organization (e.g., companies, public or private institutions, political parties, governments).

Some of the common pathology associated with an inadequate functioning or design of System 3* is (4.5.1):

4.5.1. Lack or insufficient development of System 3 *
The lack or insufficient development of a System 3* allows undesirable behaviors and/or activities to occur in System 1.

4.6. Pathologies associated with system 2

Are my operating units governed by "Every man for himself!" Is chaos proliferating and reigning in our organization? Are we being overwhelmed by bureaucracy?

Regarding the pathologies associated with System 2 (in the VSM), it is convenient to make some observations.

This system is intended to make the set of organizational units that comprise System 1 function harmoniously. These units may be related by production processes and supply chains or may simply compete for the organization's shared resources and even clients or suppliers, etc., which might lead to conflict because of each one attempting to achieve its own goals (the delivery of the assigned products or services). System 2 deals with such issues.

It is important to consider that System 2 contributes to the harmonious behavior of the operational units in System 1. I will examine some of the pathologies that are typical of its poor design or functioning (4.6.1 and 4.6.2).

4.6.1. Disjointed behavior within System 1
A lack of adequate interrelations between the elemental operating units that conform to System 1 leads to their fragmentary behavior.

4.6.2. Authoritarian System 2
System 2 shifts from a service orientation towards authoritarian behavior.

4.7. Pathologies associated with system 1

Are we producing and delivering what we should? Do the operational units of the organization work in harmony among themselves, or are some of them absorbing more resources than they should from the whole? Do the operational units have excessive power in the organization?

After revising the functions of all the systems (Systems 2, 3, 3*, 4, and 5) whose aim is to contribute to System 1's doing what it is supposed to do in accordance with the organization's purpose, we must now check to see that System 1 has everything it needs to perform its function.

System 1 can be constituted by several elementary operational units which may be exemplified in the case of a firm, where these units may comprise different product lines; in the case of a university, where they may represent the various faculties; in a health system those units can be the diverse health areas, or in a country, where they may comprise the distinct autonomous communities, etc. From the perspective of the VSM's each unit is made up from the same set of elements, including:

(a) the specific environment,

(b) the operational unit in the strict sense (the operations),

(c) the management of the operational unit, and

(d) the specific System 2 of each operational unit.

These four elements are connected by information channels, so that information flows continuously, guaranteeing a dynamic balance between all the components. The ultimate aim is to ensure that the operational unit provides the environment with the goods or services that constitute its reason for existence.

Among the pathologies that could affect System 1, the following are worthy of mention (4.7.1 and 4.7.2).

4.7.1. Autopoietic "beasts"

Elemental operating units constituting System 1 behave as if their individual goals are the only reason for being. Regardless of any considerations transcending their interests, they ignore the need to harmonize their individual goals within an integrated System 1.

4.7.2. Dominance of System 1: Weak metasystem

The power of System 1 is not handled within the limits set by the metasystem (System 3, System 4, and System 5).

4.8. Pathologies associated with the complete system

4.8.1. Organizational autopoietic "beasts"

The uncontrolled growth and activity of some individual parts of the organization put the viability of the whole organization at risk.

4.8.2. Lack of metasystem

There is an insufficient or missing definition of identity and purpose. A weak or incomplete metasystem shifts the balance between the "outside and future" and the "here and now" management-oriented activities towards the "here and now," leaving adaptation-oriented activities unattended. Inadequate connections exist between organizations at different recursion levels.

Figure 9 presents the map of the pathologies included in this group.

Figure 9. Functional Pathologies
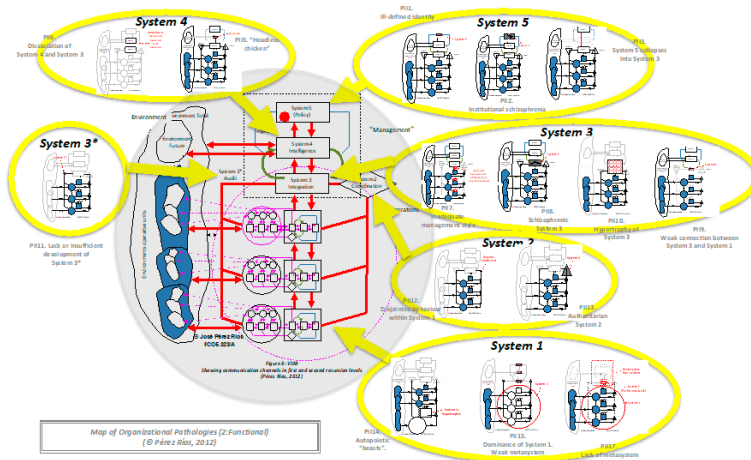
Source: (Pérez Ríos, 2012)

4.9. Pathologies associated with information systems and communication channels

Previously, I discussed the role of the communication channels within the VSM. These elements connect all functions/sub-systems, as well as the people and the operational units of the organization with the different environments to which they relate. In this section, I will identify some of the pathologies that can occur in organizations related to the existence and constitution of communication channels and, in broader terms, of information systems (4.9.1, 4.9.2, 4.9.3, 4.9.4 and 4.9.5).

4.9.1. Lack of information systems

Some fundamental information systems are missing, insufficiently developed, or not working correctly. The first pathology identified in this group is associated with the non-existence of information systems or their insufficiency in providing the requisite infrastructure for the organization to receive the information it needs in each of its parts.

The design of information systems that cover the entire organization implies its knowledge. It requires awareness of the different functions, the relationships between them and with the environment, and the necessary characteristics that communication channels must possess in each instance. Therefore, we believe that an understanding of the vsm provides a first-order conceptual framework to guide the design of information systems in any organization.

4.9.2. Fragmentation of information systems

Information systems exist in the organization but work fragmentarily, with poor or non-existent connections between them. Another set of problems and malfunctioning of an organization can be generated by information systems that are useful for certain activities within the organization but exist as islands. They have all the elements for capturing, storing, and processing data and information, but act as closed systems from the point of view of the information generated.

The issues that arise from the existence of multiple computer applications or software packages that operate in isolation can be attributed to the possible inconsistency of the data handled in different functions, the lack of knowledge of their availability, their redundancy, and, in general, the difficulty of integrating the information necessary for the viability of the organization as a global system. The consequences will be a lack of coordination, inconsistencies, a lack of knowledge in some functions of what is happening in others, a general increase in costs, etc.

4.9.3. Lack of key communication channels

Certain required communication channels that should connect the different functions do not exist, or, if they do, are either inadequately designed or work improperly.

In addition to the existence of structures designed to distribute information among the essential functions of the vsm, it is necessary that the "infrastructure," i.e., the communication channels that connect all those elements that share information, exists and has the capacity needed to "drive" the amount of information required in each case.

Regarding the matter under discussion, it is my intention to focus on the pathology that arises from an insufficient network of communication channels. If there are functions that should be connected by information but are not, the network is incomplete. This may be attributed to the fact that the channel that should connect them does not exist, or if it does exist, it fails to meet any of the requirements that all communication channels must meet to perform their function correctly. These requirements are as follows: to ensure that the information emitted by a sender reaches the receiver in its entirety, in a format that is intelligible to the receiver, and in the time required for it to be helpful. Additionally, the channel must permit the sender to ascertain whether the information has been received and understood by the receiver.

4.9.4. *Lack of or insufficient algedonic channels*

Necessary algedonic channels are missing, or if they do exist, are poorly designed for their function, or do not work correctly. Particularly serious is the non-existence (or insufficient presence) of algedonic channels. These channels have the essential function of transmitting information on any incident occurring in System 1 (or also originating in the environment and captured by System 4) that may have a significant (or even vital) impact on the viability of the organization. The design and proper functioning of these channels are critical for alerting System 5, if necessary, to the appearance of risks vital to the organization's survival and thus triggering its intervention.

4.9.5. Communication channels incomplete or with inadequate capacity
Communication channels do not have all the necessary elements for transmitting the required information (transducers, channels capacity, and sender-receiver in both directions). If the channels lack some of those the two functions that are supposedly to be connected will not be so.

In this sense, the absence of transducers or their inadequacy, the low capacity of the channels to carry the amount of information per unit of time required, will mean that although the channel supposedly exists, it will not fulfill its function of ensuring that the information arrives appropriately. A similar situation will happen if the design and choice of the "sensors" at the emission points, or how the information is displayed to the receivers, are inadequate.

Figure 10 presents the map of the pathologies included in this group.

Figure 10. Information System and Communication Channel Pathologies
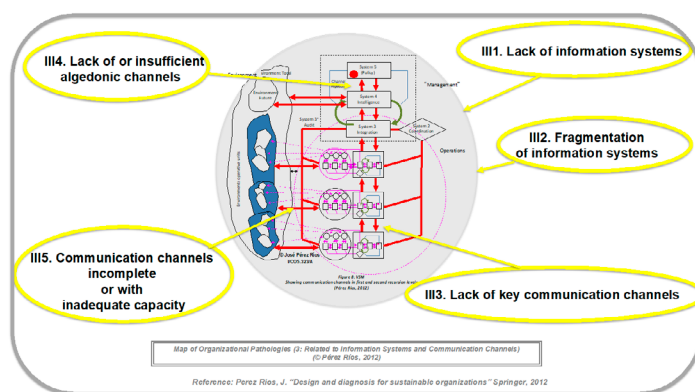
Source: (Pérez Ríos, 2012)

5. Final reflections on the design and diagnosis of organizations using the VSM

The application of Beer's VSM to both the design and diagnosis of organizations makes it possible, in the first case, to ensure that they have the necessary and sufficient elements to guarantee their viability and, in the second, to identify which aspects of the organization are not properly constituted, or if their functioning is not adequate, or if, despite having the necessary structural elements and are in principle prepared to function correctly, they are unable to do so due to deficiencies associated with information systems and communication channels.

In the previous section, I showed some of the most frequent pathologies in organizations. The benefit they offer, combined with the framework described above, is that they can help, on the one hand, to make a quick diagnosis of the whole structure of the issue under study (and the organizations involved) and, on the other hand, to share the flaws identified in the organization. They offer a language that facilitates communication between decision-takers. An example of something similar in the medical field would be the "syndromes" used by doctors to share knowledge ("diagnosis") about patients' illnesses with other doctors. The availability of this taxonomy of pathologies may also be instrumental in facilitating the application of the VSM to organization's managers.

One of the reasons proposed by different researchers as a possible explanation for the relatively slow adoption and application of VSM in the business environment and organizations in general is the difficulty in comprehending and utilizing it. The availability of new technological tools such as the VSMod® software (www.vsmod.org), in conjunction with application guides, may facilitate greater accessibility.

Finally, I will offer some comments regarding the framework proposed and other complementary tools, such as the software VSMod®.

My framework differs a little from Viplan or some other approaches in the emphasis made in the study of the global structure of the organization. For example, I delay the vsm detailed study until the Global map of the issue has been created and we have built the Recursion Matrix with all the Key factors identified and instantiated at each recursion level and each different matrix (if we are using various recursion criteria). In the approach proposed, we could even stop the study without going deeper into the vsm details of each of the organizations involved in the study. Of course, the further down we go analysing the organizations, the better. However, we can gain quite valuable and deep knowledge of the issue and its complexity just by using that matrix. Another advantage of the matrix is the clarity it provides to share the understanding of the issue at hand, visualizing at once the whole recursion structure (organizations and environments) and the relevant factors to consider in it. Each cell of the matrix contains information relevant to the recursion level (row) and to the specific factor affecting it (column).

The approach proposed **emphasizes certain aspects.** For example, when conducting an organization's vsm study, I generally use a top-down rather than a bottom-up approach. That means that I first clarify the organization's identity, purpose (System 5), and boundaries, and once this is done, I proceed with the analysis of all other elements. In summary, I start first with synthesis and then proceed with analysis. Designing or diagnosing a system without having previously clarified its identity and purpose makes no sense.

Like the differentiation that is often made between the "mind" and "brain" in the human being, I believe that identity in its broad sense could, in a way, be assimilated to the "mind", and the whole organization with its five systems and its three dimensions (anatomical, physiological, and neuronal) to the bodily part of the human being, including the brain.

Another specific component of the proposed framework is the emphasis on visualization and systemic recognition of the organization I am studying and sharing it with other decision-makers. To facilitate this, we have developed the software vsmod® (www.vsmod.org) that allows, among other functionalities (see chapter four of the book *Design and Diagnosis for Sustainable Organizations. The Viable System Method* (Pérez Ríos, 2012) to visualize my organization also in 3D (Figure 11). The idea is to convey an image of my organization resembling a "conscious spacecraft" navigating through the dark (complex) universe with the hope that this vision helps managers to "see" and "feel" the whole unity (system) of their organizations.

Figure 11. Examples of visualization of the vsm (3D) with vsmod®
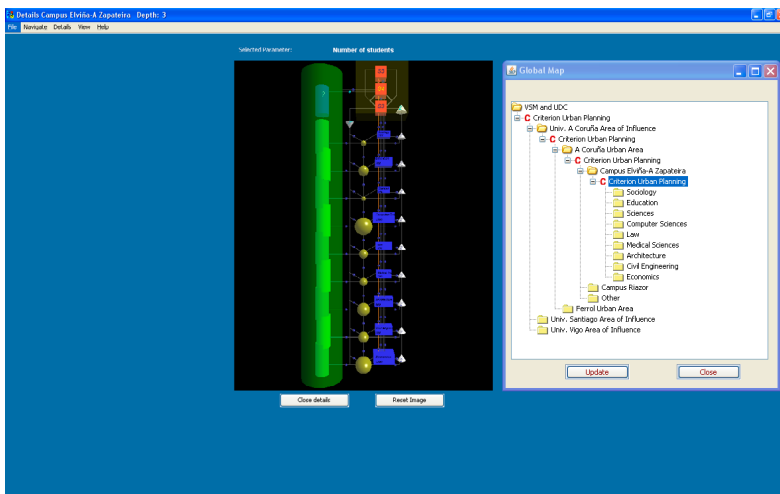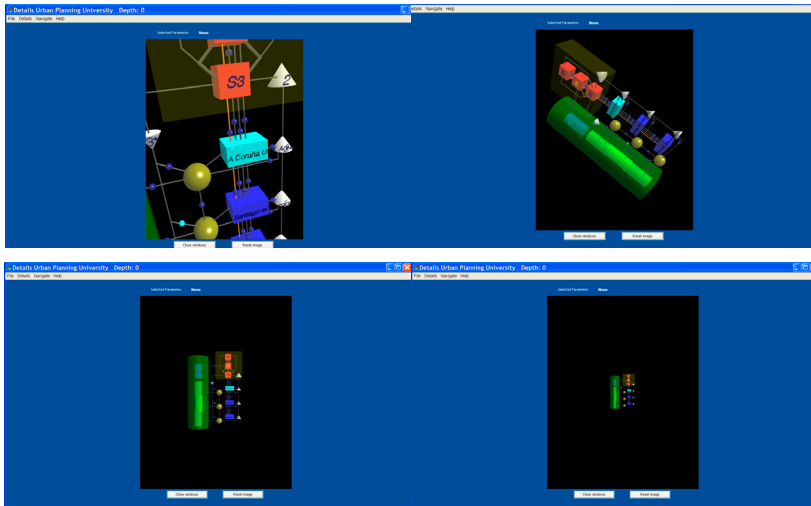
Source: (Taken from Pérez Ríos 2012, p. 197, p. 181)

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Publisher
Universidad de Ibagué

First edition: Ibagué, agosto de 2024

Design
Juan Pablo Santana

Style correction
María Paula Méndez Penagos
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Printer
Xpress Estudio Gráfico y Digital S.A.S.