INTERACTION MECHANISMS AND THE PERFORMANCE OF PRODUCTION ENTERPRISES AS SOCIAL SYSTEMS: THE TRUTH OF THE HUMAN SPIRIT

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Abstract This contribution goes beyond viewing a system as a black box receiving inputs and producing well defined outputs to an external environment. Its purpose is to explain the complementarity between first and second order cybernetics as well as of economic and sustainable performance. It discusses a black box using the notion of eigenform as developed by Heinz von Foerster (2003) wherein a performing object is understood changing overtime with apparent stability. It contemplates the concepts of structural and linguistic recursions and highlights the values of second-order and ontological cybernetics. The outputs of a black box are fed back to its inputs, possibly in real time, in order to manage its performance towards the often-economic requirements of the system's external environment, but showing signs of change and adaptation. The transformations the social systems perform are adaptive and change over time, making them non-trivial machines. Beyond producing technological transformations, the complexity of social systems emerges from the operational, moment-to-moment- interactions of its participants. Their outcomes are produced by changes in structure and ethical values, necessary for social sustainability and improved (policy) performance. These changes produce adjustments to the system's outcomes which are the observer driven mechanism of second-order cybernetics.

Keywords: organisational performance, sustainability, complexity, economics, second order and ontological cybernetics

JEL: E61, O11, O23

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1 Introduction

In this contribution I go beyond the usual view of a system as a black box receiving inputs and producing outputs to an external environment. In the context of an Enterprise Complexity Model the Viplan Method (Espejo, 2020), is offered as a means to explain the management of the complexity of a black box system. The outputs produced by this black box are fed back into the system's inputs, which if possible, are adjusted in real time to the requirements of the system's external environment (Beer, 1981). This is usually referred to as managing complexity from the perspective of first order cybernetics, and is understood as managing trivial machines (von Foerster, 2003), where inputs and their variations produce predictable output changes, which are absorbed by the market (M in Figure 1 below) of the black box through these feedback processes. However, it is apparent that black boxes are more than trivial machines and what happens within them is more that the mechanical transformation of inputs into outputs. Going beyond trivial machines is the focus of this contribution.

2 Literature Review

Actors within the black box produce more than transformations: that is, are far more than processes to transform inputs into elaborated products, which eventually interact with the market (M). The units producing these transformations within the BB, are far more than technological processes transforming inputs into finished products. They produce a wide range of changes among themselves as they modify each other and compute their mutual changes through different forms of adaptation. Indeed, they produce more than technological transformations or models between inputs and outputs; in fact, their network of interactions produces non-linear transformations in what Wene (2007) has referred to as *double closure* and are illustrated in Figure 1. As seen in this figure, beyond the input-output closure of components in social systems, which is a first form of closure, participants experience operational closure in their mutual interactions, which is a second form of closure (Espejo & Reyes 2011) through processes of structural recursions (Beer, 1979; Maturana 2002). The black box adapts through *computing relational* changes of participants in the system, which change its identity ('Z' in Figure 1) producing organisational changes, which go beyond the idea of trivial machines and offer the complementarity between the first order closure produced by the black box and its

second order operational closure (Espejo, 2021). They explain non-trivial machines, that is, explain the cybernetics of the observer (von Foerster 2003; Maturana 2002). This is second-order cybernetics. The outcomes of actors' interactions, as outcomes of closed network of operations in the black box, are observer dependent, following Kauffman (2003) discussion of eigenforms, wherein an object is seen to be a token for those forms that lend the object its apparent stability in a changing world.

Eigen behaviours are explained by Wene (2007; 2023) with the cybernetic closure theorem: "Operationally closed systems develop Eigenbehaviour". From this theorem it follows an important clarification for social systems. Beyond the input-output closure of trivial machines; social systems offer the double closure of participants interactions, affected by environmental changes, as they compute productions within the black box. These are situations of non-trivial machines, in which actors adjust their interactions as they modify each other following the need for stability in eigen forms. These are situations of double closure, which affect organisations of all sizes, from the very small to the very large, from those in need of local sustainability to those requiring global sustainability.

Scholte (2012), with a focus on the performing arts, relates creative interactions among actors and between them and audiences to the idea of eigen forms. Following the works of Kauffman (2005) and von Foerster (2003) he discusses the notion of eigenform. He uses eigenforms as the missing conceptual bridge to unite social constructivists with embodied cognitivists in the field of theatre studies and beyond in the cognate fields of film, literary and visual art theory, but also into more general social constructions. My comments to Scholte's paper in Constructivist Foundations (Scholte, 2012) were constructed as the outcome of actors' interactions with audiences in processes of double closure. Actors compute, as an outcome of transforming inputs into outputs to the environment (M), that is, as an outcome of producing stable outcomes or eigenforms, through which they carry out double closure in their interactions with collectives, their work of art. The argument is that the parts' interactions produce first order transformations of inputs into outputs, but also through computing these interactions produce second order outcomes or eigen forms. These two loops are related by self-reflecting loops (SRL) to evolving identities (Z) for the I-O transformations; that is to the *BB eigen-forms*. These eigen-forms may produce works of art, which are not objective representations of situations external to them. Actors and audiences experience stable meanings

through on-going processes of interactions, which make them changeable by an stable truth emerging from the participants interactions, that is, by the *"truth", of their emerging human spirit* (i.e. the object with their values, principles, and so forth). Scholte rejects the notion that "the collective actors", as they perform, provide to the related audiences with access to human truths (beyond their collective agreements or "truths"); for as long as they provide a genuine and rigorous grasp of a situation they are producing a "truth", which in general is not a proven scientific truth. Measurable performance does not necessarily drive these outcomes. The idea of measurable performance as the ratio between inputs and outputs, which is traditionally used as performance of commercially driven organisations, is now replaced by computations of self-reflective loops (SRL) produced by relations among the participants in these organisational systems, stretched by environmental avatars[1] triggered by ethical and value considerations, beyond commercial aspects; these are the eigen behaviours produced by double closure. Scholte's views that he relates to art can be extended to all kinds of systems; commercial and social.

3 Methodology

The interactions among the actors, and more generally of the participants producing the meanings of a situation, whoever they happen to be, through shared computing processes, possibly through shared models, experience meaning creation beyond the actors creating and inventing them. I'm offering, from an organisational perspective, an interpretation of capturing the *"truth" of the human spirit* from people's interactions. As already said, the outcome is not an objective truth, or productivity of inputs versus outputs, which may be of value for commercial purposes, but expressions of collective values, ethical considerations and more general constructions.

As already said, in Figure 1 a *self-reflective loop* (SRL) is computing processes and modifying the *identity Z* of the internal closure of interactions, producing social situations such as the UNO 17 goals (e.g, climate change, education, use of natural resources, works of art, and so forth relevant to an extended understanding of organisational systems). Furthermore, audiences and actors, beyond interpersonal interactions, interact in *contexts*, such as culture, nature, climate, which are

[1] From the English Dictionary we understand that an Avatar is the embodiment or manifestation of a person or idea; and also, it is an icon or figure that represents a particular person in an internet forum.

fundamental to understand the balancing of their interactions. It is in these spaces that the performance of interactions takes place and the question is, are these contexts contributing to produce valuable second-order experiences or are just good economic outcomes as we usually construe input-output relations?

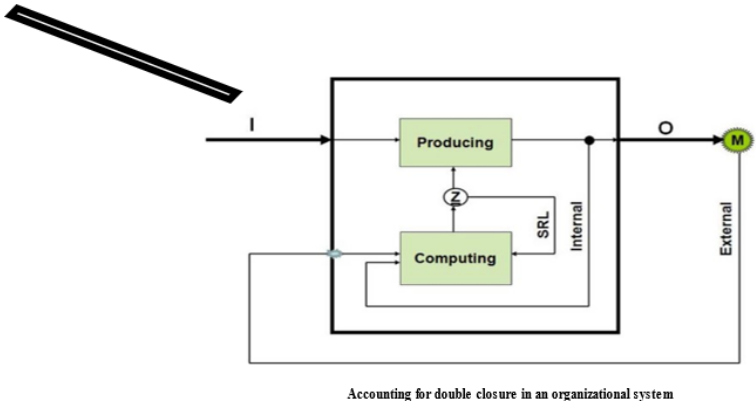

Figure 1: Second Order Organizational Systems and Active Contextual Environments The (Meta) Context of Interactions
Source: Wene (2007).

Beyond subject-subject environmental interactions, which belong to the organization-environment space of structural formations, this work is recognizing a subject-metasubject space of interactions which belongs to the cultural formation of these organisations, in contexts of religious, ethical, climate contexts and others, which constraint the way the organizational systems operates in those contexts; this is something that goes beyond the organisation-environment interaction into their *organization- meta environment space*; this is a sort of contextual closure as is explained in Figure 2.

From the perspective of variety management closure (Ashby, 1964) the input-output loop makes apparent that the output of transformational processes can be related to a desirable performance; what output is produced by what input? From the perspective of producing something, this is fundamentally a quantitative loop. If the purpose is producing something at a given level of performance the law of requisite variety tells us whether the resources available are adequate or not for this purpose

and whether the feedback loops are *correcting* relationships between actors and audiences to achieve this desirable performance. All these are *mutual variety correcting* processes between actors and audiences, in which the high variety experienced by the latter, in their contexts (what we called avatars) need to be absorbed, one way or another, by the actors' varieties in search for desirable (input-output) performance. But beyond economic performance, if their purpose is respect for participants, valuable artistic experiences of all participants or, in a more general sense, spiritual satisfaction, their interactions may contribute through the closure of their learning loops to *ontologically acceptable eigenforms* (Espejo & Lepskiy, 2022). Participants contribute with their creativity, inventiveness, values, histories to the formation of eigenforms, or stable meanings through their interactions.

4 Results

All this is highly complex. It is possible that actors to produce desirable outcomes, may recognise different views for their input-output transformations (first loop) and through their *interactions* with environmental participants trigger different understandings of these transformations and open the space for adaptation and change, that is, trigger different forms of double closure (second loop). These are non-trivial learning loops related to the black box, which create different appreciations of the contributions of different actors and trigger *computing* processes among the participants themselves and also with their medium or immediate environment.

From a complexity perspective both actors and audiences experience high varieties. However, an additional aspect is illustrated by the external loop in Figure 2; these interactions take place in a wider context, a metacontext, that shapes the complexities that they experience. As already clarified eigen behaviours lend stability to objects in a changing world. Actors creative contribution to organisation-environment interactions can be understood as extensions of Beer's Viable System Model with double-closure (Espejo, 2020) offering adaptive products and through their multiple relationships offering aspects of ethics, values, environmental responsibilities and what they may require in the spirit of a piece of work or social construction. Therefore, what happens through the black box, the transformation it produces, is more than products; it is the outcome of double closure, through linear and non-linear transformations. This epistemology is explained in Espejo (2020) as

the complementarity of a black box and an operational description of a social situation.

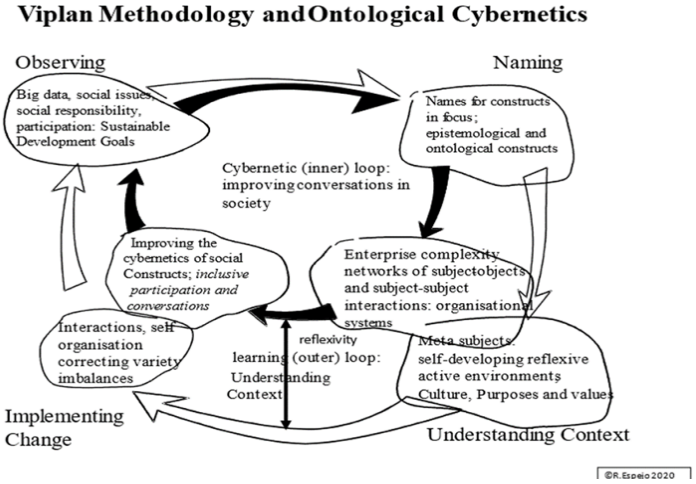

Figure 2: Viplan Methodology and Ontological Cybernetics
Source: Espejo (2020)

5 Discussion

In today's world of highly complex, digital technology, what is of significance to the above elaborated system-environment interaction criteria? In today's world, how does it relate to artificial intelligence (AI), that is, to the output of an Image Dream Generator? How does AI relate to double closure? For instance, can it produce top notch artwork? Or high-quality art is beyond an AI producer? How does it blur ethical boundaries as it is the case with human work? Human artists mix emotion and nuance in their personal styles. Is there a need for regulation in the production of AI art? AI-generated content has the potential to create new forms of art, but the complexity of works of art goes beyond computing through selections in a database. At the very least new products in situations of double closure go beyond input-output transformations.

As an expression of the human spirit, with a focus on art, artists create, regulate and implement their works, as they interact among themselves and with other subjects in their wider environments, at the same time that they are constrained by meta-

systems that culturally are shaping their spaces for action and development. These are the actors–metasubject relationships, which are relevant to all forms of social systems, that is, they apply to interactions between organisations and their environment and between them and with their contexts.

Whether the dominant epistemologies of people in social contexts are those of first- or second-order cybernetics, social responsibility in ontological cybernetics is considered in the context of the subject/meta-subject paradigm, that is in the context of self-developing reflexive-active environments, which vary in degrees of reflexivity and required regulation (Lepskiy, 2018).

While the meaning of interactions between social and environmental subjects is about the development, adaptation and implementation of their tasks, the meaning of belonging to a larger meta-systemic context is about social responsibility in self-developing reflexive-active environments (within social constrains of citizenship relationships).

These ideas are proposed under the influence of philosophical transdisciplinary, aimed at bridging social constructivists and embodied cognitivists, making possible to integrate ideas and concepts of humanitarian studies: ideas of society as social systems activity (Lepskiy 2018) and subject-activity approaches, interdisciplinary ideas of the formation of social cybernetics (Beer, 1975; 1979), socio humanitarian analysis of the experience of developing automated systems (Lepskiy, 2018; Luhmann, 1995) and others.

Self-developing reflexive active environments are increasing our understanding of organizations beyond their immediate system-environment definition. Sustainable issues are better structured and managed if relevant subject-metasubject self-developing reflexive-active environments are entangled with actors and agents in learning conversations.

Subject-subject interactions are shaped by multiple viewpoints which observe situations from their own perspectives; these are the foci of second order cybernetics. In particular these are interactions of agents in general, in which actors are stretched changing the organization's structure, triggering a variety of organizational forms (inner loop in Figure 2). However, these interactions happen

in a context of self-developing reflexive active environments (outer loop in Figure 2). This reflexivity, as presented in Figure 2, is between the organizational system improving its structure in the cybernetic (inner) loop of its operational environment and the (outer) loop of reflexive active metasubjects correcting variety imbalances to improve the organizational context. This is a contextual environmental learning. It is about correcting responses to the wider organizational environment; it is about meanings, values, concerns, emotions dominating recursively its organization and its autonomously contained primary activities; it is about global, regional and local citizenship. These contexts restrict their spaces of interactions. They are restricting the subject-subject interactions of the organizational system with its immediate environment, with the complexity of their wider environmental agents, which belong to the organization-environment space of structural formation. For its part the subject-metasubject interactions belong to a cultural formation, including religion, ethnic differentiation, fundamental societal values, and others which constraint the way the organizational systems operates in that context. From an ontological perspective we are talking of two types of cybernetic models: the first is the Viable System Model (Beer, 1979) expanded by the Enterprise Complexity Model and the Viplan Methodology (Espejo, 2020), and the second is a model of self-developing reflexive-active environments, as proposed by Espejo and Lepskiy (2020; 2022) with the name of ontological cybernetic.

6 Conclusion

Self-developing reflexive active environments as illustrated in the above loops, are increasing our understanding of organizational systems beyond formal or legal definitions. Sustainable issues are better structured and managed if relevant subject-metasubject self-developing reflexive-active environments are entangled with actors and agents in learning conversations. This entanglement is illustrated in Figure 2 to introduce a preliminary understanding of the "truth" of the human spirit.

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