

Viable Systems Theory, Anticipation, and Logical Levels of Management

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Abstract

Viable Systems Theory provides a way of exploring organisations cybernetically. It is ontologically defined in terms of three validity claims to reality that are differentiated by boundaries into three domains. These domains are connected through ontological migrations that can be expressed in terms of autopoiesis and autogenesis. The theory links with Dubois's conceptualisations of strong and weak anticipation, and Schwaninger's theory of logical types of organisational management. The result is a powerful way of seeing organisational processes.

1. Viable Systems Theory

In this paper we shall explore a cybernetic model of social communities that derives originally from Yolles (1999). It is developed into a theory of viable systems that is able to explore social complexity, and it provides as its basis a three domains model that is capable of exploring the dimensions of social communities. They are the cognitive, virtual and phenomenal domains, and each has its own set of properties that link to and extends beyond Habermas's (1979) theory of knowledge constitutive interests, and his theory of communicative action (Habermas, 1987). The nature of the domains is such that they have recursive ontologies (relating to the work of Beer, 1979), and boundaries that entail ontological relationships that connect to the work of Schwarz (1997), and that explore the nature of automorphosis (self-organisation), autopoiesis (self-production), and autogenesis (self-reference). An exposition on these conceptualisations can be found in Yolles (2003), and its knowledge management dimensionality can be found, for instance, in Yolles (2000) and Iles and Yolles (2000, 2002).

The theory proposes that each of the three domains have a relationship that can be represented in figure 1, and the domains each have properties described in table 2 (Yolles, 2000). It is clear from figure 1 that there is a clear relationship between ideology, ethics and culture in autonomous social communities that we shall briefly explore in this paper.

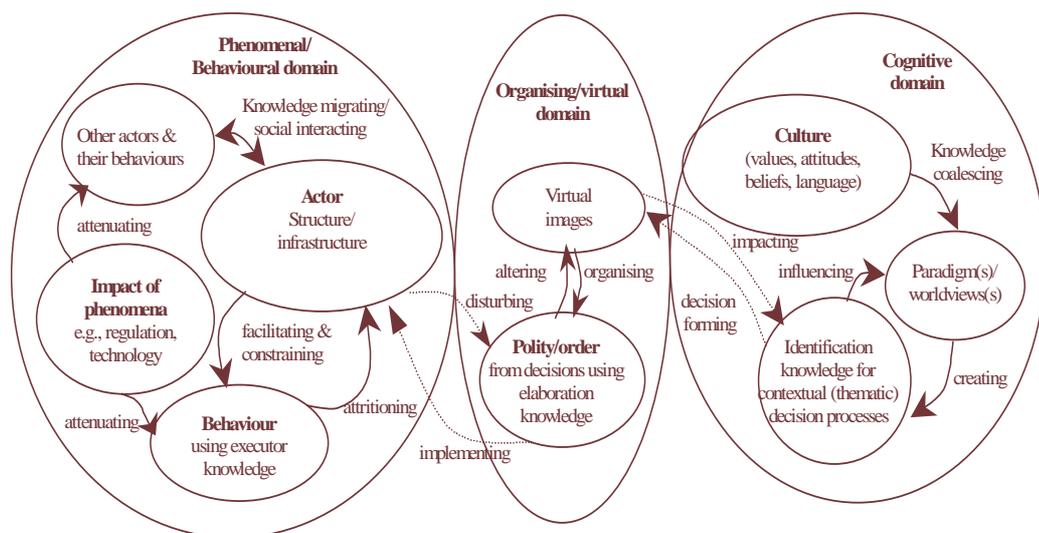


Figure 1: Relationship between the three domains in the Viable Systems Theory

	Social Community Pattern		
Cognitive Properties	Kinematics (through energetic motion)	Orientation (determining trajectory)	Possibilities (through potential development)
Interests	Technical	Practical	Critical Deconstraining
Phenomenal or behavioural (conscious) domain	Work. This enables people to achieve goals and generate material well-being. It involves technical ability to undertake action in the environment, and the ability to make prediction and establish control.	Interaction. This requires that people as individuals and groups in a social system gain and develop the possibilities of an understanding of each others subjective views. It is consistent with a practical interest in mutual understanding that can address disagreements, which can be a threat to the social form of life.	Degree of emancipation. For organisational viability, the realising of individual potential is most effective when people: (i) liberate themselves from the constraints imposed by power structures (ii) learn through precipitation in social and political processes to control their own destinies.
Purposes	Cybernetical	Rational/Appreciative	Ideological/Moral
Virtual or organising (subconscious) domain	Intention. This is through the creation and strategic pursuit of goals and aims that may change over time, enables people through control and communications processes to redirect their futures.	Formative organising. Enables missions, goals, and aims to be defined and approached through planning. It may involve logical, and/or relational abilities to organise thought and action and thus to define sets of possible systematic, systemic and behaviour possibilities. It can also involve the use of tacit standards by which experience can be ordered and valued, and may involve reflection.	Manner of thinking. An intellectual framework through which policy makers observe and interpret reality. This has an aesthetical or politically correct ethical orientation. It provides an image of the future that enables action through politically correct strategic policy. It gives a politically correct view of stages of historical development, in respect of interaction with the external environment.
Influences	Social	Cultural	Political
(Worldview morphogenesis) Cognitive (non-conscious) domain	Formation. Enables individuals/groups to be influenced by knowledge that relate to our social environment. This has a consequence for our social structures and processes that define our social forms that are related to our intentions and behaviours.	Belief. Influences occur from knowledge that derives from the cognitive organisation (the set of beliefs, attitudes, values) of other worldviews. It ultimately determines how we interact and influences our understanding of formative organising.	Freedom. Influences occur from knowledge that affect our polity determined, in part, by how we think about the constraints on group and individual freedoms, and in connection with this to organise and behave. It ultimately has impact on our ideology and morality, and our degree of organisational emancipation.

Table 1: Properties of the three domains in Viable Systems Theory

The cognitive domain is the place of worldview/paradigms where decision processes are implemented. It is connected with the virtual domains in which virtual organised images are created that reflect desirable phenomenal situations. These images are used to interpret the phenomena perceived to occur. The phenomenal domain is the place of the actor who may be in interaction with other actors. When these actors enter into communication, they participate in the process of knowledge migration. In a positivistic frame of reference this means that knowledge can be transferred between the actors. In an epistemology that is subjectivist, knowledge migration takes on another meaning, and we shall explore this in due course. Actors in the behavioural domain are social communities that we can call organisations, and they have structure or superstructure. This is susceptible to the impact of new phenomena like regulation or new technology that attenuate the structure. To understand how this works, follow the arrows that indicate effects in figure 1 from the attenuation back to the culture. The attenuation caused by the phenomena, due for instance to new regulation or new technology, will require some change in (operational) behaviour. Behaviour is both facilitated and constrained by the structure itself. Small levels of attenuation can simply influence the nature of the facilitation or the constraint. Thus, a new budget for computer software and staff training creates a facilitating influence. However, when the changes are significant the attenuation is great, and the attrition on the structure becomes **ever** unless changes are made (e.g., a new department of computing). To continue following through the arrows from left to right, attrition on the structure will have to be responded to within the polity/order being sought that is directly connected to decisions about interventional behaviour. These attritions will likely have an affect on the virtual images of the organisation that will in turn impact on the decisions and eventually the paradigm(s)/worldview(s) and culture. All of these changes have an impact on our knowledge, of which three types have been identified. As a consequence, new knowledge is generated, and so the arrows from the right to the left can be followed to eventually result in new behaviour that will respond to the new phenomena.

Within the cognitive domain people think and use the context related concepts that have mutual relationships that weave a fabric of meaning. The concepts are part of identification knowledge, harnessed for a theme that relates to a known problem situation. It operates to provide a basis for decision processes that are concretised during decision forming, when virtual images are created. The decisions eventually result in phenomenal domain actions. In critical theory, phenomenal reality exists but cannot be seen in its entirety or necessarily in the same way as others would see it. This is because it is consciousness mediated (also referred to as cognitively demiurgic). As such the phenomenal world is not universally the same to all of the actors involved, and there are thus at least as many views of the phenomenal world as there are perceiving actors. This has some importance to the nature of actor communications, and the migration of information and knowledge between them.

An actor may be a unitary individual or a plural one. The unitary focus enables the model to refer to that a person's worldview in eventual relation to their behaviour. The plural focus is represented by a multiplicity of people forming a coherent social community that makes up a corporate organisation, possessing and maintaining a worldview or a set of worldviews that enable claims about reality to be understood, purposefulness to be developed, and actions to be formulated and performed. If these worldviews are at least semi-formalised (their cultural basis of attitudes values and beliefs, and propositions that derives from them and made explicit) and socially shared with a significantly large social community, they may be seen as virtual paradigms that may become paradigms in the sense of Kuhn (1970). Paradigms are the result of a plurality of individuals (a group) that are culturally generated, responsible for the formation and maintenance of the organisation's patterns of knowledge, and form the basis of an actor's behavioural procedures and thus its bureaucratisation. It is through this that the orthodoxy that defines acceptable behaviour in an organisation is defined. The worldview/paradigm is not only a cultural manifestation; it arises with the knowledge that coalesces around the cultural belief system.

The relationship between the domain boundaries is not something that we wish to discuss here, and will return to it later. Let it be said though that the trans-boundary arrows are not intended to simply indicate elementary trans-boundary domain influences in situations that are more than frequently complex. They are intended just as indicators, and it must be realised that change in a domain is actually the result of ontological migrations across ontologically related domains. Thus for instance, in figure 1 forming and influencing should be seen as a *representation* for the ontological migrations that can occur between the cognitive and virtual domain, and disturbing and implementing should similarly be seen as *representations* for the ontological migrations that occur between virtual and phenomenal domain.

There is another way of exploring the three domains model. It occurs by adopting a psychological frame of reference¹ that enables actors to be explored through psychoanalysis. Seeing actors in psychological terms enables us to talk about the corporate couch, and refer to the corporate mind and its particular neuroses. Carl Jung would likely have referred to a plural actor as having a collective mind with collective neuroses². Following Jung (1933) neurosis is an inner cleavage that drives actors to internal conflict because of incommensurable intuition or knowledge. The form of the incommensurability that is meant here involves contradiction. It happens, for instance, when distinct groups or factions in a plural actor have developed their own incommensurable paradigms making it difficult to meaningfully communicate. Where this paradigm competes for domination in a social community, it can result in analytical schizophrenia. Like Jung, Erich Fromm (1947) sees that every neurosis is the result of a conflict between an actor's inherent powers and those forces that block their development. For Jung (1916), the moment of the outbreak of neurosis is not just a matter of chance – it is generally critical, and is usually the moment when a “new psychological adjustment, that is, a new adaptation, is demanded”. Examples of manifestations of plural actor neuroses are:

¹ Suggested in a private communication by the psychoanalyst Michael Whitenburgh. It is not necessary to suggested that the psychological model is structurally coupled to the phenomenal one, as some might propose by relating these ideas to those of Luhmann (1995). The reason is that they simply both provide different ways of explaining the same thing, using different language.

² A traditional definition of neurosis in psychology is a functional disorder in which feelings of anxiety, obsessional thoughts, compulsive acts, and physical complaints without “objective” evidence of disease, occur in various degrees and patterns, and dominate the personality.

- An employee strike against its corporate employer
- The capacity of corporate managers to share information with other managers is compromised by their power seeking interests (we note that if the culture in the corporation is such that this behaviour is normative, then it can be argued not to be a neurosis)
- Riot in a prison or plural ethnic community.

Within this frame of reference the phenomenal cognitive domain can be represented as the actor consciousness, with awareness attached to behaviour. The virtual domain is the sub-consciousness, with its mental images that are tied to the ego. The strength of the ego is related to the inability of an actor to change its virtual images that can enable the renewal of knowledge and understanding about self. The ego operates as a *potential modulator* for the ontological migrations between relating domains. Finally, the cognitive domain might be identified as housing the unconscious, but like the preconscious (that is not amenable to conscious reflection and modification), this is deemed to be inaccessible to the actor. Rather, the cognitive domain is a non-conscious dimension discussed by Bourdieu (1984) and his interest in the non-conscious coordinated development of regular patterns of knowledge. The non-conscious is a better descriptor of the cognitive domain because it implies that the patterns of knowledge that an actor has, underpinned by beliefs can be made accessible. These are existential and thus related to perceived experiences, evaluative and thus related to subjective personal attributes like taste, and prescriptive relating, for example, to human conduct (Rokeach, 1968, p113).

The psychological frame of reference leads to the notion of *corporate or social psychoanalysis* as practiced by *corporate or social therapists*. In general the function of a therapists is to “treat” an actor by helping it deal with its own neuroses principally through facilitation and constraint, thereby enabling it to “improve” its behaviour. We may now distinguish between soft and hard approaches to therapy. Soft “treatments” in this frame of reference are group therapy sessions, in which the group self-defines both the structure within the “treatment” sessions and its own recovery process. In more usual organisational theory, this is known as action research. In hard “treatments” the therapist will predefine the structure, and the actor will simply take the prescribed journey.

It is not only the word actor that can be used to represent the individual or the group, the term agent can also be used (Midgley, 2000, p114). While actors *may* have identifiable purposes ascribed to them, agents *will* have them. Where an agent is representative of a group, not all its participants need to share the same purposes as a whole; rather, the agent is perceived to act on behalf of a dominant purpose whether or not there are sub-agents with other purposes. The nature of the “dominance” is that it legitimates the function of the agent on behalf of the group. In particular, the dominance implies that there is a dominant paradigm that is operative in the group that an agent is representative of. Worldviews are generators of knowledge, and as a consequence, an agent can be argued to be taking action on behalf of a group under the influence of a knowledge generating system that can be associated with meaning.

There is thus a distinction between the terms actor and agent. An actor is a person or group that performs actions. However, when we speak of an agent we are assuming something more. We are supposing that the agent undertakes actions that are meaningfully purposeful and (in the case of a group) fully representative. The term actor encompasses the term agent, and is more general. More usually we shall use the term actor unless we explicitly wish to imply individual or corporate purposefulness.

Interpretation of reality occurs through the individuals who make up the organisation, and this results in an interaction between the weltanschauungen between these individuals (and their informal groups), and any dominant the paradigms that exist. Indeed, one function for the paradigm is as an institutional referent. This interaction can also be reapplied at this lower internal level of consideration. We refer to this as the recursive property of the model. The outcome of the interaction between weltanschauungen and paradigms is decision making, that then becomes manifested as cognitive purpose.

2. The Three Domains Model and its Ontology

The nature of the three domains must, for the sake of understanding, be considered ontologically. Ontology is belief about the nature of reality and its connection to Being. It will also enable us to construct a cybernetic theory of information for coherent³ autonomous social communities, or as we shall more generally call them, organisations. These may be macroscopic, as in the case of nation states, or corporate as in the case of commercial enterprises, and governmental or non-governmental bodies.

One of the more interesting entries into the ontological basis for organisational theory comes from Habermas's (1987) in his theory of communicative action. This theory is concerned with lifeworld processes, some of the attributes of which are described in table 2. In the lifeworld, every situation has both teleological⁴ and communicative aspects of a situation that is to be managed. Lifeworld holds patterns of meaning for the social community as a whole. It is a transcendental site where speakers and hearers meet for intersubjective affairs like dealing with validity claims, settling disagreements, and achieving agreements. The lifeworld appears as a reservoir of elements that: are taken-for-granted, are unspoken convictions, and that lead to interpretation through cooperative⁵ processes. Single elements are mobilised as consensual⁶ knowledge when they are relevant to a situation. The lifeworld is defined as a culturally transmitted linguistically organised stock of interpretative patterns. It has relevant structures that are interconnections of meaning holding between a given communicated utterance, the immediate context, and a horizon of meanings that are implied within communications but not stated. Lifeworld is goal orientated, and is connected with the cognitive interests and aims of at least one participant. It circumscribes a platform of relevance for thematisable⁷ elements of the situation. Fundamentally, lifeworld is associated with culturally transmitted background knowledge. Communicative actors are always moving within the horizon of their lifeworld to which they belong as interpreters and speakers. That which can be mastered and identified as a structured problem is restricted to an action situation of what remains encompassed within the horizon of a lifeworld - however blurred these may be. Every step we take beyond a horizon of a given situation opens up access to a further complex of meaning.

Three Worlds		Three Domains	
Type of World	Nature of World	Types of Domain	Nature of Reality
The external natural (object)	Material objects have relation between them and between individual actors (and their strategies) in a cognitive knowledge-based frame of reference.	Phenomenal or behavioural	Material objects or events in interaction, the perception of which is conditioned by a cognitive knowledge-based frame of reference. It is cognitively demiurgic (meaning formative or creative), deriving from the notion of one who fashions the material world from chaos, and consistent with Husserl (1950) and Frieden (1999, p.108).
The social	Actions associated with actors in a social group derive from common values expressed as a set of norms. The norms take on special status that includes moral validity and facts.	Virtual or organising	Symbolic or logical relational images that relate to phenomenal reality and involve purposeful organising. It is local to the experiences of the perceiver. Images of value and belief are maintained, partly represented through ethics and ideology. The domain is conditioned by a cognitive knowledge-based frame of reference.
The internal (subjective)	The local sphere of internal personal experiences and meanings associated with the individual worldviews.	Cognitive	The local belief based creation of concepts and their patterns held in worldviews that establish a frame of reference, and determine what is known and their related meanings.

Table 2: Comparison between Habermas' three worlds and our three domains

³ When we speak of coherent social communities (organisations) we mean those that have some degree of logical or aesthetical ordering or integration (Webster on-line English dictionary, 1996 ed.), and by autonomous we mean self-producing and self organising. We shall discuss these two terms again in due course.

⁴ This word teleonomy means the degree of autonomy, coherence, and identity. Thus, teleological means realising one's aims or carrying out ones plan of action.

⁵ By cooperation we imply cooperative action that seeks to avoid not reaching a common understanding, and creating a plan of action that does not miscarrying (fail)

⁶ Consensus occurs when a hearer both accepts the truth of an assertion, and accepts the normative validity of a command. Commonality in the lifeworld rests on consensual knowledge, and on the cultural stock of knowledge that members of that lifeworld share.

⁷ When meanings are thematisable they can be made explicit

Habermas's interest centres on cognitive, interactive and expressive use of language (Goldkuhl, 2000). Language allows us to make truth claims (about the external world), rightness claims (about our social world) and claims about subjective experiences and sincerity (internal world). Essential to this is the speech act⁸ that has both a descriptive part, and an action related part that embeds meaning. To participate in a speech act, he argues that people must also participate in three worlds (table 1), each of which has validity claims about reality through basic functions of language. The three worlds are analytically distinct, but within communicative action they become an emergent whole. The nature of that reality is that of the everyday lifeworld, in which the wide-awake and normal adult simply takes for granted in the attitude of common sense. Like many validity claims about reality, Habermas's three worlds have boundaries that operate to distinguish one world from the other, and frame of reference for each world that is fixed.

The theory of communicative action acts as a base for the communicative process from which derives all organisational processes in which meaning and consensual behaviour has significance. As such, the theory that we are interested in pursuing here adopts this work in principle. However, communicative action simply provides an entry into the cybernetic world of autonomous behaviour, for which information processes are central. The meaningful communications of lifeworld must necessarily also form an interest of viable systems theory, and to enhance its development it will be useful to consider the limitation of Habermas's three worlds claim about reality. It centres on the lifeworld that is fixed in terms of its problem situation and its constituent membership for any given socially definable group. When we move beyond these constraints, we are in a position where the frame of reference used to see a social group may change, or the boundary that defines the nature of the group may change. As a result, it is essential to develop validity claims about reality that have this feature. We have done this through the creation of three domains (table 1) that may be compared to the three worlds.

The three domains have boundaries that condition their validity claims about reality. That of one domain is differentiated from that of the others through its ontological horizon⁹. This horizon maintains a content that varies with cognitive perceiver, and provides an entry into what may be meaningfully reflected on, spoken about, or acted over. The three domains are ontologically related, and they affect each other through what we shall call *ontological migrations*. When the three domains come together as an emergent whole, their ontological horizons meld¹⁰. However this can only occur if the boundaries that create the horizons also harbour ontological connections that inform that melding. Thus, ontological horizons both *distinguish* and *connect* differentiable validity claims about reality.

There is another dimension of consideration that we should take into account when discussing domain ontology. Maturana (1996) explores the nature of reality, regarded as "a proposition that we use as an explanatory notion to explain our experiences.... [beyond this] it is that which in our living as human beings we live as the fundament of our living. Under these circumstances, reality is not energy, not information, however powerful these notions may appear to us in the explanation of our experiences. We explain our experiences with our experiences and with the coherence of our experiences. That is we explain our living with our living, and in this sense we explain human beings are constitutively the fundament for all that exists, or may exist in our domains of cognition".

Explaining our experiences with our experiences is a *recursive* phenomenon, enabling whatever images of reality that we perceive to be embedded within the other images, like two mirrors at an angle reflecting an image of an object to infinity. This is effectively a recursive frame of reference, and each image represents a new validity claim about reality that is contextualised by the validity claim in which it is embedded. This idea allows us to talk about ontological recursion, by which we mean that each of the three domains can, through the local context of its own validity claim about reality, recur-

⁸ The speech act according to Habermas has an object of attention that appears to the speaker as being objective, normative, subjective. Every responsive speech act is part of the framework of the lifeworld framework

⁹ The idea of ontological horizon may be developed by referring to Ladrière, (2002)

¹⁰ According to the American Heritage Dictionary 4th edition 2000 on line, the world meld means to merge or blend (e.g., a meld of diverse ethnic stocks). In our context it relates to a process of de-differentiating that is a consequence of emergence.

sively host the set of three domains. When this happens, the host domain has a validity claim that is ontologically distinguished. When the domain hosts other relative domains within it, they are capable of formulating finer, more local validity claims about reality.

Let us illustrate this. Phenomenal reality can be apprehended by a unitary consciousness from which a single person responds to his or her phenomenal experiences. Alternatively a socially plural consciousness with distinguishable complexities may be defined, for which coherent social behaviour occurs phenomenally. This is enabled through phenomenal structures that anticipate¹¹ a plurality of commonalities and norms (as identified in the social world), and an expectation for behavioural adherence to them. It is within the virtual domain that images of these arise that enables the phenomenal structures and behaviours to be manifested in the first place. They are defined in the conceptual domain through the knowledge that constitutes such commonalities and norms. They arise because of the recursive nature of the domains within the conceptual domain, through which the commonalities and norms are manifested through the interaction of a plurality of consciousnesses. It may be noted that the commonalities and norms that have arisen to create a paradigm for the group arose originally through the creation of a virtual paradigm in the virtual domain at another level of recursion. In this case the paradigm itself with its shared concepts and their structured interconnections that constitutes a pattern of normative knowledge would have been represented in the phenomenal domain.

We have identified two conceptualisations: that (a) boundaries are ontological entities in themselves that embed both distinction and connectedness, and (b) validity claims about reality can imply recursive frames of reference. This leads lies at the basis of our three domains model that stands against the three worlds of Habermas (table 2). It's thinking derives from a cybernetic frame of reference that draws significantly on the work of Eric Schwarz (1997). Three domains offer conditioned validity claims about reality that also admits theory of communication.

3. Strong and Weak Anticipation

After Rosen (1985) an anticipatory system contains a predictive model of itself and/or of its environment that allows it to change state at an instant in accord with the model's predictions pertaining to a later instant. He claimed that anticipation distinguishes living systems from non-living ones

Dubois (2000) demonstrated that anticipatory effects exist in physics, for example in the electromagnetic field, so that using anticipatory aspects as a distinction between living and non-living systems is not adequate. He also explained that Rosen's consideration of an anticipatory system deals with weak anticipation because the anticipation is based on a model of the system and thus is a model-based prediction and not a system-based prediction. He extended the class of anticipatory systems to strong anticipatory systems when the anticipation is self-produced by the system itself and not by the model. He further showed that any model is implicitly anticipatory. Anticipatory systems must obey the least action principle of Maupertuis, as do all classical, quantum and relativistic systems. In such a variational formulation, the purpose aspect is explicit instead of the causation aspect, which are complementary. The exploration of the anticipatory nature of viable systems requires some care if considered in terms of Rosen or Dubois

By definition, viable systems theory is a cybernetic theory of coherent purposeful human organisations. They are not "living systems" in the biological sense, but can be argued to have generic characteristics that are related to living systems. Viable systems theory takes a critical view of the notion of a system. From this critical perspective an object of attention will take on the metaphorical generic qualities of a system, so that the object of attention and metaphor are distinct. Thus, the notion of a model in critical perspective is quite distinct from that in positivism. In the physical sciences one can differentiate between a model and a single objective reality, and this has an impact on the way that

¹¹ When we say anticipation, we are actually referring to "strong anticipation" proposed by Daniel Dubois, that derives from the nature and relationship of the boundaries of the three realities. We shall discuss this in more depth in due course.

one considers and validates the model. For instance, it is possible to differentiate between a logical representation of an object of attention and the object itself. In a sense, the logical representation may be seen as a metaphor that needs to be validated against some criteria. However, from a critical perspective it may not be possible to know what constitutes that "reality". This is because any individual or group of individuals "sees" a representation of "reality" in a way that is unique to that individual or group due to their distinct worldviews. The worldviews are generators of knowledge, and provide criteria for validation. Adopting a critical worldview perspective therefore severely complexifies the traditional ontological considerations of models.

Planning in most organizations deals with weak anticipation because it is based on the model of the object to be planned. This can be linked to Stafford Beer's concept of organisations as a "black box". Planning would seem to be a pre-requisite for self-production in viable systems. However, in complex situations long term planning and thus long-term deterministic anticipation normally fails. If a viable system is adaptive then it is both evolutionary and will change cognitively. This will enable new structures to arise enabling new forms of behaviour to occur that can relate to changes in the environment. Anticipation is thus a dynamical process in constant renew. This itself occurs through the development of patterns of knowledge that are being continually created and discarded, meaning that anticipatory systems in a complex world are continually finding new and shifting sites of bounded stability.

Dubois (2000) argues that using anticipatory aspects as a distinction between living and non-living systems is not adequate. Rather he distinguishes between two forms of anticipation: *weak anticipation* (à la Rosen) because the anticipation is based on a model of the system and thus is a model-based prediction; and *strong anticipation* that occurs as a consequence of the system structure itself. The nature of both types of anticipation can be connected to autopoiesis (Yolles and Dubois, 2001), itself connected to the theory of autonomous organisations.

When we talk of autonomous organisations, we should realise that in complex situations there is no such thing as total autonomy. An organisation exists with others in its environment in a partially autonomous way, and has evolved together with all the others in its environment.

This is indicative of what Stafford Beer refers to as different focuses in a complex of embedded systems¹². It also gives rise to the idea of structural coupling (Varela, 1984), in which the environment triggers (but does not formulate) changes that are determined by the organisation. An organisation can similarly become structurally coupled¹³ to other organisations within its environment. As a consequence, structural coupling in autonomous organisations is connected to, and provides an explanation, for the idea of self-determined adaptation.

Organisations that are autonomous are normally involved in some sort of anticipation. This can occur by virtue of cognitive modelling and planning (weak anticipation). It can also occur because of their very structures that facilitate and constrain behaviour, i.e., the organisation behaves in a way that is more or less predictable because of its inherent structures (strong anticipation)¹⁴. There is another way of explaining strong anticipation, in terms of Schwabinger's management levels, which results from the notion of autopoiesis.

¹² This is sometimes called a system hierarchy, or as Eric Schwarz would have it, a holarchy.

¹³ Following Lucas (2001), structural coupling is a "plasticity in structural topology". An autonomous organisation undergoes a history of perturbations from another organisation to which it is structurally coupled then this will follow its own trajectories. If these triggers are regular, then the organism is also has a regular process, and if they are continuously changing then novel trajectories will occur. If the affect is two way, then we have a co-evolution of two structurally coupled organisations. If these triggers result in state changes that involve component changes (rather than just interactional ones) then we have adaptation. However, there is no necessary informational or semantic commonality between the two, each reacts to the other on its own terms.

¹⁴ There is a slight problem here. Let us suppose that an inquirer sees a structure from which strong anticipation is to be made. In critical theory reality is virtual, and so the seen structure must be a mental model. This raises the question whether or not strong anticipation can exist at all in a critical theory world. The answer is probably that for the inquirer the anticipation is strong, while for others with different mental models it is weak.

We have said that social communication arises through structures of expectation that generate rules. The expectation structures are maintained over time, and can be both facilitate and constrain communicative behaviour through the collections of rules. This leads to Viskovatoff's (1999) stress that in Luhmann's theory it is structural expectation that enables social systems to endure. This notion of expectation is consistent with Dubois' concept of strong anticipation, where rules are a formalised potential for behaviour that are a consequence of structure. Within this context we shall therefore consider the terms expectation and anticipation to be interchangeable.

Anticipation structures are also important to an understanding of the way information is acquired by autonomous sinks. Let us elaborate on this a little. Communication is the process of message transmission between a source and a sink. However, the meaning of the message is subjective and will differ for the source and sink. Consider that a message is composed of signs that are syntactically structured. The information carried in the message is determined by the structural differentiation of that structure that constitutes the bound information of a message that acts as a potential for subjective acquired information. Now in the theory of autonomous systems message transmission occurs between an autonomous sink and source when they are structurally coupled. Thus, the information embedded in a message transferred between source to sink is an anticipated disturbance to the sink.

The notion of structural coupling argues that when two (autonomous) social communities are structurally coupled they may affect each other through behaviour. The notion of structural coupling implies a form of joint alliance, and while this may occur implicitly for an autonomous system that experiences an "environment" when the embedded autonomous system uses some of the structures of its environment, this may not be the case for two separate autonomous systems where a structural relationship is normally explicit. In the three domains theory structural coupling would more appropriately be referred to as phenomenal coupling because two autonomous social communities are coupled through the behavioural phenomena that each experiences of the other. The principle that we have referred to concerns the behavioural norms that each social community maintain, and which are expressed phenomenally. They are embedded in culturally based worldviews, and create both individual and social community behavioural expectations. Distinct behavioural norms are therefore migrated across phenomenally coupled social communities. This can eventually influence culture and ideology through the normal ontological migrations that occur within the three domains model. This leads to the idea that strong anticipation is not only inbuilt into the structures of our organisations, but must necessarily also be part of our culture. Weak anticipation is therefore an intellectualisation process that results from the application of thought and reflection, resulting in what one commonly calls prediction, while strong anticipation is ultimately the consequence of belief.

4. Autonomous Organisations and their Types of Management

Traditionally managerial cybernetics is concerned with control processes. However, Schwaninger (2000) is interested in the development of a cybernetic theory of management that highlights pre-control processes. Pre-control provides the conditions that enable operational controls to be affected with success, and relate to three types of logical management: operative, strategic and normative. One is logically embedded in the other (figure 1) and each has its own definition (table 2). The pre-controls that we have referred to are associated with each logical level that may themselves be described in terms of goals and control variables. These go beyond the traditional orientations of profitability/surplus creation and liquidity, and provide insights into categories that operate in larger horizons of time and complexity, and relate to value/earning potentials, viability and development. Operative management concerns the efficiency criterion of viability in terms of productivity, profitability, and quality. Strategic management concerns effectiveness criterion, and is related to such variabilities as core competencies and competitive position including competitive and cooperative effectiveness (Schwaninger notes that competition can spur cooperation, and vice versa). Normative management concerns organizational legitimacy, i.e. the ability for an organisation to match the demands of all key stakeholders, including its clients/customers, staff, shareholders, allies, the State, the public and even future generations (represented by those who speak up for them). It concerns the logic of culture and

of social values. For sustainable legitimacy, normative management has to reconcile internal and external demands as well as the various economical and other imperatives that assail it. The attainment of viability requires the simultaneous management of the control variables at all three logical levels. Balance must be maintained, even if contradictions between the imperatives of the three levels occur.

Inputs to each of the control process are variables, and outputs are regulated variables. As can be seen from table 3,. System regulation occurs through reference criteria that relate to viability and development. For the strategic management system process,. System regulation occurs through reference criteria that relate to value potentials. For the operative management system process, inputs are variables like customer benefit and profit. System regulation occurs through reference criteria that relate to stakeholder value. The relationship between the three levels and their outputs is important. For instance, profit may influence value potential that may influence viability.

The three logical types of management can be related to Viable Systems Theory in terms of ontological distinction. Normative management is fully a cognitive process since it derives from the organisational paradigm. However, strategic management is an ontological transboundary phenomenon in that it is a derivative from knowledge that is created within the cognitive domain, and links into the virtual domain in some way. Operative management is similarly an ontological transboundary phenomenon in that it links across the link between the phenomenal domain and the virtual domain. The significance of this distinction will become apparent when we consider another aspect of Schwaninger's ideas, that of anticipation, and later those of viable systems due to Eric Schwarz.



Figure 1: Representation of management levels, one embedded in the other

Logical Management Level	Logical Need	Control Variables and Parameter Knowledge Examples	Goals
Normative	Legitimacy	System ethos, identity and vision, system dynamics, system structure, system culture.	Viability and Development
Strategic	Effectiveness	Core competences, customer problems, problem solutions, technical substitutions, critical success factors, and competitive and collaborative position.	Value potentials
Operative	Efficiency	Customer/client benefit, profit/return, cash flow, enterprise value, social benefit, ecological value.	Value

Table 1: Relationship between the three Levels of Management (based on Schwaninger, 2001)

Examining this theory in relation to the notion of anticipation can enable us to extend this idea of organisational pathology. Earlier we said that his concept of strategic management was an ontological transboundary phenomenon that links the cognitive domain to the organising and behavioural domains of three domains model, and that operative management was a transboundary condition that linked the organising domain to that of the behavioural domain. This can be elaborated on by realising that the model of our Viable System Theory is a subset of that provided by Eric Schwarz (see Yolles, 1999). It leads to figures 3 and 4, which indicates the ontological connection between the different domains. This also illustrates that boundaries can do more than just differentiate one domain from the other; they can also exert a connecting or conditioning influence. These relationships are

explained in table 4. We in particular recall that automorphosis¹⁵ is phenomenal, though images of automorphosis occur virtually.

Let us consider the ontological relationships between the domains. The boundary between the cognitive and organising domains is conditioned by autogenesis. This is *self-creation* representing the self-generation of rules that govern production. The boundary between the organising domain and that of the behavioural domain is conditioned by autopoiesis, but this is itself conditioned by autogenesis. We can illustrate this by relating it to Schwaninger's transboundary levels of management, and noting the correspondence between these and the ontological properties of figure 3 that link domains. Since the ontological relationships will be represented by corresponding transboundary connections, they will also be involved in both strategic and operative management.

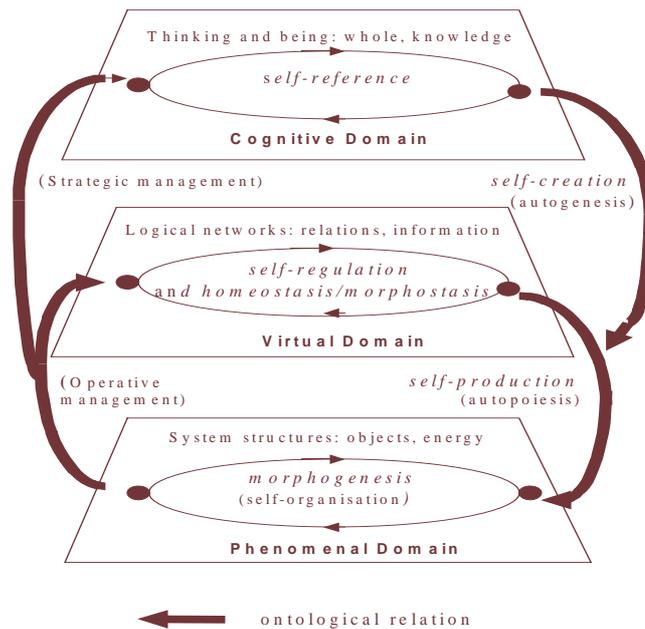


Figure 3: Ontological Relationship between the three Domains of Viable System Theory

Ontological Object	Concern	Interpretation
Cognitive Domain	Being Autoreference	Social organisation as an existing whole, including its holistic attributes. Its degrees of autonomy, coherence, and identity increase with its complexity. Social entity emerging from the dialogue between itself and its own image. The closer the object is to the image, the greater its harmony and autonomy. This can be influenced by myth and self-delusion.
Ontological relation between cognitive domain and virtual domain	Autogenesis (self-creation)	Organisations influence themselves by their production of their own rules. A contrary process that can occur is the continuous creation regeneration, evolution or transformation of the organisation as an existing whole.
Virtual Domain	Networks Homeostasis (self-regulation)	Logical relations that determine society. Several levels of interaction with environment: for resource gathering, security, social organisation of the noosphere (e.g. networks of knowledge, myths, beliefs), and money. Complex organisation of logical relations defining social organisation as a functional unit. Global homeostatic cycles can result from the co-evolution between actor behaviour and the corresponding logical network.
Ontological relation between phenomenal and virtual domains	Autopoiesis (self-production)	Production of individual and collective physical and psychic behaviour, from organisational networks. A contrary process is the regeneration of the logical networks through actor and institutional behaviour. An example is: myth regeneration by (a) pressure (rituals, power, honour, money) of the system on mediators (e.g., presidents, leaders, owners, directors,...); (b) pressure of mediators on the masses (e.g., faithfuls, stakeholders, employees, consumers).

¹⁵ The structure related self initiated change in form (normally called self-organisation) by an organisation.

Phenomenal Domain	Structure Automorphosis (self-organisation)	Social phenomena connected to structures that are connected to logical networks, individuals, groups, institutions, infrastructures, artefacts, natural movement, fluxes of energy and resources in space and time. An expression for self determined morphogenesis, it involves emergence, replication, regeneration, transformation, evolution or destruction of social structures. This is indicated by the autopoietic loop and within the energetic constraints. Positive feedback is especially important. Relationship between physical impact environmental responses highlighted. It connects to the flow of time, and the global trends toward the probable.
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Table 4: Explanation of the Relationship between the Domains and their Ontological Natures (modified from a representation by Schwarz)

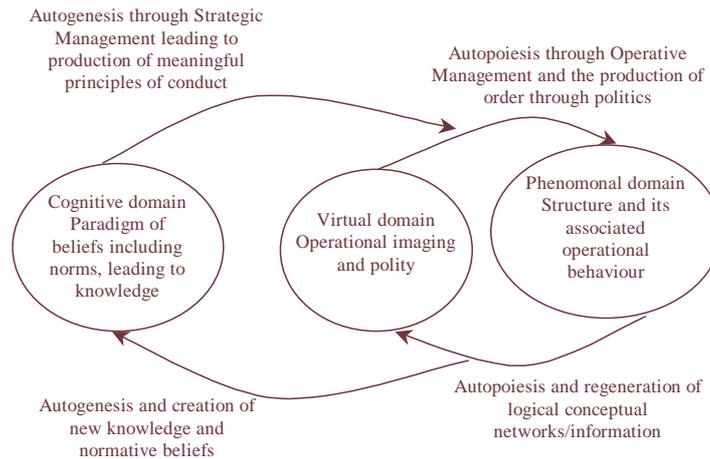


Figure 4: Relating Schwaninger's three types of management to Schwarz' representation of autogenesis and autopoiesis through the three domains model

Operative management can be assigned an autopoietic ontological connection that connects the phenomenal and virtual domains. Operative management processes are integrally tied to the structure of an organisation and its associated processes. Value is produced that results from structurally tied behaviour, through such factors as customer benefit, social benefit, and cash flow. In principle, because of its link to structure, operative management offers *strong anticipation* for an autonomous organisation, and responds to situations in a way that is triggered by this anticipation.

Strategic management can be represented as having an autogenic ontological connection between the cognitive domain and autopoietic action. This conditions the relationship between the virtual and phenomenal domains. In other words, and unsurprisingly, strategic management can condition operative management.

These relationships can be represented in figure 4, in which the transboundary ontologies are expressed in terms of autogenesis and autopoiesis. It sees strategic management as involving the creation of meaningful principles of conduct, while operative management involves the production of order. The virtual domain involves operational imaging that occurs through polity. Operative management can be seen to be in part a political process that assists the development of order through the implementation of polity. Since within this context operative management is autopoietic, producing order, it may also be seen as a political process that uses the networks embedded in the operational imaging to achieve coherent structure and regulated operational behaviour.

Coming back to management strategy once more, it is concerned with the interpretation of an organisation's environment and the development of consistent patterns in streams of organisational decision. However, in an autopoietic organisation, the understanding of the environment comes from interpretations of environmental perturbations on its behaviour, and it is therefore model-based and offers *weak anticipation*.

An organisation maintains autogenesis through its own principles or metarules (the rules that govern its production) in connection, for instance, with the nature of its core processes, its core competencies, its capabilities and its resource allocations. These metarules can *enable* the value potential that Schwaninger has referred to for strategic management. They derive from the cognitive domain, define the state of autonomy of the organisation, are operationally closed, and define the nature of the being of the organisation through self-identification.

It is interesting that if an organisation has a new idea, it can only be implemented by addressing the relationship between the organising and behavioural domains (figure 3). To do this the idea should be formulated as objectives within its strategic management processes that express all the (weakly) anticipated benefits. This must now be expressed in terms of operative management goals that guide operations, and enable the (strong anticipation) outcomes associated with any new facilitating structures that have been created.

Both strong and weak anticipation are important to the organisation. For instance, the former can operate without the constraint of the latter. One form of this may occur when an organisation's weak and strong anticipation differ in that that distinct outcomes to a situation are expected. Thus, the organisation may wish through strategic management to respond to a given situation in a particular way, but it may respond in a different way through its operative management. When this occurs we are faced with what we shall call *anticipatory contradiction* that has to be resolved if the organisation is to maintain its viability.

Another condition that we can theorise as occurring is when no strategic (weak) anticipatory perspective has even developed. Here it may be that the organisation experiences situations that have conditioned it, and are reminiscent of other situations that have damaged it in some way. It now responds through its strong anticipation, rather than through the unfolding events that it experiences. We can refer to this as *projective anticipation*. Conceptually it can also result in a form of *organisational paranoia*. To appreciate the nature of this Richard Hofstadter in his 1967 publication *The Paranoid Style in American Politics and Other Essays* wrote that there is a vital difference between the political and the clinical paranoid. They both tend to be overheated, over-suspicious, over-aggressive, grandiose, and apocalyptic in expression. However, the clinical paranoids see the hostile and conspiratorial world in which they feel themselves to be living as directed specifically *against them*; political paranoids finds it directed against a nation, a culture, a way of life whose fate affects not them alone but millions of others. We can shift from political paranoia to the paranoid organisation by positing that in the latter case political paranoia has been objectivated within the organisation, which now sees itself as a victim.

Erich Fromm, in his 1961 essay *May Man Prevail? An Inquiry into the Facts and Fictions of Foreign Policy* wrote that paranoid, projective and fanatical political thinking are all truly pathological forms of thought processes, different from pathology in the conventional sense only by the fact that political thoughts are shared by a larger group of people and not restricted to one or two individuals (i.e., the political thoughts have been objectivated).

This suggests that we can assemble a variety of organisational pathologies together. We have already referred to the following pathological features: pathological colonisation the lifeworld, pathological autopoiesis, anticipatory contradiction, projective anticipation, political paranoia, and paradigmatic schizophrenia. There is a need to be able to diagnose an organisation as being pathological. This is because like personal pathologies, pathological organisations require profound treatments that will usually involve cultural change, knowledge housekeeping, and restructuring. If there is one thing that conflicts with the development of organisational learning, it is pathology.

The new ontology of the three domains model provides the capability of more easily appreciating the notion of *pathological autopoiesis*, a term that is easily open to a variety of interpretations. This is primarily because autopoiesis is an ontological condition, and if one does not engage ontological ar-

guments the notion of autopoiesis can become convoluted and unclear. Viewed from the ontological perspective of Schwarz, the meaning of pathological autopoiesis is very clear. Since autopoiesis is the capacity of a social community (or individual) to establish/produce its image of itself and its future as a pattern of behaviour, pathological autopoiesis must mean that that the social community gets locked into this, thereby decoupling the ontological connection (autogenesis) to autopoietic shown in figure 6.

We have represented this situation of pathological autopoiesis in figure 7 as a development of figure 6. The pathology leads to a stationary image of oneself and the future with whatever embedded variety it may have in it. Adaptation can occur, but if none of the possibilities available within that image are adequate to deal with the changing environment, then a lack of capacity for adaptation occurs. In general, while it might appear that an evolutionary process is under way, this is not the case since a host of variations available to the community will be called on, but no new evolutionary ones will develop. As a consequence there is not possibility for a co-evolutionary process. This type of situation therefore explains the onset of the eventual demise of a species of social community, when all of its variety has been used up without success.

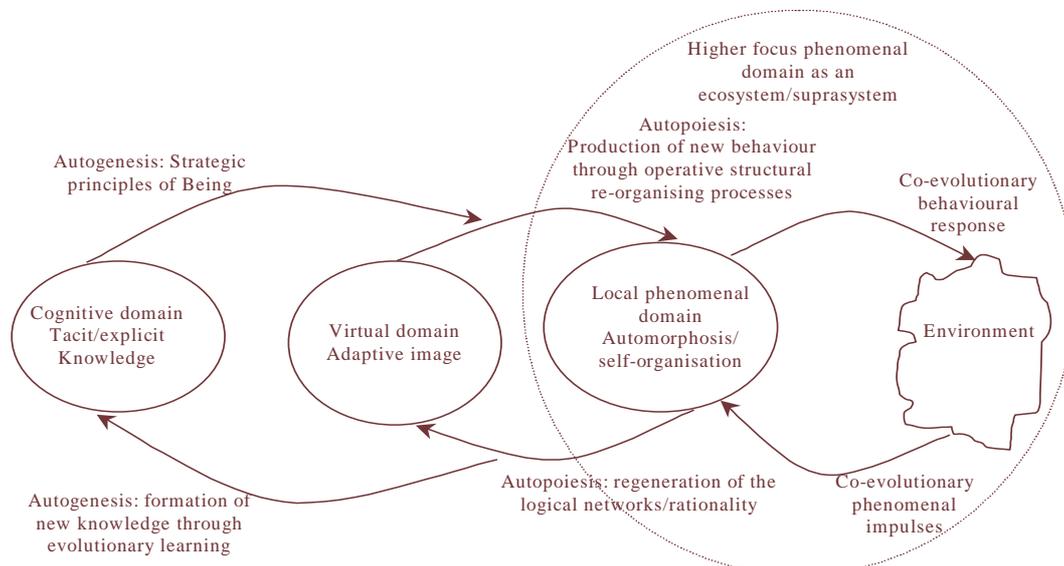


Figure 6: Indication of the Ontological Relationship between Adaptation and Co-evolution
 “Man is a prisoner of his own way of thinking and his own stereotypes of himself” Beer’s (1975, p.15)

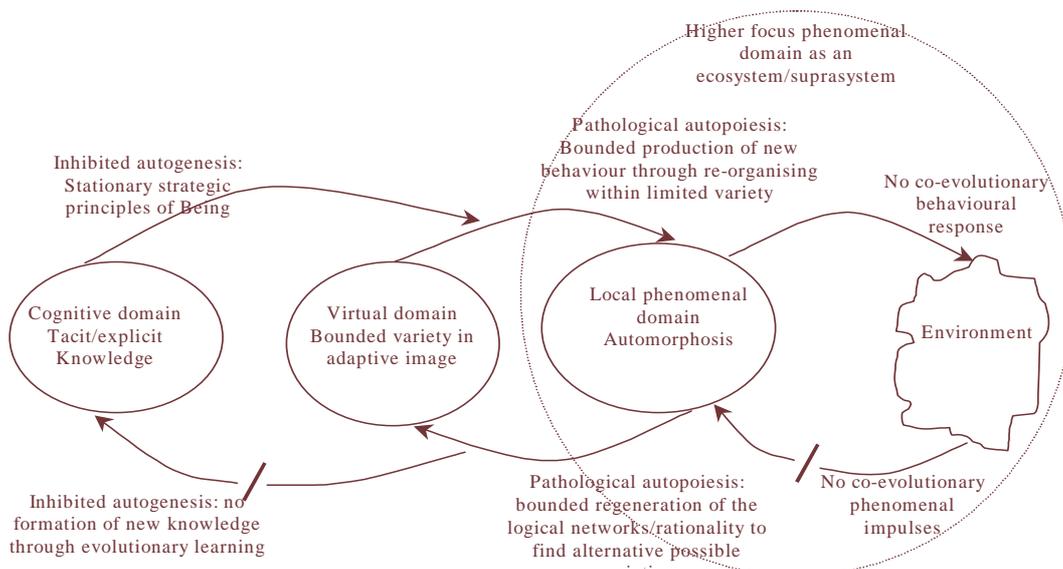


Figure 7: Situation during pathological autopoiesis with bounded variety options

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