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Towards cyber-cooperatives: Studying the sharing economy of the tourism industry through an evolutionary approach to organizational cybernetics

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Abstract

Purpose: The lodging industry is transitioning to the online collaborative economy, with digital platforms mediating between hosts and guests. However, this has created significant inequalities between the platform management and the service providers. **Objective.** The paper proposes (a) to contribute to organisational cybernetics through evolutionary theory, (b) to analyse the emergence of platform cooperativism, and (c) to propose a platform cooperative based on the VSM, which we have called a cyber-cooperative. **Design:** Applying cybernetic evolutionary epistemology and the VSM, the article analyses the current state of the platform lodging industry and proposes the core characteristics of the cyber-cooperative. **Findings:** The article finds: a) it contributes to the theory of viable systems by integrating evolutionary theory; b) it uses the proposed theory to explain the developments in the collaborative economy of the lodging industry; c) it relates meme theory with the identity of the system and identifies the political ideas in cooperative organisations; d) it proposes the idea of the cyber-cooperative for developing the lodging industry. **Originality:** Evolutionary epistemology in organisational cybernetics, and the politics of identity in cooperativism are both novel approaches in the VSM. **Type of paper:** Research paper.

Keywords: Stafford Beer; VSM; viable systems; organisational cybernetics; evolutionary theory; meme theory; anarchism; adaptation.

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1. Introduction

The Collaborative Economy, Cybernetics, and Evolution

In 2007, with the emergence of Airbnb, the lodging industry welcomed what has been perhaps the most revolutionary technological and organisational advancement in the industry: the introduction of the sharing economy. Although revolutionary, it seemed to be a natural progression from a technological trend that had been growing for the last two decades: that of the "common-based," "collaborative economy," "sharing economy," or "platform economy," or what Benkler (2013) called "working anarchies." Currently, the term collaborative economy is used to designate organisations that either produce value communally, like Wikipedia, or produce it by sharing assets, like Uber.

The emergence of the collaborative economy revolutionised the functioning of the lodging industry. It provided customers with a more casual, informal, and cost-effective option for temporary accommodation. Additionally, it developed a significant base of hosts—homeowners, bed and breakfast establishments, and rural inns—that was previously inaccessible to customers. Regrettably, the collaborative economy, which encompasses market and technical disruptive advances, has faced allegations in numerous countries of establishing a new exploited group of workers known as the "precariat" class (Schor, 2014). These workers are falsely presented with the prospect of autonomy and independence. The essence of the collaborative economy sadly turned into the "gig economy," also known as the "on-demand" economy (Arrieta-Idiakez, 2019).

Benkler (2013) highlights that the emergence of digital collaboration marks a new trend in organisational paradigms. Cooperative enterprises have relied from their inception on one form of technology or another, from the simple establishment of a given set of values and principles formalised in a constitution (International Cooperative Alliance, s.f.) to the establishment of digital platforms for deliberation (Fox, 2023). Apparently, technological developments, while enhancing the operation of digital collaborative organisations, undermine the cooperative impetus of these organisations.

An exception to the dominant tendencies of the collaborative economy are platform cooperatives. Platform cooperatives are online-based businesses collectively owned and democratically operated that function in similar circumstances to platform businesses by connecting service providers with customers through an online platform (OECD, 2023). Some notable cases include Stocksy United, a platform coop of photographers collaborating to offer stock pictures online, and Up&Go, another platform coop that offers home cleaning services by connecting cleaners with homeowners who require their services. In the accommodation and travel industry, Fairbnb is a platform-coop owned and operated by users, hosts, and communities.

The evolution of the new lodging industry has shifted towards cyberspace, and that evolution presented some instances in the digital collaborative economy that have blurred the initial idea of cooperativism. The Viable Systems Model (VSM) produced by Beer (1972) was specifically built for producing an organisation with high levels of autonomy like those in the modern collaborative economy.

Although the evolutionary capabilities of VSM were envisaged by Beer (1994a), he did note elaborate on how evolutionary theory works within the Viable System Model. For instance, many scholars think the conscious policy-based decision-making process of the 5th subsystem of VSM is not compatible with the evolutionary selection processes. In addition to this commonly held appreciation, VSM adaptability is not discussed as an evolutionary feature, even though it could be argued that it is also a product of an evolutionary change.

Having in mind what we have mentioned, we formulate our research question as follows: How can organisational cybernetics, through evolutionary theory, help us understand the current changes and foresee the future ones in the collaborative economy, focusing on the lodging industry?

This article addresses the question by setting the objective of using an evolutionary cybernetic framework that is compatible with VSM (Osejo-Bucheli, 2023a; 2024a) to analyse the current trends and possibilities in the platform economy within the lodging industry. This

article also proposes the use of VSM to create a cyber-cooperative for the lodging industry. Furthermore, the concept could be extrapolated and applied to comparable institutions.

Important insights can be derived from discussing the new trends in the lodging industry using the approach proposed before, both in theory and in practice. In theory, we can contribute to the onto-epistemological integration of evolutionary theory into the VSM, improving our understanding of both evolutionary theory and systems thinking. In practice, because a new wave of innovative business models is emerging, where cooperation and collaboration are at the core of their organisational ideas, the results of this study could be directly extrapolated to those industries.

2. Methodology

The problem identified in the introduction requires two approaches: a descriptive-explanatory approach to aid in understanding the ongoing evolution of the phenomenon, and a prescriptive approach to design what we propose as the cyber-cooperative. As far as the descriptive-explanatory approach, the study presents an evolutionary interpretation of the current theory, followed by an evolutionary extension of it. Finally, it extends the theory by suggesting guidelines for evolutionary cybernetics. For the prescriptive part, the study applies a summarised version of the VSM model to the idea proposed of a digital cooperative.

2.1. Evolutionary Epistemology

Evolutionary epistemology can be regarded as a naturalistic approach to knowledge in the philosophy of science. It is characterised by understanding cognition as a product of evolution; furthermore, it considers the mechanisms of natural evolution as a way of understanding human knowing. It is associated with the contributions of Campbell (1974). In evolutionary epistemology, the approach to knowing is to understand not only the products of nature as a result of evolution but also evolutionary processes that can be used

to investigate the social world. Although evolutionary epistemology has its roots in the study of human psychology, it also extends to understanding the cognitive aspects in nature. In our view, this epistemology transposes adequately onto Viable Systems Theory, given the biological and anatomical origin of VSM.

Evolutionary epistemology exhibits a particular strength in that the processes of evolutionary theory are not applied as metaphors but as heuristics to explain, understand, and predict the dynamics of systems.

Evolutionary theory has different approaches. By the end of the nineteenth century, evolutionary theory was rarely contested, but there was no agreement among scholars on the means of evolutionary theory (Bowler, 1992). Evolutionary epistemology considers natural selection as an explanation for organisms' traits. This is of special importance because it means other variants of evolutionary theory are not accepted in this epistemology, such as behaviourism. Evolutionary epistemology adopts a selectionist account for cognition (Campbell, 1997). This article elaborates further on this mechanism in its content.

2.2. The VSM and its Biological Origins

The prescriptive method applied is the VSM. The VSM is a cybernetic-theoretical development that proposes a way to organization based on the network best adapted for viability which is the human nervous system (Beer, 1972). The VSM proposes the organization as a system composed of five subsystems akin to those in the human body (see Table 1).

Table 1. Subsystems in the VSM and organism analogy

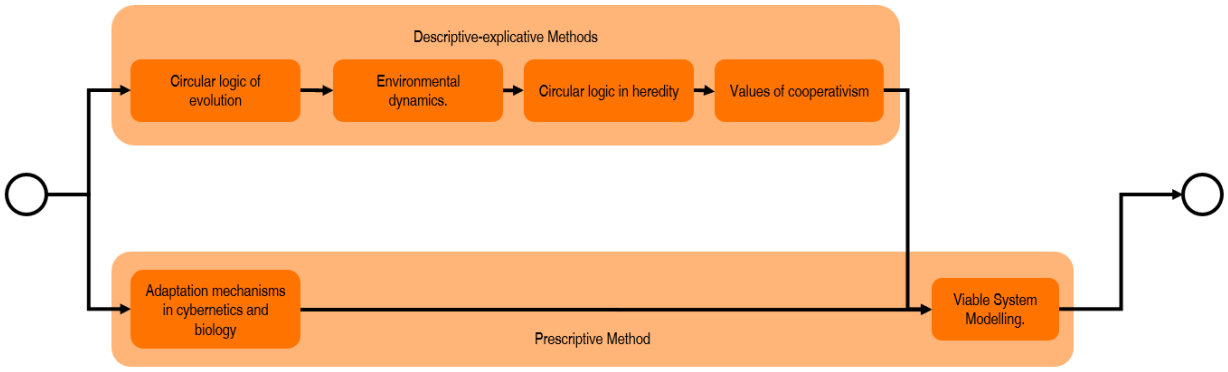
System	Analogical description
System 1	The operative units are those that perform the work in the system. It is analogous to the muscles and organs in the human body (Dominici & Palumbo, 2013).
System 2	The anti-oscillatory system, or resource-bargaining system, coordinates the operational units. It is analogous to the sympathetic nervous system, which stabilises the activity of muscles and organs and ensures that their interactions are kept stable (Vahidi *et al.*, 2019).
System 3	It is the subsystem that controls the inside of the organisation at the current time. It is comprised of the base brain, pons, and medulla, which oversee the entire complex of muscles and organs and optimise the internal environment via a thorough screening. It optimises the collective operations of the muscles and organs in the body via a thorough screening (Beer, 1994b).
System 4	It is the subsystem that is responsible for scanning the environment and anticipating the future. It is comprised of the midbrain, the diencephalon, that connects to the outside world through the senses. It is analogous to the human conscious nervous system, which observes the environment, gathers information and makes predictions. Adopts the necessary strategies and plans to have an optimum adaptation to the environment (Espejo, 2013).
System 5	It is the subsystem that maintains and decides the ethics and identity of the system. It is analogous to the human cortex and higher brain functions. It defines the system's identity and its overall vision or reason for being. This system decides which operating policies and guidelines it will follow (Beer, 1994b).

Source: Adapted from Vahidi *et al.*, 2019; Walker, 1991, pp. 8-9.

After proposing the VSM (1972; 1979), Beer formulated a methodological proposal where the VSM is applied as a diagnostic and proscriptive tool (Beer, 1995). This is the basic framework of VSM that will be matched to our descriptive methods in the protocol provided below.

2.3. General Research Design

Figure 1. Research design



Source. Own elaboration.

In the procedure shown in figure 1, as a first step, we will use natural selection to establish the biological analogies of the VSM and the circular logic of the evolutionary algorithm. Then, we will propose an analogy between evolutionary competitive forces and the environmental dynamics of systems. After that, we will present the circular logic in the bases of heredity. Finally, we will locate the set of political values of cooperativism that promote adaptation in sync with those proposed in the VSM. We will conclude this essay by applying the VSM to formulate what we have called the cyber-cooperative.

For our case study, we chose the platform cooperative in the lodging industry from the OECD's platform coop project, which gathered data on more than 500 active platform coops in various industries. The choice of platform cooperatives in the lodging sector, such as Fairbnb, is convenient due to their comparable services to traditional platform lodging industries. Furthermore, Fairbnb serves as an illustrative example of an industry that provides a more equitable option for both customers and hosts compared to other platform enterprises. Notably, Fairbnb allocates half of its platform commission towards community investments in the areas where it operates (OECD, 2023).

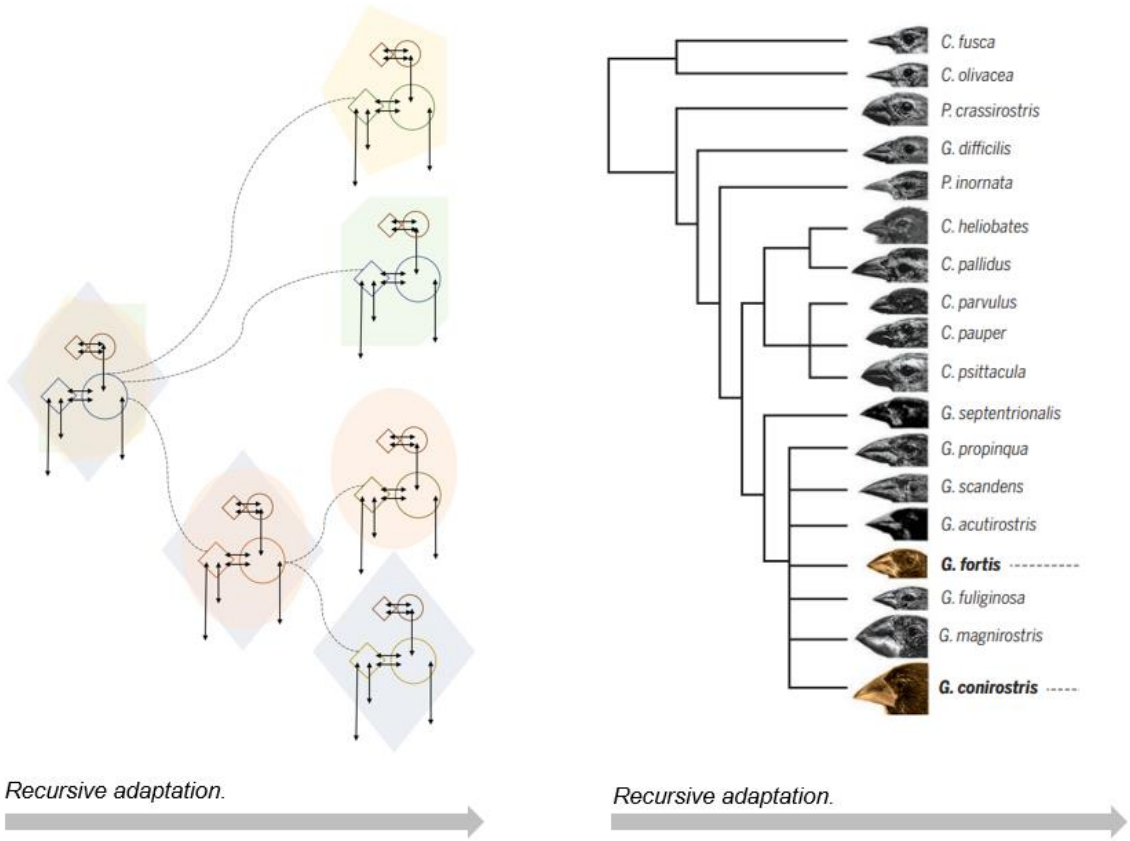
3. Adaptation in Viable Systems and in Species: Interpreting the Current Theory

The Viable System Model demonstrates evolutionary adaptability to its environment through generating recursions (Espejo, 2004). An organisation can be understood as an organism capable of adapting to changing environmental conditions (Beer, 1994a, p. 135). This suggests that the process is analogous to the adaptation of species to their environments.

The most relevant outcome of the evolutionary process through natural selection is adaptation to the environment. Espejo (2004) says about Beer´s (1972) Viable System Model: "its origin is in a study of nature's evolutionary strategies that have produced human beings capable of maintaining viability over time. Human beings have been extremely successful in this endeavour." The adaptive strategy to deal with overly complex environments for viable systems is to make complex tasks viable by embedding "autonomous systems within autonomous systems" (Espejo, 1990). The disaggregation of complex environmental variations into manageable portions of complexity and allowing autonomous subsystems to interact with comparable intricacies in the environment, allows viable systems to adapt to highly uncertain environments.

Figure 2 shows a graphic parallel between recursive adaptation of viable systems to their environment and the evolutionary adaptation of finches' beaks to the various diets offered by the environments. This produces different species and varieties of finches.

Figure 2. Recursive adaptation in living systems



Source. Own elaboration using Beer's recursive adaptation idea and Wagner's (2018) finches.

Adaptation mechanisms in systems depend on "policy, intelligence, and cohesion." Intelligence is concerned with the problematic of the current and future environment. Cohesion focuses on the actual interior of the system, while policy oversees the closure of communications, strategies, and the utilisation of intelligence and cohesion (Espejo, 2004; 1996). In other words, adaptation involves the whole metasystem.

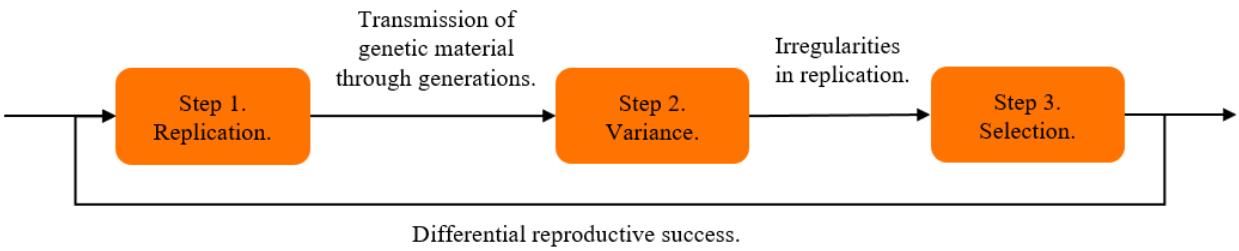
4. The Cybernetics in Evolutionary Theory: Extending Theory

This section proposes to understand evolution in cybernetic terms as a dynamic equilibrium of forces that act from the environment onto living systems, from systems to the environment, and among living systems.

4.1. The Evolutionary Circular Logic

Evolution is a continuous and gradual process without a specific goal. It follows a replication-variation-selection algorithmic feedback cycle (figure 3). Bateson recognised that evolution favours "reciprocal causation" or cybernetic feedback (1991, pp. 306).

Figure 3. Evolutionary algorithm



Source. Own elaboration

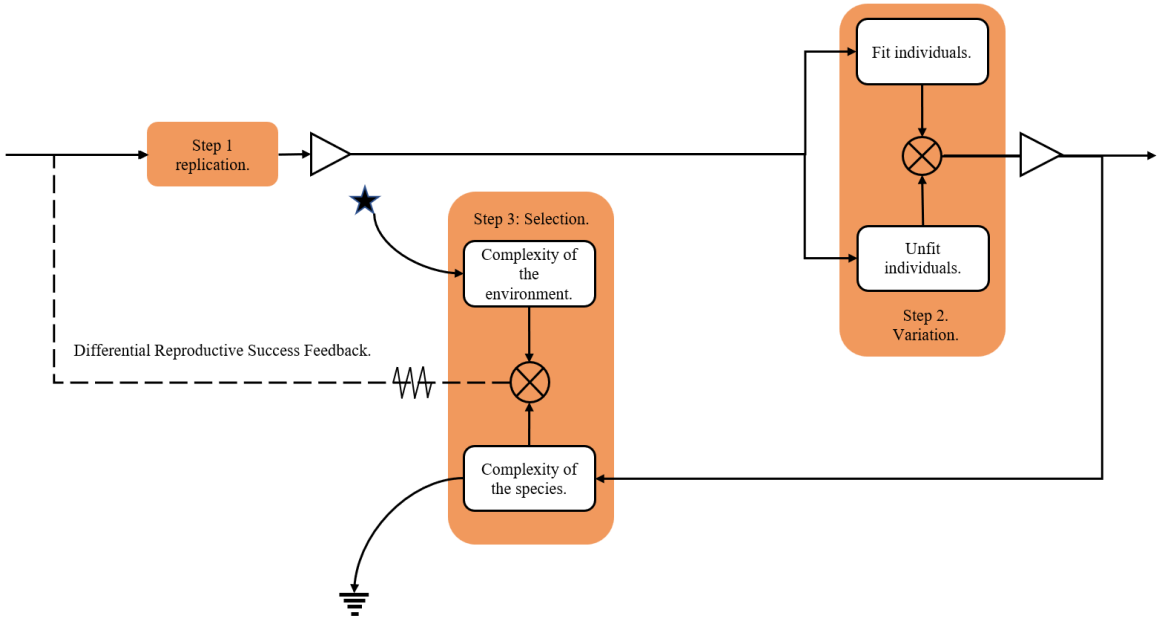
When individuals within a species reproduce, their genetic material is replicated and transmitted to the following generation. Replication in biological systems is not perfect, it is copied with small, random variations, producing similar but different individuals (Dawkins, 1976). In SFEs, Tyrtania (2008) understood that there is a reproductive process, which he equated to a "combination" process, that generates variation and, in turn, complexity. This process creates differentiated systemic structures, adapted to different environments (Adams, 2007), or, as Beer (1984) puts it, systems that inherit conditions to show viability in certain environmental conditions. Similarly, systems that are not adequately adapted to compete for resources within their environment have fewer opportunities to reproduce. The

less favoured are eliminated from the gene pool because their genetic information is not replicated from one generation to the next (Adams, 2007). This differential reproductive success rate produces, once again, systems that are better adapted to the environment.

The evolutionary algorithm we examined is centred on the individual, as Darwin believed. Nevertheless, modern evolutionary theory indicates that natural selection acts on genes, as discussed below.

4.2. Evolution in Systems

Figure 4. Cybernetic model of the evolutionary algorithm



Source. Osejo-Bucheli (2024a).

In natural systems, the traits that make a system viable are repeated in the next generation. Beer (1984) fully recognises that acquired features of individuals cannot be inherited; for example, if a lizard loses its tail, its descendance will not inherit such a characteristic, yet

characteristics can be inherited in social groups. Beer believes he has identified a limitation in the VSM. We will revisit this topic later to propose a solution.

> A major battle in biology concerning the possible inheritance of acquired characteristics in the individual, as conceived by Lamarck, seems to have been settled in recent years by microbiologists. There is no such inheritance, for genetic information is always carried by nucleic acid to inform the protein molecule – and never the reverse. In society, however, that is in the social group, there clearly is an inheritance of acquired characteristics. Therefore, a major difference emerges as between the VSM of the individual and the VSM of society to constitute, at least on first sight, a limitation of the model (Beer, 1984, p. 9).

As demonstrated by applying Systems Far from Equilibrium (SFE) theory to populations, reproduction is a combination of genetic information (Tyrtania, 2008, pp. 41-68). In natural systems, variation creates systems that preserve both the traits required for the original system's viability and the organism's identity features. This variation creates an identity within another, which corresponds to Beer's concept of recursions (1984; 1992, pp. 51-56). Adams (2007) recognises in SFE that combination and variation form varied "systemic structures" that are adaptable to diverse situations as well. This implies that certain individuals may adapt to one environment but not to another. In figure 4, the comparator (⊗) represents this variation in our model. The comparator represents individuals adapted to varied settings, which contribute to the species' complexity. This is why an amplifier follows the comparator.

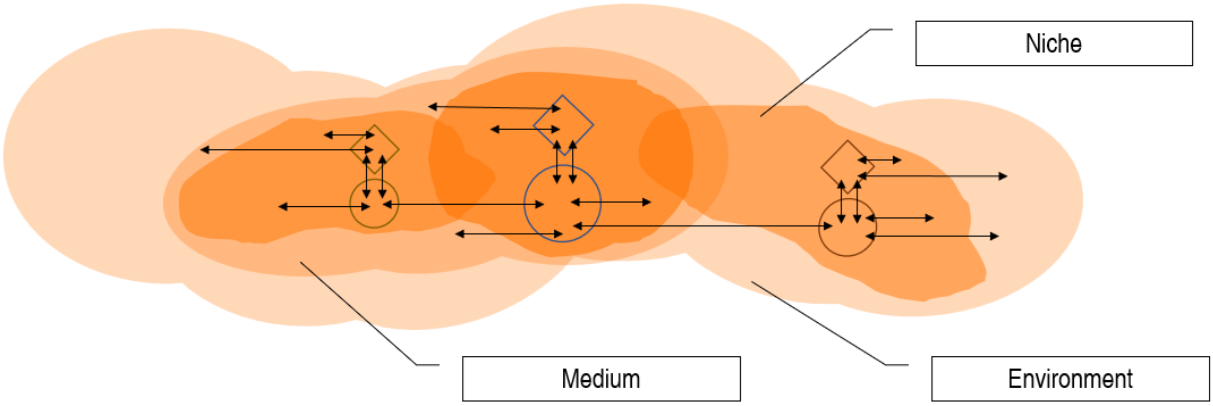
When a system lacks the ability to exhibit the variability required to match the variability of the environment, it enters an unviable state. Again, even while referring to SFE, Adams (2007) acknowledged that they, as biological beings, do not reproduce in the next generation. The less favoured are eliminated from the gene pool. The presence of variability in the environment is depicted in our model, and the symbol (⛛) can be interpreted as the energy contained in these organisms returning to the environment as they perish. This is why there is an attenuation effect after the comparator, which equates the complexity of the environment with the complexity of the systems in our model.

Our model demonstrates that the environment influences system adaptability during selection. Following this, we will examine how Beer (1972; 1992, pp. 51-56) conceptualises the idea of adaptation to the environment.

4.3. Living Systems and the Environment

Adams (1983) uses Systems Far from Equilibrium (SFE) theory to describe the dynamics of living systems in their environment. As living systems have differential energy requirements, they obtain energy from their own environments, as well as from other systems and the larger ecosystem (Tyrtania, 2007). The competitive interaction of living systems for resources in their environments drives evolution (Adams, 1983; Ortiz *et al.,* 2016; Tyrtania, 2008, 2007). Darwin (1885) observed that individuals of the same species compete for reproductive opportunities, different species compete for alimentary resources, and species of the same (or different genus) compete for territory and resources. For us, the environment encompasses all that surrounds the living system. The living system encounters it within the medium of its existence, which we refer to as the niche. The exchange between systems and their mediums generates a dynamic competition for resources (Espejo, 1996). Figure 5 shows the relationship between living systems, their niches, mediums, and the environment using Beer's (1972) notation on Adam's proposition (Adams, 2007). The struggle for resources and survival is a circular causal relationship between living systems, their niches, mediums, and the larger environment. Despite the competition, there is an apparent stability or equilibrium in the ecosystem. Biologists refer to this observation as "punctuated equilibrium" when the fossil record remains unchanged, despite the presence of forces that maintain a homeostatic balance.

Figure 5. A VSM-SFE analogue of environmental dynamics



Source. Own elaboration using Beer's (1972) notation.

We have established that evolutionary forces drive the relationship between living systems and their environments in a dynamic, homeostatic way. In the following sections, we provide a synthesis of the workings of evolutionary forces.

5. Cybernetics and Genetics: Theory Formulation

This section provides a theory of cybernetics and genetics, consistent with the theoretical analysis presented above, to reveal that cybernetics, evolutionary theory, and political theory are linked together.

5.1. Genotype-Phenotype Reciprocal Causation

Darwin (1885) believed that natural selection acted on individuals, but Dawkins (1976) argues that it operated on genes. Consequentially, the genotype dictates not only the external shape of living organisms but also its internal functions, construction, and even the organism's behaviour. The phenotype is the perceptible set of characteristics of the genotype.

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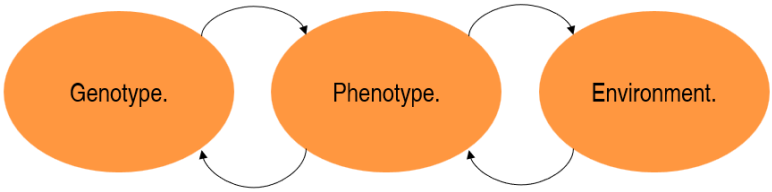
Therefore, the physical attributes generated by the genotype confer a survival advantage on the individuals who possess them.

Ashby (1968) deemed DNA "unreferenced information" because it has no connection to any form of "knowing" but to the various "causes" external to the DNA as a physical system. Modern evolutionary theory challenges this claim. Dawkins popularised the revolutionary idea that the phenotype is also manifested in the organism's natural behaviour. In that sense, the long flat tail of the beaver is a phenotypical expression, as much as the dam the animal builds. The beaver doesn't need to learn how to build a dam; the information needed to do so is encoded in its genetic material. By constructing a dam, the beaver improves his possibilities of survival by modifying the environment and shaping the surrounding landscape (1999, p. 59).

This way, we reach the third circular causality pattern in evolutionary theory. The relationship between genotype-phenotype and phenotype-environment. As portrayed in figure 6.

Figure 6. Circular causality genotype-phenotype-environment



Source. Own elaboration.

As we aimed to propose explanations from evolutionary theory to conscious decision-making, in the next section, we elaborate on the evolution of information and ideas.

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5.2. Memetics and Politics

In humans, two evolutions occur simultaneously: a biological evolution and a cultural evolution of ideas (Harari, 2014). Dawkins (1976), who describes how members of the same species copy melodies in the Saddleback of New Zealand (a species of bird), provides a better explanation. Among the plethora of new melodies, some are chosen to be copied again, and some are not. Other birds may choose to whistle the copied melodies, thereby initiating the process anew. Imperfections are incorporated while copying the melodies in a flawed reproduction following the algorithm in figure 3. Dawkins uses this example to formulate a theory of cultural evolution. Culture reproduces in human's ideas, as melodies in the New Zealander Saddleback. He proposes the meme as the minimal unit of cultural selection, analogous to the gene in natural selection.

The system identity, which dictates its operating policies and guidelines, is, by nature, its memetic material. If a system lacks the necessary identity to adapt to its environment, it loses its viability. However, unlike the genetic material that naturally determines an individual's fitness or unfitness to survive, the genetic material of a system can change and adapt to the fluctuating conditions of its environment. Furthermore, this adaptation is gradual: "violent change is uncommon, and when it is encountered, the organism may reel under the impact and become quite unstable and ineffectual for a period, after which it is likely to settle down to the new circumstances" (Beer, 1994b, p. 135). Also, according to Di Paolo (2005), a system may become unviable for a period before becoming viable.

Remembering that the identity of a system is that which dictates how subsystems cohere, let us accept that the identity of an organisational system is analogous to its politics and policy. All three are part of the memetic material that determines its form and behaviour, as the genetic material does with organisms. *Politi* is the set of ideas that dictate how people organise and orient decision-making, it is often exercised through a constitution, which is the formal or informal set of rules or procedures that govern organisations and determine legitimate behaviour. Policy, derived from the word *politi,* refers to the means by which a social community is governed, controlled, or influenced. Finally, politics is the total complex

of relations between people that enables organisations to become established (Yolles, 2003). Assuming a particular political role of management in decision-making, as mentioned by Espinosa *et al.* (2015), it is possible to identify implicit values in the VSM consistent with a political theory derived from autonomy, participation, and the maximisation of freedom, all characteristics of the VSM's management-cybernetics. The identity of the system is what carries the ideas that dictate the organisational principles. In the next section, we discuss the characteristics of the political identity of VSM.

5.3. Cybernetics, Political Identity, and Natural Systems

Every organisational proposition is based on intrinsic values and principles. In cooperative organisations, this link can be established through anarchist cybernetics. Beer observed that organisations which prioritise freedom as their output were those where workers had the most autonomy and self-control (1972; 1979). Some academics, both in political theory and in management, interpret this idea as a strong coincidence with the principles of anarchy. Anarchy is the state of free and voluntary organisation where no domination from authority is present (Osejo-Bucheli, 2024b), and cooperative organisations coincide with this definition. According to De Gaus (2014), the classical anarchist Piotr Kropotkin also advocate for some of the values of organisational cybernetics.

Academics have been applying the VSM to cooperative environments, even though Beer acknowledged its application to cooperative organizations, only drawing from Walker's (1991) text on cybernetics and cooperativism. Only a handful of academics (Swann, 2018, 2020; Fox, 2023; Osejo-Bucheli, 2024b) have developed anarchist cybernetics in recent years. The idea that hierarchy of authority is rejectable and should be replaced by free interactions between members of an organisation, which has been called “functional hierarchy” (Swann & Husted, 2017), is common between anarchy and cybernetics, the idea spun out of the human nervous system where no single leader is present. Self-organisation and self-regulation, which are crucial for establishing decentralised structures, are also evident in both fields of knowledge (De Geus, 2014) as well as in natural systems.

"[A]natomical hierarchy" and distributed decision-making are features of anarchist organisation as well as management-cybernetics (McEwan, 1963).

Interestingly, highly democratic organisations and societies at large, and their features such as public debate, suffrage, and decision-making by majority, are a "cybernetic evolution" (Walter, 1963). Evolving self-organising systems, complex interlocking control structures, learning and decision-making units, and "redundancy of potential command" are bionic ideas present in both cybernetic and anarchist organisations (McEwan, 1963). The natural, decentralised, leaderless structure is an aspiration of anarchism. The ideal of a network of autonomist, collective, or distributed leadership (Collister, 2014), or the bionic idea of a natural "nuclei of leadership [that] emerge[s] and shift[s]" (Ward, 2010 [1966]), is increasingly possible due to the advances in communication and technology (cybernetics). Contemporary anarchist revolutionary groups have found a way to spontaneously organise and collaborate in large regional, national, and international groups in an autonomous, non-hierarchical way, as smaller groups do, using social media for communication despite individual environments (Osejo-Bucheli, 2023b; Osejo-Bucheli, 2024c; Swann & Husted, 2017).

6. Evolutionary Analysis of Platform Economics and Digital Cooperativism: Analysis Results

The introduction proposed that the technology enabling the appearance of the platform economy also led to the appearance of severe inequalities in the industry, disguised as worker's autonomy. This section uses the epistemological framework proposed by evolutionary cybernetics to analyse the platform economy to transition to digital cooperativism.

6.1. The Evolution from the Platform Economy to the Digital Cooperativism

The evolutionary model shows the biological system's capacity to adapt and survive by accommodating the diverse fluctuations in the environment. From that perspective, we can view the digital cooperative as a standard platform-based business adaptation. Some interpretations propose that the platform economy represents a reorganisation of the economy, indicating a shift towards digitization (Cañigueral, 2016). Additionally, the emergence of platform-based business models has led to the appearance of unsatisfactory working circumstances (Arrieta-Idiakez, 2019), which presents an opportunity to contribute to an improved version of the collaborative economy (Cañigueral, 2016).

Digital cooperatives enable the necessary socio-political decisions to establish a platform-based economy and enhance the working conditions of service providers. These cooperatives would promote social protection by improving their members' working conditions and ensuring democratic control over the organization by both service providers and platform users (Arrieta-Idiakez, 2019). They also collaborate on the platform's operation and governance (Morales-Sánchez, 2023).

The ideals of cooperativism, as defined by the International Cooperative Alliance (s.f.), encompass education and transparency in information management. Digitizing and making information accessible online allows for easy sharing, fostering collaboration among local agents and facilitating the creation of social projects that rely on trust or the replication of the organization in various settings. Digital cooperatives, like traditional physical businesses, have the potential to enhance the accessibility and affordability of products (Morales-Sánchez, 2023).

6.2. Adaptations of Digital Cooperativism

In organisational cybernetics, disaggregation of complexity through recursions is the means of achieving adaptation (see Section 3). This allows the enterprise or industry to adapt to environmental conditions by altering its structure.

The digital cooperative should adapt to various environmental conditions, such as the tendency of markets to use cooperative organisations to elude compliance with employment requirements. In this sense, digital cooperatives should avoid turning into billing cooperatives or self-employed worker cooperatives (Arrieta-Idiakez, 2019). There are two ways to achieve this: first, by implementing rules that guarantee workers a permanent contract and prevent cooperatives from evading labour legislation (Villalba Sánchez, 2021); and second, by asserting the implementation of cooperative values, such as constitution-setting, democratic management, worker participation in decision-making, and guaranteeing the highest standards of working conditions (Arrieta-Idiakez, 2019).

The digital cooperative's structure and organisation could adapt to externalities. Digital cooperatives could work as multi-goal enterprises by connecting consumers and suppliers alike using blockchain technology (Frenken, 2018). This ought to establish a framework that enhances the principles of collaboration, such as offering meeting spaces, facilitating joint development, and promoting value enhancement through cooperation (Arrieta-Idiakez, 2019). Providing education in entrepreneurship and providing advice, training, and mentoring to members can enhance the adaptability and versatility of the organization (Arrieta-Idiakez, 2019). Additionally, educating members in legal and economic knowledge and reinforcing the values of the social economy and cooperativism can also contribute to improvement (Villalba Sánchez, 2021). This would provide a resolution and guidance for decision-making inside the cooperative when faced with the choice of prioritising either efficiency and financial gains or the enhancement of social benefits (Morales-Sánchez, 2023).

6.3. Platform Economy and Cooperativism Relationships with the Environment

Neither the platform economy nor the digital cooperative is immune to environmental influences. The technological environment provides the background for businesses to escalate and facilitate connections between customers and service providers. The labour regulatory environment has not kept up with technological developments.

The economic environment exerts pressure on platform creators to exploit loose normativity and increase profits at the expense of workers' job security. This is evident in cases like illegal lending of workers, camouflaging the provision of self-employed day labour, or invoicing services for workers without a work contract (Villalba Sánchez, 2021). This situation has created pressure on lawmakers to legislate professional regimes for the collaborative economy, starting from its basic definition (Arrieta-Idiakez, 2019).

In this sense, the digital cooperative could support the social economy by channelling genuine mutual aid initiatives leveraging the principle of inter-cooperative support. The digital cooperative can provide technical advice to those who want to associate with and create a worker's coop (Villalba Sánchez, 2021). By the same token, ensure a true value exchange among individuals, both buying or selling products or services, and create open research and development opportunities by relating a network of cooperatives (Frenken, 2018; Morales-Sánchez, 2023).

6.4. The Memes of Political Identity in Digital Cooperativism

The platform economy enterprises stand out as they connect individuals not through direct encounters but through a technical entity, like a platform or algorithm, operating within a computer network. The platform economy enterprise would be distinct from a conventional organisation (Osejo-Bucheli, 2024c).

However, it is important to incorporate the ideals and principles of cooperativism into the algorithms that operate the technology platforms (Villalba Sánchez, 2021). The system's structure should adhere to organisational principles, specifically voluntary association and disassociation within a cooperative. It should also incorporate the option for worker-members to have a formal working contract. Additionally, the interface should enable the creation of meeting spaces to facilitate the free exchange of ideas and decision-making processes regarding the cooperative's operations (Arrieta-Idiakez, 2019).

7. Evolving Platform Capitalism in the Lodging Industry into the Cyber-cooperative: Prescriptive Results

This section introduces the concept of the cyber-cooperative and defines it by first, identifying the political values of cooperativism, reformulating the findings of the analysis of the industry presented in the last section, and finally crafting the VSM of the cyber-cooperative.

7.1. The Platform Economy and the Politics of Voluntary Association

The concepts discussed in anarchist-cybernetics offer a highly effective means of explaining the sharing economy (Osejo-Bucheli, 2023c). These concepts include voluntary association, democratic and participatory management, self-management, and self-control, among others. These ideas have been integral to both cybernetics and anarchism, independently. In addition, anarchist-cybernetics combines political concepts with their organisational outcomes to create a specific form of organisation that promotes individual freedom and autonomy. Benkler (2013) referred to voluntary organisations in the collaborative economy as "working anarchies."

7.2. Transforming the Analysis of the Industry into Requirements of the Cyber-Coop of the Lodging Industry

Using the cybernetic and evolutionary epistemology framework applied for the analysis of the industry in the last section, this section proposes some ideas of how the cyber-cooperative of the lodging industry would operate.

Using the concept of environmental equilibrium, we can propose two ideas regarding management and organisation: (a) an improvement on the equilibrium of forces, making the lodging platform user-governed, similarly to the Wiki platform, with a community of experienced users that curate problematic transactions; and (b) cooperatively owned, meaning that the hosts and inn owners own a share of the platform. These changes would

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bring a lot of balance to the disparity of power that exists between the platform operators and the workers.

Mutual aid observed by kinship in the animal world, as mentioned by Kropotkin (1989 [1902]), would explain and support collective ownership of the cyber-coop. A cooperative organization expects collective ownership of capital or the means of production. Instead of owning the inns' buildings and furniture, the cyber-coop could establish itself by collectively owning the transactions made through the platform. This implies that a portion of every transaction would go towards covering insurance expenses and balancing the less-chosen but suitably priced and graded destinations. Another approach to achieving cooperative ownership would be to buy shares of either the platform or the collective transactions produced. This would incentivize reinvestment among the associates.

The evolutionary algorithm can illuminate significantly on the management of the cyber-cooperative association. For example, (a) it can limit the power of management by establishing a learning process to decide policy and a set of feedback channels to receive the early detection of responses to policy as suggested by Osejo-Bucheli (2024e); (b) another valuable improvement could be to democratically elect the committees and directorates to oversee certain aspects of the operation of the platform, such as optimisation, ethics, discussion, etc. This is also a characteristic of anarchist-cybernetics (Osejo-Bucheli, 2024b); (c) a simpler but perhaps more effective improvement in the use of the evolutionary algorithm is to establish a system that informs the hosts collectively of the improvements they made autonomously to the service and the feedback they received from their guests. This could also improve the whole experience of the customer in the cyber-coop.

The genotype-phenotype principle governs recursiveness in the same way that it explains teams, cooperatives, and federations. From this principle we learn (a) the possibility to federate with other service providers, for instance, an inn owner, who cannot afford to have his/her own catering service, could associate through local cooperatives or federations with restaurant owners or even “home-food” service providers next to their inn to offer a complete package of lodging-catering for their customers; (b) the federative principle can be applied

also to generate balances in the cyber-cooperative between the most and the least touristic regions, and even lend services for their associates, for example, offering long-stay services for an inn owner and associate who needs a temporary residence for their family in a different region; and (c) the cyber-coop should look for political deliberation in local town councils by promoting active members of the cyber-coop to be part of those governing bodies.

From meme theory, the sharing of ideas, could be used for (a) applying the pooling of customers of the cyber-coop, to the pooling of service providers, e.g., the cyber-cooperative captures customers as the standard lodging industry app, but could also capture the dry cleaning service most favourable for all the inns that had a guest the night before in a given area, making it an extremely affordable service; also (b) the cyber-cooperative could set up an academy that shares the learning experiences of the associates to promote the entrance of new members to the business. In this case, we must remember that the education of the members of a cooperative is also one of the pillars of cooperativism, and an ideal of the anarchist organisation.

7.3. The Cyber-coop through the Eyes of the VSM

This section converts the results obtained in previous sections into an idea of the VSM of the cyber-cooperative of the lodging industry categorised through the five subsystems of the VSM.

Members of two classes make up System 1: hosts and guests. Hosts are those who offer lodging services, whereas guests are members who pay a maintenance fee to remain on the platform as associates. A single individual can be both a host member and a guest member. Associates in various environments freely replicate System 1 operations whenever they have the opportunity to utilize the collective shared experience that is social on the platform.

The platform executes System 2 functions through algorithms, which involve classifying room listings according to geographical area, price, and location, as well as assigning discounts and promotions. The system functions based on the concept of mutual aid, determining average earnings by considering the specific geographic region and supporting income. The platform facilitates customer and service provider interactions by promoting autonomy, independence, and moderation. It also promotes unrestricted affiliation and disaffiliation from the cooperative, favouring long-term permanence.

System 3 guarantees the implementation of cooperative principles by establishing a constitution, promoting democratic management, encouraging workers' participation, and facilitating the sharing of information among members and other stakeholders with the aim of creating social projects. The platform also ensures that members and users have democratic control over the organisation and provides suggested guidelines for members to follow. Additionally, it provides meeting spaces to foster the exchange of ideas and the development of new products and services while promoting cooperation. Lastly, it ensures that members have optimal working conditions and offers them a formal employment contract. System 3 is composed either by the whole community, a set of representatives or a meritocratic appointment. It provides education in entrepreneurship, advice on business development, internal training, and mentoring. It imparts legal and economic knowledge to its members, all the while reinforcing the values of the social economy and cooperativism.

System 4 also embeds the values of cooperativism. It gathers data on market trends from the environment through the cyber-cooperative's members' locations and produces statistical analyses, enabling the committees to make informed, long-term decisions like developing touristic regions and offering services for the associates. Additionally, System 4 maintains a multi-goal orientation by utilizing blockchain technology to connect both consumers and suppliers. The cyber-cooperative will support the social economy by channelling true mutual aid initiatives leveraged by the principle of inter-cooperative support, like providing technical advice to those who want to associate and creating a worker's cooperative to federate and exchange products or services. Additionally, System 4 manages regulatory

constraints in each region of operation and oversees various essential services required by the company, such as webpage maintenance and advertising.

System 5, as the identity and ethos of the system, enables the necessary socio-political decisions, oversees the working conditions of members, ensures transparency in information management, establishes frameworks to enhance collaboration, decides when to prioritise financial gains or the enhancement over social benefits, and safeguards the protection of the environment.

The three most important environments the cyber-cooperative deals with and the approaches it assumes are: In the legislative environment, which dictates the operation of the cyber-cooperative, it is ensured that the organisation is not used to circumvent labour regulations or undermine the equitable treatment of workers. In the market environment, the operation of the host members contributes the information needed for long-term management. In the technological environment, which provides the background to escalate the operation, the cyber-cooperative will use it for democratic management, the education of its members, and to relate to the social economy in general.

8. Conclusion: Summarising and Discussing the Results

This paper concludes with a synthesis of its findings, their implications, and suggestions for future research.

The article aimed to discuss the current state of the collaborative economy using the lodging industry as a framework. This is not a trivial problem in current times because we are witnessing a systemic change in the way business are conducted. Other researchers have posed explanations for the collaborative economy from technology, marketing, and even law, but the approach from cybernetics and evolutionary theory has the power to comprehensively unite explanations. In that line of thinking, we proposed to answer the question of how organisational cybernetics, through evolutionary theory, can help us understand the current developments and foresee the future ones in the collaborative

economy of the lodging industry. We answered the research question by proposing various ideas, the most relevant of which are:

(a) This article reiterated the comparison between VSM and biology and emphasised the theoretical significance of evolutionary theory in viable systems. As mentioned in the introduction, Beer demonstrated a comprehensive understanding of evolutionary theory, specifically natural selection. However, he made a deliberate decision to exclude it from his theory. Hence, there exists a prospect to investigate Beer's conceptualization of evolution.

(b) This essay suggested that the connection between living systems and the environment is characterised by competitive dynamics within a state of homeostatic equilibrium. The proposal suggests that living systems undergo adaptation and are influenced by evolutionary forces. It also states that there is a cyclic relationship between genotype and phenotype, which is relevant to the notion of viable systems. These prove to be valuable as they introduce dynamism to VSM by incorporating time and dynamics in connection to change. Moreover, considering evolutionary processes in VSM is an innovative technique that helps identify environmental dynamics in VSM.

(c) It drew a comparison between memetics and the political ideas that shape the identity of a system. It identified a connection between the principles of organisational cybernetics and anarchism and examined and suggested methods for advancing the lodging industry through the cyber-cooperative. This work holds significance since it has the potential to be further developed into a political theory of VSM. Additionally, it has practical relevance in elucidating the concept of modern-day cooperativism.

Upon considering the results regarding evolutionary theory in alignment with VSM, it is evident that the notions related to competition within the framework of evolutionary theory, which greatly influence social cognition, are insufficient in elucidating the existence of cooperation and collaboration. There is a significant shift towards a new way of thinking focused on collaboration in the field of evolutionary theory. As Benkler (2011) has already pointed out, it is recommended to thoroughly investigate and further develop the concept under consideration.

One shortcoming found in the theory relates to the correlation between the system and its surrounding environment (Gaetano, 2010). Francisco Varela (1974) and Humberto Maturana (1994 [1973]; 2000) have made notable advancements in the field of cybernetics. These researchers have proposed multiple hypotheses regarding the process of systems adjusting to their surroundings, based on their significant research in the field of biology. This would offer valuable insights not just on the process of acclimating to the environment, but also into the ancestral origins of the industry.

> The notion of system identity in VSMs refers to the underlying principles, values, and conventions that establish the essential character of the organisation. In the cyber-cooperative framework, technological advancements enhance cooperative values. However, it is crucial to recognise that this capability is still concentrated in software developers, resulting in centralised control. Consequently, potential conflicts in corporate ethos and contradictions among values, as identified by Schwaninger (2006), persist. The problem of multiple simultaneous identities on a single system persists, and the field of systems evolutionary biology can shed light on novel approaches to comprehend it in future investigations, building upon the proposition put forth by Maturana and Mpdozis (2000). Moreover, the study of anarchist-cybernetics offers a compelling alternative for analysing identity and has great promise for research in the Latin American context (Osejo-Bucheli, 2024d).

9. References

Adams. (1983). Energy and structure: a theory of social power [1975]. University of Texas Press.

Adams, R. (2007). La red de la expansión humana. Centro de Investigaciones y Estudios Superiores en Antropología Social, Universidad Iberoamericana. https://biblioteca.clacso.edu.ar/Mexico/ciesas/20170504041225/pdf_812.pdf

Arrieta-Idiakez, F. (2019). Digital cooperatives as channels for digital work in the context of the collaborative economy. *Boletín de la Asociación Internacional de Derecho Cooperativo, (54),* 75-96. https://doi.org/10.18543/baidc-54-2019pp75-96

Ashby, W. R. (1968). The contribution of information theory to pathological mechanisms in psychiatry. *The British Journal of Psychiatry*, 114(517), 1485-1498. doi:10.1192/bjp.114.517.1485

Bateson, G. (1991). Pasos hacia una ecología de la mente. Planeta, Carlos Lohlé.

Beer, S. (1972). *Brain of the firm.* Devon: John Wiley & Sons. https://eclass.duth.gr/modules/document/file.php/ENG112/The%20Brain%20of%20the%20Firm.pdf

Beer, S. (1979). The heart of the enterprise. John Wiley & Sons.

Beer, S. (1984). The viable system model: Its provenance, development, methodology and pathology. *The Journal of the Operational Research Society, 35*(1), 7-25. https://doi.org/10.2307/2581927

Beer, S. (1992). Recursion zero: metamanagement. *Transactions of the Institute of Measurement and Control, 14*(1), 51-56. https://doi.org/10.1177/014233129201400108

Beer, S. (1994a). Beyond dispute: the invention of team syntegrity. John Wiley & Sons. http://books.google.com/books?id=VwVPAAAAMAAJ

Beer, S. (1994b). Decision and control: the meaning of operational research and management cybernetics. Wiley & Sons. https://www.wiley.com/en-us/Decision+and+Control%3A+The+Meaning+of+Operational+Research+and+Management+Cybernetics-p-9780471948384

Beer, S. (1995). Diagnosing the system for organizations. John Wiley & Sons.

Benkler, Y. (2011). *The penguin and the leviathan: how cooperation triumphs over self-interest.* Currency.

Benkler, Y. (2013). Practical anarchism: Peer mutualism, market power, and the fallible state*. *Politics & Society, 41*(2), 213–251. https://doi.org/10.1177/0032329213483108

Bowler, P. J. (1992). The eclipse of darwinism: anti-darwinian evolution theories in the decades around 1900. Johns Hopkins University Press.

Campbell, D. T. (1974). 'Downward causation' in hierarchically organised biological systems. In F. J. Ayala & T. Dobzhansky (Eds.), Studies in the Philosophy of Biology (179-186). https://doi.org/10.1007/978-1-349-01892-5_11

Campbell, D. T. (1997). From evolutionary epistemology via selection theory to a sociology of scientific validity. *Evolution and Cognition, 3*(1), 5-38, https://kli.ac.at/webroot/files/file/Evolution%20%26%20Cognition/1997%203-1.pdf

Cañigueral, A. (2016). Hacia una economía colaborativa "responsible". *Oikonomics,* (6), 16-27. https://oikonomics.uoc.edu/divulgacio/oikonomics/es/numero06/dossier/acanigueral.html

Collister, S. (2014). Abstract hacktivism as a model for postanarchist organizing. *Ephemera: theory & politics in organization, 14*(4), 765-779. http://www.ephemerajournal.org/issue/management-business-anarchism

Darwin, C. (1885). The origin of species by means of natural selection: or, the preservation of favoured races in the struggle for life. J. Murray.

Dawkins, R. (1976). The selfish gene. Oxford University Press.

Dawkins, R. (1999). The extended phenotype: the long reach of the gene. Oxford University Press.

De Geus, M. (2014). Peter Kropotkin's anarchist vision of organization. *Ephemera: theory & politics in organization* 14(4), 853-871. https://ephemerajournal.org/sites/default/files/pdfs/contribution/14-4degeus_0.pdf

Di Paolo, E. A. (2005). Autopoiesis, adaptivity, teleology, agency. *Phenomenology and the Cognitive Sciences, 4*, 429–452. https://doi.org/10.1007/s11097-005-9002-y

Dominici, G. & Palumbo, F. (2013). Decoding the Japanese lean production system according to a viable systems perspective. *Systemic Practice and Action Research, 26*, 153-171. https://doi.org/10.1007/s11213-012-9242-z

Espejo, R. (1990). The Viable System Model. *Systemic Practice, 3*, 219-221. https://doi.org/10.1007/BF01062728

Espejo, R. (1996). Requirements for effective participation in self-constructed organizations. *European Management Journal, 14*(4), 414-422. https://doi.org/10.1016/0263-2373(96)00029-1

Espejo, R. (2004). The footprint of complexity: the embodiment of social systems. *Kybernetes, 33*(3/4), 671-700. https://doi.org/10.1108/03684920410523643

Espejo, R. (2013). Organisational cybernetics as a systemic paradigm: lessons for the past-progress for the future. *Business Systems Review, 2*(2), 1-9. https://ssrn.com/abstract=2242459

Espinosa, A., Reficco, E., Martínez, A. & Guzmán, D. (2015). A methodology for supporting strategy implementation based on the VSM: a case study in a Latin-American multi-national. European *Journal of Operational Research, 240*(1), 202-212. http://doi.org/10.1016/j.ejor.2014.06.014

Fox, J. D. (2023). Dis/agreement, trust and spaces of dissent. [Doctoral dissertation]. Essex Business School. https://repository.essex.ac.uk/36479/

Frenken, K. (2018). Economías políticas y futuro ambiental para la economía colaborativa. Papeles de Relaciones Ecosociales y Cambio Global, (141), 117-140. https://www.fuhem.es/wp-content/uploads/2018/12/Economias-politicas-futuro-ambiental-de-economia-colaborativa-KFrenken.pdf

Gaetano, M. (2010). Viable systems approach (VSA): governing business dynamics. CEDAM

Harari, Y. N. (2014). Sapiens: a brief history of humankind. Harper.

International Cooperative Alliance. (s.f.). Cooperative identity, values & principles. https://www.ica.coop/en/cooperatives/cooperative-identity

Kropotkin, P. (1989 [1902]). Mutual aid: a factor of evolution. Black Rose Books.

Maturana, H. & Varela, F. (1994 [1973]). De máquinas y seres vivos. Autopoiesis, la organización de lo vivo. Editorial Universitaria.

Maturana-Romesín, H. & Mpodozis, J. (2000). The origin of species by means of natural drift. *Revista Chilena de Historia Natural, 73*(2), 261-310. http://dx.doi.org/10.4067/S0716-078X2000000200005

McEwan, J. B. (1963). Anarchism and the cybernetics of self-organising systems. *Anarchy, 3*(9), 270-283. https://www.thesparrowsnest.org.uk/collections/public_archive/8485.pdf

Morales Sánchez, R. (2023). Economía colaborativa. *Mediterráneo económico, 37*, 419-432. https://publicacionescajamar.es/wp-content/uploads/2023/10/ME_Economia-colaborativa.pdf

OECD. (2023). Platform cooperatives and employment: An alternative for platform work", OECD Local Economic and Employment Development (LEED) Papers, No. 2023/16, https://doi.org/10.1787/3eab339f-en

Ortiz, P., Delgado, A., Gómez, F. y Jullian-Montañez, A. (2016). Los lenguajes de la complejidad. In P. Ortiz, A. Delgado & F. Gómez (Eds.), Sistemas alejados del equilibrio: un lenguaje para el diálogo transdisciplinario. Clave Editorial.

Osejo-Bucheli, C. (2023a). Exploration of the relationship of viable systems, identity, and environment: extending the bionic analogy. *SciELO Preprints*. https://doi.org/10.1590/SciELOPreprints.5410

Osejo-Bucheli, C. (2023b). Propelling development through education and innovation in Latin-America: A comparative analysis of the autonomous and voluntary organizational ideas in Oppenheimer and Malatesta. *Revista de la Facultad de Derecho y Ciencias Políticas, 53*(139), 1-22. https://doi.org/10.18566/rfdcp.v53n139.a02

Osejo-Bucheli, C. (2023c). The viability of cooperative societies from the anarchist-cybernetics perspective: a sistematic review of the field and research opportunities. *Ingeniería Solidaria, 19*(3), 1-33. https://doi.org/10.16925/2357-6014.2023.03.04

Osejo-Bucheli, C. (2024a). Adaptation in viable systems is an evolutionary process driven by the system's political identity. *Systems Research and Behavioral Science. Early preview*. https://doi.org/10.1002/sres.2993

Osejo-Bucheli, C. (2024b). Contributions to anarchist-cybernetics, identifying committee directorates with Errico Malatesta´s theory: content analysis using dynamic causal diagrams and viable system modelling. *Kybernetes, 53*(4). https://doi.org/10.1108/K-07-2022-0944

Osejo-Bucheli, C. (2024c). Elements of Gilbert Simondon´s cybernetic ontology. *SciELO Preprints* https://doi.org/10.1590/SciELOPreprints.8081

Osejo-Bucheli, C. (2024d). Prefiguring the design of freedom: an informational theory approach to socio-political cybernetics; analysing the messages in 2021 Colombian uprisings. *Systemic Practice and Action Research*. https://doi.org/10.1007/s11213-024-09669-z

Osejo-Bucheli, C. (2024e). Whiteheadian experience in beer's cybernetic model: policy-making in cooperative societies. *Philosophy of Management, 23,* 41-58. https://doi.org/10.1007/s40926-023-00235-6

Schor, J. (2014). Debating the sharing economy. *Great Transition Initiative*. http://greattransition.org/publication/debating-the-sharing-economy

Schwaninger, M. (2006). Design for viable organizations: The diagnostic power of the viable system model. Kybernetes, 35(7/8), 955-966. https://doi.org/10.1108/03684920610675012

Swann, T. (2018). Towards an anarchist cybernetics: stafford beer, self-organisation and radical social movements. *Ephemera: theory & politics in organization*, 18(3), 427-456. https://ephemerajournal.org/sites/default/files/2022-01/18-3swann.pdf

Swann, T. (2020). Anarchist cybernetics: control and communication in radical politics. Bristol University Press. https://doi.org/10.2307/j.ctv177tgsj

Swann, T. & Husted, E. (2017). Undermining anarchy: Facebook's influence on anarchist principles of organization in Occupy Wall Street. *The Information Society, 33*(4), 192-204. https://doi.org/10.1080/01972243.2017.1318195

Tyrtania, L. (2007). La termodinámica de la supervivencia humana. En R. Adams (Ed.), *La red de la expansión humana* (1ra ed., pp. 16-42). Centro de Investigaciones y Estudios Superiores en Antropología Social - CIESAS. https://biblioteca.clacso.edu.ar/Mexico/ciesas/20170504041225/pdf_812.pdf

Tyrtania, L. (2008). La indeterminación entrópica: notas sobre disipación de energía, evolución y complejidad. *Desacatos,* (28), 41-68. http://www.redalyc.org/articulo.oa?id=13902805

Vahidi, A., Aliahmadi, A. & Teimoury, E. (2019). Researches status and trends of management cybernetics and viable system model. *Kybernetes, 48*(5), 1011-1044. https://doi.org/10.1108/K-11-2017-0433

Varela, F., Maturana, H. & Uribe, R. (1974). Autopoiesis: the organization of living systems, its characterization and a model. *Biosystems, 5*(4), 187-196. https://doi.org/10.1016/0303-2647(74)90031-8

Villalba Sánchez, A. (2021). Las cooperativas de trabajo asociado en la economía de plataformas. CIRIEC-España, *Revista Jurídica de Economía Social y Cooperativa*, (38), 93-125. https://doi.org/10.7203/CIRIEC-JUR.38.20794

Wagner, C. (2018). Improbable big birds. Darwin´s finches prove a mechanism for the rapid formation of new species. *Science, 359*(6372), 157-159. https://doi.org/10.1126/science.aar4796

Walker, J. (1991). Viable systems model, a guide for co-operatives and federations. ICOM, CRU, CAG and Jon Walker. https://vsmg.lrc.org.uk/screen.php?page=home

Walter, W. G. (1963). The development and significance of cybernetics.

Ward, C. (2010 [1966], february 26). Anarchis as theory of organization. https://theanarchistlibrary.org/library/colin-ward-anarchism-as-a-theory-of-organization

Yolles, M. (2003). The political cybernetics of organizations. Kybernetes, 32(9/10), 1253-1282.