THE VIABLE SYSTEM MODEL

A BRIEFING ABOUT ORGANISATIONAL STRUCTURE[1]

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1. WHY DO WE NEED A VIABLE SYSTEM MODEL?

The Viable System Model (VSM) offers a holistic form of observing collective behaviours in today's societies. Its history goes back into the late 1950s. Stafford Beer created it in the context of the earlier work in cybernetics by Norbert Wiener, Warren McCulloch and Ross Ashby. Over the past twenty years its methods have evolved in the context of the work of Syncho Ltd., a small research and consultancy company associated to the Aston Science Park, Birmingham, UK. The work has been driven by our shared desire to understand why institutions, whether large or small, public or private, are as they are and how we can intervene to make them work better for their stakeholders.

Our work is focused on organisational diagnosis and design. The Viable System Model is a particularly helpful instrument for this purpose. It allows us to diagnose the structural mechanisms in use in an enterprise and this is a platform for organisational design. This briefing shows the VSM as a powerful tool to steer interactions in directions that produce effective structural mechanisms. Organisational design has to go beyond tinkering with local improvements in the direction of producing enterprises capable of creating, regulating and producing espoused purposes and values. Most approaches used in designing or re-structuring organisations are focused on improving value chain processes without a clear understanding of how these business processes interact with myriad of organisational processes producing together with them the emergent organisation. We need a holistic framework to relate business and organisational processes as well as local and global processes. This is what the VSM is all about.

The VSM helps us to understand how people's interactions produce *shared communication spaces*, whether real or virtual, with particular structures. For instance, shared communication spaces populated by people with uneven power are likely to produce hierarchical structures, which themselves become the media to constitute interactions with uneven distribution of power. This is a social mechanism that leaves in the hands of the few most of the influence in producing

organisational meanings. The declarative power of these few can be seen as responsible for the creation and development of our enterprises. This distribution of power has fundamental consequences in the constitution of responsible enterprises.

In this brief we explore how organisation can release the potentials of people, enabling them to handle autonomously their problems, thus providing enterprises with the flexibility they need to survive in complex and rapidly changing environments. An effective enterprise produces simultaneously global cohesion and local autonomy. The first is a requirement to achieve synergy; the second is a requirement to achieve flexibility and creativity.

The VSM provides a means of observing the structural context hindering people's communications as they experience problem situations. A lack of awareness of this context often produces both *unintended consequences* and *performance problems*. *The VSM offers through diagnosis a framework to assess these risks and through design a framework to ameliorate them.* Too often we tackle problem situations without establishing this necessary condition for effective action. The VSM is above all about connectivity, about structuring the system to facilitate the healthy growth of effective relationships.

2. SOME DEFINITIONS

Viable systems are those that are able to *maintain a separate existence.* Such systems have their own problem solving capacity. If they are to survive, they need not only the capacity to respond to familiar events such as customer orders, but the potential to respond to unexpected events, to the emergence of new social behaviours and even to painful catastrophes. The latter capacity is the hallmark of viable systems; it gives them the capacity to evolve and adapt to changing environments. While a catastrophic event may at a particular instant throw the viable system off balance, the fundamental characteristic of viability lessens its vulnerability to the unexpected, making it more adaptive to change.

An organisation is a 'closed' network of people in interaction producing a whole. *Organisation* emerges when members of a collective produce a closed network of recurrent interactions. Closed network, or 'closure', means that the collective has decision rules and mechanisms to make up their own minds about relevant issues, producing through their actions and decisions a whole, which maintains a separate existence. An organisation has *identity* and *structure*.

People's recurrent interactions produce relations. However, the same interactions in a different social context may produce different relations. Interactions can be direct communications, such as everyday conversations, or indirect communications, such as when people coordinate their actions as an outcome of sharing a context or culture. Relations are the embodiment of *social relationships* in a particular collective. It is these relationships that provide the organisation with its *identity*: when these relationships change, regardless of whether the individual actors remain the same, the organisation is not the same anymore; equally, individuals may leave the organisation, but if relationships remain unchanged, the same organisation remains. It has not altered its identity.

An *organisation's structure* is often understood as the formal hierarchy of functionally based reporting relations among people as shown on the typical organisation charts. In our definition, structure emerges from stable forms of communication, or mechanisms, which permit the parts of an organisation to operate together as a whole. These parts can be the various *roles* that people adopt in an organisation and the *units* that they form, such as teams, departments or business units. Roles and units are resourced by all kinds of materials, tools and technologies. In other words, stable relations that allow people and other resources to operate together as a totality define structure. The organisation's structure is thus viewed as a network of stable 'real life' on-going communications, or *organisational processes*, and not as static formal reporting relations. Objects, such as communication devices or information systems, thus constitute an organisation's structure. *This point suggests the relevance of understanding both the contribution of technology and other resources to organisational processes and the influence of structure in the design of communication and information systems.*

The idea of a viable system can be applied to any collective or group of people who are in recurrent interactions and over time develop an identity of their own (e.g. members of an enterprise, family, local action group, shift in a plant, etc). An institution may not be a viable system if it doesn't operate as a cohesive autonomous whole. On the other hand a set of institutions or institutional parts, if they develop requisite connectivity among them, they may produce a viable system. This would be case of an education system in a country, where its organisation may emerge from the interactions among people creating policy in national and local educational authorities, regulating these policies in regulatory bodies and producing education in myriad of schools and other formal and informal educational bodies.

When a collective is constituted as a Viable System its members are not only creating but also producing collective meanings. These emergent meanings are the collective's purposes and values-in-use, which may be different to the purposes and values that they *create* and espouse. No doubts, members of a collective, by agreeing purposes for their action can focus their efforts better. However, if debates concerning purposes are inadequate or are poorly grounded in people's every day actions, the collective's purposes-in-use may become out of phase with their espoused purposes, suggesting lack of coherence (i.e. people not walking the talk) and possibly lack of alignment with the interests and requirements of customers and other agents co-evolving with them in their environment. This lack of coherence may derive into ethical and long-term viability problems, as, for example, recent corporate scandals in the USA have made apparent.

3. VIABLE SYSTEMS AND REQUISITE VARIETY

Ross Ashby's *Law of Requisite Variety is at the core of the VSM*. Broadly speaking, this law states that *a "controller" has requisite variety - that is, has the capacity to maintain the outcomes of a situation within a target set of desirable states - if and only if it has the capacity to produce responses to all those disturbances that are likely to take the outcomes out of the target set.* In other words the situational variety must be equalled by the response variety of the controller.

An example of this law is the case of a man driving a car. The man wants to keep the car on the road; and as the road twists and turns he responds to these disturbances by turning the steering wheel, reducing speed, putting more attention, braking the car and so forth. He can be said to have requisite variety since he can apply such measures as are necessary to keep the state of the car within its target set (i.e., close to the kerb). If, however, the steering broke down and he could not respond to these changes then the car would be out of control and a crash would follow (a state outside the target set). In this instance, the man did not have requisite variety for the task at hand.

Fig. 1 represents a hypothesised *viable system* such as a manufacturing company, a service business, a charity or any other collective, which is run by its *management.*
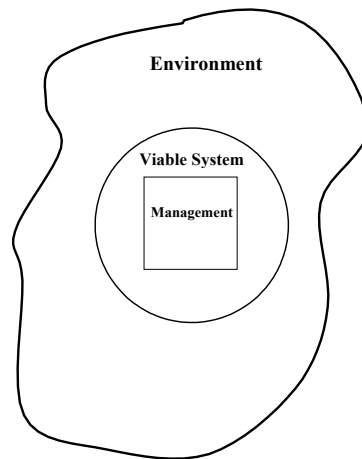
Figure 1   Viable System

The viable system is co-evolving with a range of agents producing its environment, such as customers, competitors, suppliers, neighbours, etc. This environment is largely beyond the knowledge and control of the people within the viable system; they simply cannot take for granted the actions of the environmental agents, let alone know everything about every aspect of the world within which they operate. Similarly, managers cannot take for granted the people

working within the organisational system, let alone know everything about every aspect of the viable system that they manage. People may not only be unpredictable but also may defect if so they wish. However if the organisation is to maintain *viability* within its environment, and management is to continue to steer the organisation, then the Law of Requisite Variety suggests that the variety of responses displayed by the organisation should at least equal that emerging from its environment, and the variety of responses of management should at least equal that of the organisation (see Fig 2).

$$V_E \gg V_S \gg V_M$$

Code: $\triangleleft$ = Amplifier

$\wedge\!\wedge\!\wedge$ = Attenuator
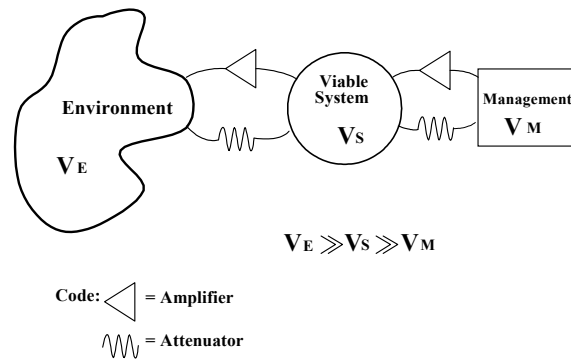
Figure 2   Managing complexity

Yet, as established above, the variety of the environment is far larger than that of the organisation, which in its turn is far larger than that of management, so, it would appear, these varieties couldn't equate. But organisations maintain viability in their environments and managements more or less give direction to their organisations. Both develop one way or the other strategies to cope with the much larger variety of the opposite side.

These mismatches are resolved by recognising the fact that of all the environmental variety, only part of it is relevant to the system; namely that part producing the disturbances that its organisation has to respond to in order to maintain viability. Also it is not necessary for this

organisation to deal with all this relevant variety since agents within the environment may perform much of this activity for the organisation. For example, a car dealership network performs this service for the car manufacturer. A volume car manufacturer could not hope to deal with each individual customer; instead, the dealer sells the cars and passes on orders to the manufacturer. Thus the massive variety of all the actual and prospective customers' requirements is absorbed by the dealership network, which then passes block orders to the manufacturer. Conversely, the variety of the manufacturer, which may have only a few sites in the country, is amplified by having a nationwide dealership network giving it a presence in every major town. The organisational system as a controller of its relevant environment can only respond to a relatively small number of possible states in this environment, but uses agents in this environment to respond indirectly to all the others. It is this capacity to collaborate with others and support action in the shared environment that allows the organisational system to deal with a much larger variety than otherwise would be the case. How much of the environmental variety is relevant depends on performance requirements. More competition implies higher performance requirements, which in turn increase the number of states that are relevant to the organisation.

The above argument suggests that it is possible to match more variety (i.e. achieve more) with less variety (i.e. fewer resources). This implies to use more of the capacities of the environmental agents in support of the organisation's performance. In our example of the car manufacturer, dealers in the environment deal with most of the relevant variety. However, the *residual variety* that is not dealt with by these environmental responses must be met by the organisation of the viable system itself. The orders from the car dealers to the manufacturer make up the *residual variety*, to which the manufacturer responds by producing the required number of vehicles.

The same relational pattern occurs between *management* and the other participants within the system. To say that management controls the system does not mean that the varieties of both are the same, but that the residual variety left unabsorbed by the processes of self-organisation and self-regulation within the viable system has to be absorbed by management. Complexity, or variety, is

again dealt with by the use of management amplifiers (e.g. delegation, people's commitment, training) and attenuators (e.g. exception reporting, modelling, selective conversations).

However, it is a common occurrence for amplification and attenuation processes to creep out of balance: the promises made by the sales people cannot all be fulfilled due to lack of adequate delivery channels (i.e. the attenuation of customers' requirements as expressed by accepted orders cannot be matched by delivery of products; there is not enough amplification capacity, leading to underperformance of the system), or the market segmentation in use does not offer distinctions (attenuation) that the organisation's response capacity could deal with if it only knew about them; they treat varied groups of customers as if they were all the same (poor attenuation leads to waste of amplification capacity).
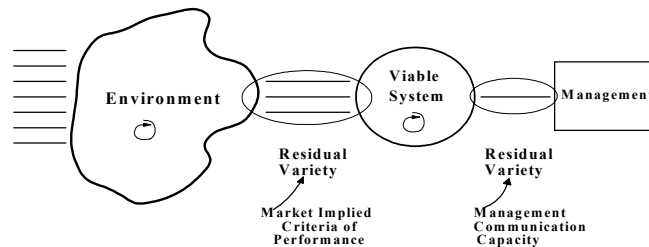

Figure 3: Residual Variety

Fig 3 shows this balancing of variety between the environment, the viable system and its management. A test of effective management is achieving this balancing at a minimum cost to the organisation and management. In this figure we find that seven environmental critical success factors -CSFs- (the seven lines to the left of the figure) are matched by response capacity in the

environment itself (the circular arrow, which absorbs the variety of four critical success factors) and three organisational responses (the three lines to the left of the viable system). It is apparent that increasing the variety absorption capacity of environmental agents, to the point where say, they absorb the variety of 5 CSFs would make it possible a leaner organisation, requiring capacity to deal directly with only two CSFs rather than the 3 shown in the figure. The same argument applies to the interactions between management and the organisation, where the more self-regulation and self-organisation takes place locally within the structure the less management is required for a similar level of performance.

4. UNFOLDING COMPLEXITY

According to the command-and-control model of management, which in spite of all the management developments of the 80's and 90's still dominates management practice, enterprises are structured as pyramids, with decisions about policy being taken at the top and implemented through their lower structural levels. According to this practice an enterprise's total task is broken down into smaller and smaller fragments, leading to an increasingly narrow definition of tasks and an emphasis on functional specialisation.

The Viable System Model works on a different principle, one that is derived from studying biological systems: hierarchy is replaced by *structural recursion*. Living (viable) systems, from the most elementary cells to human beings, are self-organising and self-regulatory. Evolution is responsible for their increasing complexification, where cells' functional differentiation and connectivity may produce more complex living systems, without cells losing their self-organising and self-regulatory characteristics. This produces viable systems within viable systems, at increasing levels of complexity. Each component maintains its autonomy vis-à-vis its environment, but contributes to the production of a larger also autonomous viable system. Picture Russian dolls within Russian dolls, only that there is not only one within each of the larger dolls but potentially many. All components share the same complexity management requirements to remain viable, at all

structural levels of complexity, and therefore have the same structural requirements, even if they are functionally differentiated. This will give an idea of how powerfully complexity is managed through these processes of complexification; most of the complexity is managed locally in each of the components and only a small residual variety is required to align them with the more global interests, to increase the likelihood of higher levels of evolutionary complexification. In social systems we often experience the opposite process; a collective of people with no clear functional differentiation find themselves without the requisite structures to carry out something that is still not clearly defined. They interact in given contexts, try to find their common path and hope for the best; if the ride is difficult some of them may defect if that is at all possible, the ones left behind fight, suffer and eventually may generate some degree of cohesion. It is in this scenario that collectives may strive for an improved viability, beyond survival. They can learn from biological systems how to create conditions for local viability (i.e. autonomy) without fragmentation and loss of cohesion. Now we are opening the Russian dolls, and learning how is it that autonomy within autonomy can be enabled; we are unfolding the enterprises' complexity. We also encounter examples of organic growth, where individuals or small cohesive units develop synergistic relations with other so far independent people and /or units and produce a new organisation. Of course we may find many other forms of complexification from where new organisational forms emerge. Regardless of whether the process is bottom-up, top-down or of any other form, in all cases we find that there is complexity unfolding.

The unfolding of complexity in a collective is by and large the outcome of local processes of self-organisation, rather than purposeful design. The formal organisation chart bears little resemblance to the organic processes of communication and control in use within, say, an enterprise. In order to reduce the pain and cost that is often involved in processes of self-organisation the challenge is to learn, both from past social experiences and also from nature strategies, to manage connecting processes leading to successful composite viability. This means producing cohesion of components while respecting their autonomy. For collectives, as meaning producing social systems, this implies aligning the meanings produced by the actions of each individual with the purposes they

collectively ascribe to their joint enterprise. The better is this alignment, I will argue, the more effective is the enterprise's organisation.

A balance should be achieved between actions *producing* the intended collective purposes and actions *enabling* this production. In the extreme, if all actions went into production there would be neither capacity to support connectivity and cohesion nor capacity to challenge the already ascribed purposes. This is a crucial distinction; those actions producing these purposes are called *primary activities,* those enabling them are called *regulatory activities*. Viable systems emerge from the connectivity (i.e. communications and interactions) among primary and regulatory activities. However, for collectives, whether an action is primary or regulatory is in the eye of the beholder; it depends among other aspects on the awareness that observers have about the collective's purposes and their own individual or group purposes. It is common to find that what keeps collectives together are relationships rather than shared purposes. Often members of a collective strive for their own, rather than the collective's purposes, but are not prepared to defect. In practice this produces conflicts as different groups ascribe different purposes to their collective's actions.
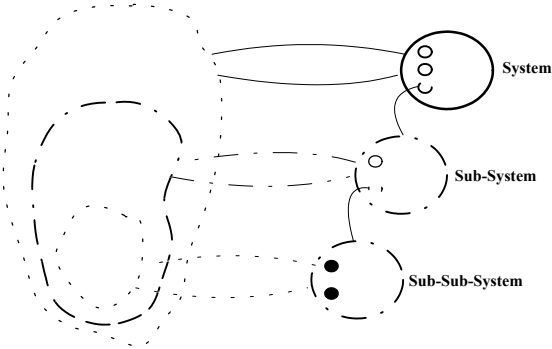

Figure 4: Unfolding of Complexity

Fig 4 shows the unfolding of an organisation's complexity once it is accepted that it has a particular, ascribed, purpose. It is therefore a hypothetical viable system. *Primary activities* are implied by the purposes ascribed to the collective's actions and are structured in autonomous units within autonomous units[2]. What are the meanings shared by the collective? What are they producing as a collective? What inputs are they transforming into what outputs? How are they producing this transformation? What customers are they serving? Who is controlling this transformation? In what context are they doing this production? Answering these questions (which are often less obvious than they at first appear) help to work out the key *transformation* in which the viable system is engaged; this is its primary transformation. Establishing the *activities* producing this transformation, as opposed to those enabling its production, permits modelling autonomous units within autonomous units or levels *of recursion* in the viable system. This point is explained in what follows.

Producing a transformation in the environment (e.g. offering a successful service to customers, or increasing people's aesthetic awareness) is a highly complex relational process that depends on the collective's purposes. Complexity emerges from the collective's relations with environmental agents, which may be the trigger for organisation. Demanding environments stretch the collective and put pressure to their ingenuity. This stretching may transform the collective into a cohesive organisation. The collective needs to find ways to amplify its own variety and to attenuate the environment's relevant variety, hopefully making 'more with less' (minimising residual variety). This is a driver for problem solving and ingenuity. The best way to achieve amplification is to enable individual autonomy within the collective. Autonomy realises individuals' creativity and increases the collective's flexibility to deal locally with environmental variety. However, the environmental complexity stretching them has structure itself. It comes in chunks of connected customers and suppliers, or chunks of location based, geographic, needs or chunks of time in which services are required and so forth. An effective organisational structure maps these chucks of complexity. How people in the organisation chunk their environmental complexity is a matter of

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[2] These autonomous units can be real or virtual, and do not necessarily match the formal units defined in the organisational chart.

ingenuity. For instance, some may exploit difficult to see connectivity, in the light of their strategic intent and the technologies-in-use. Some may develop new technologies altogether. Whatever are the chunks they decide to respond to, the organisation needs to map them structurally. Since in general individuals cannot cope in isolation with these chunks, organisation fosters structurally their collaboration to form *autonomous units*, accountable for chunks of environmental complexity. Each of these autonomous units is functionally specialised in producing an aspect of the collective's purposes. If, as an outcome of a learning process, they find that a number of these autonomous units could beneficially collaborate with each other to map a bigger chunk of environmental complexity, they are now recognising a larger autonomous unit embedding a number of autonomous units and itself embedded in an even larger autonomous unit. Equally they may find the need to break an existing autonomous unit, say their total organisation, into several units to produce some form of desirable functional specialisation and thus map better their relevant environmental complexity. Further structural unfolding may happen within each of the newly formed autonomous units, suggesting even further specialisation. These are all learning processes, dynamically producing the organisation's structure. These processes of *complexity unfolding* are at the core of how collectives structure their purposes and values. Indeed organisational qualities, such as transparency, fairness and participation, also have a structural underpinning.

The organisation's total transformation is thus produced by the synergistic communications of multiple autonomous units. Whether these autonomous units are forced by hierarchical impositions of power, or are the outcome of self-organising processes sensitive to the structure of the environment's complexity, is a complex social question that requires empirical observations. However, some form of complexity unfolding happens in all complex situations and the challenge is to hypothesise alternatives that increase the organisation's fit to its environment, considering available and/or new emerging technologies.

The huge number of primary activities performed by the collective, structured in whatever forms, define the organisation's performance complexity. They produce its products and services. The exact number of structural levels and the number of autonomous units at each level is an empirical

issue, however a good appreciation of the environment and also of the technologies available to cope with its complexity may help to anticipate successful structures, making the learning more effective. In all cases the structure is of autonomous units within autonomous units within autonomous units and so forth (see figure 4). And all autonomous units experience the same challenge that is, producing an environmental transformation in a situation where their complexity is much lower than that of the relevant environment. The requisite structures to enable autonomy and cohesion are common to all of them; these are *recursive structures*.

Achieving cohesion of primary activities in autonomous units requires regulatory capacity, which is produced by regulatory activities. The more regulatory capacity is kept at the level of small autonomous units, the smaller is likely to be the residual variety left to the attention of higher levels of administration and management. But, how much decentralisation do members of the collective want and are prepared to accept? This is a political question. A highly centralised structure can be viable, but only at a high cost of co-ordination and support activities.

An autonomous unit is desirable if the collective gives a positive answer to the question: 'Do we want to make this unit viable?' Answers to these questions define an organisation's espoused purposes. In a diagnostic mode it is possible to observe the actual organisational forms or structures matching the environmental complexity implied by these espoused purposes; if there is a mismatch it is possible to diagnose a dysfunctional organisational structure.

Activities enacting personnel, finance, marketing, information services, etc tend to fall into the category of support or *regulatory activities*. They produce the regulatory functions giving cohesion and adaptability to autonomous units. They are crucial to the viability of the overall organisation and of each of its embedded autonomous units. Regulatory activities are performed at different levels depending on the balance between centralisation and decentralisation accepted within the organisation. Functions such quality assurance and human resources management may need to be devolved in one form or another to each autonomous unit. Modelling this interaction between regulatory and primary activities is central to the use of the VSM.

This suggests that in any viable system there is, in one form or another, a complementarity between cohesion and autonomy. The challenge is to find design criteria to make this complementarity effective.

The concept of a recursive organisation suggests that all autonomous units in an enterprise have (should have) a structure that gives them the capacity for meaning creation (i.e. policy making), meaning regulation (i.e. management and services) and meaning production (i.e. implementation). It is seldom that we find these capabilities embodied in the structures of modern enterprises, let alone in the structure of their component 'autonomous units'. They remain hierarchical in nature, in spite of all claims to the contrary. This implies an unnecessary restriction of people's autonomy and therefore a reduction in performance complexity. 'Autonomous units' to maintain a separate existence in their environment need to create their own meanings (i.e. policies) and need to implement them. Traditionally, autonomy means to norm oneself. Additionally, in our view, autonomy means to produce oneself.

From natural systems we learn that structurally there are two key mechanisms for viability. One is the mechanism that keeps the components together as a cohesive whole. This is the cohesion mechanism or as I have called it elsewhere the mechanism for monitoring-control. The other is the mechanism that supports the organisation's co-evolution with agents in its environment. This is the mechanism for adaptation. The next section describes how these two mechanisms operate. For simplicity of presentation, we will refer, for the most part, to the operation of these mechanisms at the level of the total enterprise; however, it must be remembered throughout that the same principles apply to all viable systems, at whatever level of structural recursion they find themselves.

5. MECHANISMS FOR VIABILITY

These are structural mechanism emerging in a collective that is concerned with its viability in the long run. These are mechanisms that account for making things happen in an uncertain world, constantly changing and evolving. The first challenge for the collective is to achieve cohesion and synergy from their connectivity. This requires a mechanism -the cohesion mechanism- that allows people to produce meanings that transcend them as individuals. The second challenge is to remain viable over time in co-evolution with those the collective is constructing the world together. This requires a mechanism –the adaptation mechanism- that allows people to create new meanings as conditions evolve. These two mechanisms are discussed in what follows.

5.1 Cohesion Mechanism

For a collective to became an organisation they need to achieve cohesion. Cohesion means aligning individual and collective interests. This alignment does not imply that individuals and their collective have the same interests and purposes, but that however different these might be, the implementation of individuals' purposes produces the purposes ascribed to the organisation. Of course we may expect that organisational purposes constitute individual purposes in a cycle of mutual production and constitution. The cohesion mechanism explains how to achieve structurally this alignment. In other words it explains the kinds of stable forms of communication among organisational resources that increase the chances of articulating the autonomous units' programmes with the organisation's purposes. For the purpose of explaining this mechanism we will distinguish between those resources and relations producing the organisation's purposes, we call them the *implementation function*, and those resources and relations steering the implementation function in desirable directions, we call them the *cohesion function*.

All autonomous units, whether real or virtual, formal or informal, *producing* the collective's purposes and values constitute the implementation function. It is not unusual to find out that the units that develop autonomy in a collective are not consistent with the collective's purposes. This

discrepancy suggests that there is a distinction between their espoused theory and their theory-in-use. In this situation the collective either adjust their espoused purposes or create the conditions for the emergence of desirable autonomy and the elimination of undesirable autonomy. *Managing the coherence of established policies and their implementation is the purpose of the cohesion function.* Therefore, the cohesion function is constituted by resources whose purpose is, first to negotiate programmes and resources with autonomous units in order to make local policies coherent with the organisation's global policies, and second to monitor the development and performance of these programmes over time. Its fundamental concern is the organisation's internal complexity, that is, the 'inside and now', of which it has to be an effective attenuator. For this the cohesion function needs first, an accurate appreciation of the achievements and capabilities of those units that should develop autonomy in the organisation, and second, a means to enable their coordination. In this sense the cohesion function is a form of control that respects and enables the autonomy of units in the organisation.

Unfortunately control is a loaded term often misunderstood. Cohesion managers and people in the autonomous units often experience the *control dilemma*: management, having lower implementation variety than the autonomous units they control, cannot possibly maintain awareness of all that is going on within them; there is a natural 'information gap'. Yet management knows that they are accountable for any loss of control. The information gap often leads to a feeling of discomfort and uncertainty on the part of management ('what *is* going on down there? How can I tell if they're telling me the truth?') This anxiety to know more leads to increased demands for special reports and the undertaking of more investigations, to keep 'in control'; however, in reality these demands and instructions only serve to reduce the variety of autonomous units, making them less flexible, as they struggle to fulfil increased management requirements at the expense of carrying out their own operations. At the very time that autonomous units need more flexibility to respond effectively to their own environmental pressures, managers' behaviour is reducing this flexibility. Because of the law of requisite variety management in the cohesion function cannot win with this type of control strategy. This strategy reduces de variety of implementation units, hindering their autonomous development and performance. At the same time this strategy increases

the residual variety that management needs to deal with. This kind of relationship is the hallmark of hierarchies and bureaucracies.

Control games with negative effects are common phenomena in these circumstances. These are interpersonal games in which, on the one hand, senior management uses the allocation of resources as a means of exercising control power, and on the other, local management uses its better knowledge of implementation to manipulate senior management into unchecked decisions. Most of the time, these games are not the outcome of deliberate actions, but simply of poor interpersonal interactions.

Summing up the control dilemma, as people feel the pressure from agents in their environment to become more flexible and sophisticated, managers sense larger information gaps. However, if they respond to these gaps with traditional control strategies, less flexibility and larger bureaucracies are likely to emerge, precisely when there is a need for greater flexibility. A proliferation of control games is the likely result.

The problem can be redefined as how to achieve cohesion among the all-important autonomous units, despite managers experiencing these unavoidable information gaps? Or more precisely, how is it possible to match the desirable large variety of autonomous units to the unavoidable low variety of management? Indeed, autonomy is a requirement to make units more responsive to agents in their relevant environments, and the low variety of managers is in their fabric as human being. This question leads to another question, how to reduce the residual variety that is relevant to management at the same time of increasing the organisation's response capacity? Indeed, the more local problem solving is enabled within autonomous units the less implementation variety is left unattended, and therefore the smaller is the residual variety left for the attention of management. Answering these questions in concrete situations challenges our ingenuity but at least the VSM gives us generic advice; the design of the cohesion mechanism, which assumes that the collective has evolved into a number of autonomous units embedded in the collective enterprise (itself an autonomous unit at a more global level). This design is driven by three guiding principles:

i Negotiation: minimise the use of direct commands

Fig 5 shows the operation of the cohesion function in relation to three autonomous units (e.g. operating divisions in an enterprise), which are to a greater or lesser extent interdependent by virtue of the fact that they belong to the same organisation. Indeed, working out their interdependence challenges the ingenuity of the cohesion function. They may interact operationally, by one providing inputs to another, or through the environment, for example through an overlap in the markets they serve, or through sharing technologies or through any other ingenuous form of seeing them as part of the same whole. A key role of the cohesion function, as its name suggests, is to achieve a degree of cohesion among these parts for which it is held accountable.
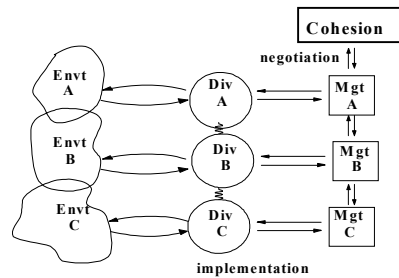

Figure 5   Control Dilemma

The central vertical channel between the cohesion function and the management of each of the three autonomous units (e.g. divisions in a company) is the communication channel through which senior management negotiations programmes with divisional management. Also, it is the channel through which performance reports are passed and corporate intervention takes place (e.g. issuing safety policies in the company) As we have seen above, however, overloading this channel, confusing it

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with a command channel, only leads to control dilemmas. No doubt, one way of reducing direct commands is making use of 'exception reporting' systems, common in most organisations today, and equally 'management by objectives' avoids too much interference and helps senior level management to 'see the wood from the trees'. Yet these devices are not in themselves sufficient to bridge the communication gaps between managers at different structural levels. They may deal with information overload but not with problems of maintaining organisational cohesion and developing synergy among autonomous units. The next two 'design criteria' address these issues.

ii Use sporadic monitoring - with discretion

The problem emerges from autonomous units at two different structural levels trying to communicate with each other. In our example, the enterprise and the divisions are autonomous units; each of them has its own reality. Neither side can assume that the other assigns the same meanings to the available information. Making this assumption would deny the autonomy of the other, which of course is what happens with lower level units within hierarchies. Giving meaning to the shared information requires its contextualisation and this implies breaking the boundaries of the autonomous units, and learning first hand the context from which they produce the information. This is the meaning of monitoring in this framework.

This grounding of information in the operational reality of the other is achieved by developing a monitoring channel that runs directly between the enterprise's management and the autonomous units themselves, bypassing their management (see Fig 6).
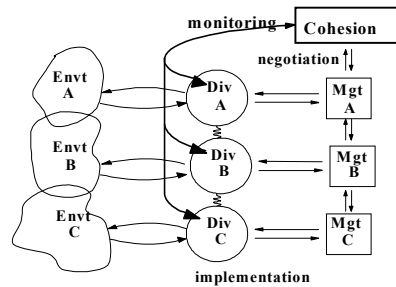
Figure 6   Monitoring of primary activities

The cohesion function needs support to decode the accountability reports it receives from divisional management; what do they mean? What is the division's attitude to risk? What are their current concerns? How are they coping? They need an assurance that they are decoding information properly. Monitoring can take a variety of forms, from the obvious auditing programmes, to informal conversations, unscheduled visits, sharing common task and many more. However, they must adhere to the following principles:

a)   They must not be prepared, anticipated events - otherwise they are not going to be effective in recognising values, concerns, and attitudes within the autonomous units;

b)   They must be infrequent, otherwise they risk undermining the authority and trust vested in the management of the autonomous units;

c)   They must be an openly declared approach, of which everyone concerned is aware. The intention is not to play 'big brother', employing secretive tactics and games of subterfuge; it

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is simply to demonstrate an interest in knowing what is going on at first hand. If employed sensitively, monitoring should communicate a message of caring to those involved in the operations in question, without resulting in defensive behaviours from the intermediate 'by passed' level of management.

d) In general, it must happen only in between successive structural levels. Monitoring activities at several levels below, like the traditional 'management by walking around' of senior managers not only by-passes several levels of management, which is a poor strategy to manage complexity, but more significantly may inhibit necessary relations in between.

Negotiation of programmes and their monitoring are the two sides of the same coin, that is, two sides of the same cohesion function. One without the other is meaningless. Programmes for which there is no negotiation capacity are not negotiated. Negotiation without understanding the other side cannot be negotiation. This is what monitoring brings into the cohesion function.

iii Maximise co-ordination among the autonomous units

While, as we have discussed, enabling autonomy improves the flexibility of the viable system, it also increases the likelihood of units producing inconsistent responses. To counteract this drawback it is necessary to enable and if possible design stabilisers among autonomous units. Enabling their *lateral communications* is indeed a means first to reduce the chances of inconsistent responses and second to increase the opportunities for a coherent development. Sharing the same culture, setting common procedures and standards in all those aspects that are not central to the units' own purposes can play this role. This strategy, based on enabling self-regulation, is likely to produce consistency among the autonomous units over time, as long as the entailed learning is not stopped at an early stage because it is perceived as too chaotic and costly. To a much lesser extent it is possible to use *coordination by direct supervision*. This is a useful coordination strategy for those aspects where the operational connectivity among autonomous units is not high and can be overviewed and contained by a manager or a corporate administrative unit. Otherwise, being this a centralised form of coordination, the variety of the autonomous units may overload the cohesion function, as this

function becomes a bottleneck for unresolved communication problems among autonomous units. Whether we are talking of mutual adjustments or direct supervision an organisation depends on a *coordination function* to enable autonomy. It is a critical function to enable connectivity and therefore cohesion. The better is coordination the less residual variety is left for the attention of the cohesion function and the more space is given to implementation units to assert their autonomy. The co-ordination function provides a common language that facilitates lateral communications among autonomous units and thus enables local problem solving. Co-ordination by mutual adjustment takes place in the moment-to-moment actions of people, and as such it may absorb far more complexity than any formal device to coordinate people's actions from above.

Summing up, the *co-ordination function* is a powerful, high variety function: the stronger it becomes, the more the space for self-regulation within the *implementation function* thus reducing the residual variety that needs attention of the *cohesion function* and the greater the autonomy exercised by the lower structural levels. Together these three functions constitute the *cohesion mechanism* (see Fig 7).
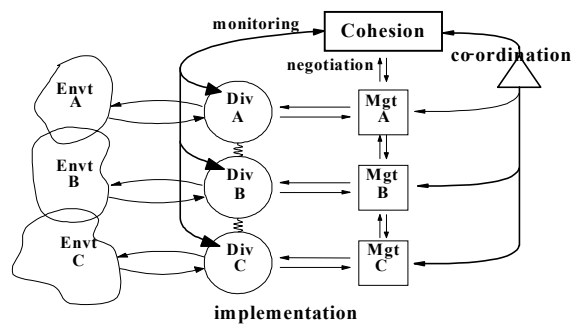
Figure 7   The cohesion mechanism

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Sadly, it is not unusual that people, especially those operating in traditional, hierarchically structured organisations, perceive standards as bureaucratic interference with their personal freedom. This is partly because they often appear as instructions coming down the line ('Here we go again - management throwing its weight around!') instead of lateral support, designed to make their life easier in the longer term.

However, if people in support (regulatory) functions can learn to enable people's coordination, communicating their purposes with greater clarity, they may begin to change this attitude; and if such guidelines are clearly couched in a language different from that of direct commands and instructions, their acceptance may increase. Finally, if an increase in the use of the coordination function is accompanied by a corresponding increase in local decision making and problem solving, people may begin to resonate with the expression: 'We are slaves of the system in order that we may be free.'

5.2 Adaptation Mechanism

However, for viability, it is not enough for the collective to become a cohesive whole; in addition this cohesive whole must be adaptive to changes in its environment. This is the hallmark of viability and a necessary condition to transform the collective into an organisation. An effective enterprise is one that not only 'does things right' but is also able to find the 'right things to do'. Moreover, a *responsible enterprise* is one that finds ethical means to do the right things. Capacity for adaptation and sensitivity to the eco-system are normally associated with the enterprise's normative and strategic levels of management.

The three types of resources involved in adaptation are, first those focused on the 'inside and now', that is those constituting the cohesion function, second, those focused on the 'outside and then' and third, those focused on giving closure to the organisation. These last two are referred as the *intelligence function* and *policy function* respectively. These resources together with their relations

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constitute the *mechanism for adaptation*. In what follows we discuss the structures required for this adaptability.

With reference to the policy function, what is the appropriate contribution of policy-makers? How can they increase the likelihood that their vision and values will support the organisation's long-term viability?

Senior managers are often confronted by seemingly impossible situations. For instance, it is not unusual for a board of directors to find out that a new product, in which large sums of money have already been invested, has no market, or is technically infeasible; or that the new salary policy that they recently approved has led to damaging industrial relations.

In such cases, managers usually have an implicit awareness not only that they have been deciding on issues beyond their own immediate technical expertise, but also that important existing organisational resources - people with the necessary knowledge - were under utilised in the debates that led to the critical decision now in question.

Furthermore, it is not unusual for people in policy-making positions to feel that they are only rubber-stamping what has already been debated and decided within the organisation; or that management briefings focus their attention on issues on which they do not have the required in-depth knowledge to pass judgment. In these conditions, policy-makers may either abdicate their responsibility completely by blindly following the advice of their subordinates, or they may take a 'strategic decision' (i.e. a leap in the dark) - and hope for the best.

If most of the time policy-makers are in the invidious position of deciding issues that are beyond their capacity for scrutiny, how can they keep control of these policy processes? In other words, how can they help the organisation glide in its environment?

The variety of policy-makers is by definition much lower than the variety of the organisation they are accountable for; therefore, they must have effective attenuators to filter this complexity and bring it within range of their relatively limited response capacity. In practice this means that most of the variety has to be absorbed within the structure only leaving a small residual variety for their attention.

In broad terms there are two main sources of complexity for policy-makers: what is going on inside the organisation now, or its *internal environment*, and what going on outside the organisation challenging its future, or its *problematic environment*. The former is concerned with the 'inside and now' of conditions occurring within the organisation; the quality of its structure, its capabilities and in general all those aspects that ground policies in operational realities. The latter is concerned with the 'outside and then' of possible future environmental opportunities and threats; it is concerned both with the turbulences likely to make bumpy the organisation's gliding and the corridors for free and exhilarating flying. We have referred to these two structural filters concerned with these two main sources of complexity as the organisation's *cohesion* and *intelligence* functions (see Fig 8).

These functions exist in one form or another in any *viable* organisation, but they are not necessarily related to well-defined entities in the organisation chart: it is perfectly possible, for example, that resources within one department have both intelligence and a cohesion functions or roles; or that in a small organisation one individual has all roles. The essential question is how to relate these resources in order to make policy-making more effective? The basic design rules are as follows:
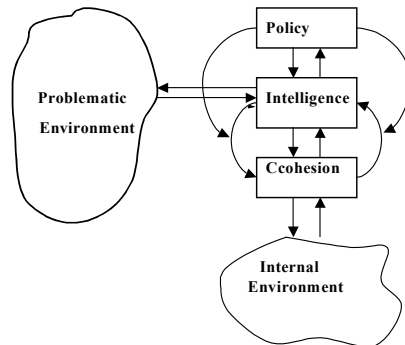
Figure 8   Adaptation Mechanism

i Minimise the response requirements of policy-makers

There is no need for policy makers to be 'experts' either in their industry or the technologies they use. In a way it can be argued that 'policy-makers' don't make decisions; organisational issues are complex enough to be beyond their personal attention, the study of options and related checks and balances need the participation and contributions of many people within the organisation. It is these people the ones in the end making the decisions. The challenge for policy-makers is to steer their interactions along the lines of the organisation's purposes and values. It is in this steering that they give closure to the organisation. Policy makers should provide clarity about the overall direction, values and purpose of the organisation, as well as design, at the highest level, the conditions for organisational effectiveness. Whether their understanding of technical issues is good or otherwise, they will (should) not have time to go deep into them. Their appreciation of these issues should be sufficient to be able to understand and communicate with intelligence and cohesion resources, after they have gone through the necessary checks and balances among themselves. This approach reduces residual variety relevant to them. Indeed, to remain in control of the policy processes the briefings reaching them need to make minimal demands on their attention, consistent with their contextualised response capacity.

ii Design debates with balanced contributions of the cohesion and intelligence functions

The intelligence and cohesion functions offer alternative, but complementary, perspectives on shared problems: those of organisational adaptation.

Policy-making is a process, the outcome of which is the choice of courses of action for the organisation. Which are the transformations the organisation intends to produce in its relevant environment? The issues of policy concern may have their origins in the policy-makers themselves, or elsewhere in the organisation and the environment. In the former case, there is a need to substantiate these issues with further detailed research from a variety of different perspectives; in the latter case, the ideas need to be subjected to detailed checks and balances from different points of view *before* they reach policy-makers.

Effective policy-making requires the orchestration and monitoring of organisational debates in such a way as to enable people to contribute to the best of their abilities to organisational adaptation and survival. It follows, from this point and the concept of structural recursion, that the policy-making process happens (should happen) not just at the level of the global enterprise but also within all autonomous units, at all structural levels. Extensive debates within the organisation among different and opposing viewpoints should produce informed conclusions and improve the quality of policy briefings. Policy-makers should only be exposed to issues and alternatives that have been properly examined in this way.

A lack of balance in the resources used in the interactions between intelligence and cohesion will damage the performance of the policy function. For example, if intelligence produces issues of policy relevance at a higher rate than the control function can cope with, then the policy-makers may receive views of external possibilities unchecked by on-the-ground management; or if all the issues reaching policy are concerned with matters of internal efficiency, vital signals from the wider

external problematic environment may be overlooked. Decisions over-influenced by either of the two filters are likely to be both costly and ineffective.

iii   *Make intelligence and cohesion highly interconnected*

The effectiveness of the intelligence and cohesion functions depends not only on purposeful and balanced debates among people representing the 'inside and now' and the 'outside and then', but also on the on-going interactions and communications of people representing the cohesion and intelligence functions. These structural communications need also to be monitored by policy-makers.

If the two functions were completely unconnected then, by definition, policy-makers would not only be receiving information independently from both sides, but they would have the invidious task of performing all the checks and balances among them by themselves. The policy-makers would be the only communication channels between two separate sets of people, which, in enterprises of any size, each deals with far more complexity than the policy function itself could possibly hope to cope with.

This situation may sound far-fetched, but how many enterprises have established centralised R&D departments far removed from those managing its current affairs? And how often is Manufacturing brought into discussions on new product development as an after-thought, when the Marketing and Technical teams have already defined all the characteristics of the new product? Indeed, current information and communication technologies may offer a hope in overcoming these structural problems.

Both functions therefore need to be highly interconnected. When this is the case, most of the issues emerging from each side can be crosschecked with reference to the other at multiple levels before reaching the stage of general policy debates and the attention of the policy makers.

In the light of the above considerations, the role of policy-makers, or leaders at all levels of the enterprise, may be elaborated as follows: first, in an uncertain world to identify key issues of organisational concern; second, to recognise the contributions that different structural parts of the organisation can bring into the policy-process (i.e. to form working teams containing a balanced representation of the intelligence and cohesion functions, and for this they need good models of how the organisation structure works with reference to the organisation's purposes); third, to monitor the interactions of these functions as they debate, cogitate and appreciate issues and decide in the light of the organisation's purposes and values. This is the mechanism for adaptation, which of course is far more chaotic and complex that the above description may suggest (fig 8).

6 APPLICATIONS OF THE VIABLE SYSTEM MODEL

Fig 9 shows how the two main mechanisms for viability - those of Adaptation and Cohesion - are combined to define the organisation structure of a viable system. Fig 10 shows these mechanisms taking into account complexity unfolding; this figure makes apparent the principle of structural recursion; this is the complete model, which shows a simple structure of an organisation with two autonomous units, each of which contains two autonomous units. For the purpose of a more detailed study, a separate VSM can be drawn for each of the autonomous units at each structural level, using a simple labelling system to relate the models to the unfolding of complexity model.

The key proposition arising from our analysis of the characteristics of viability is that in truly viable systems, policy, intelligence, cohesion, co-ordination and implementation are distributed at *all* structural levels. In complex environments, people's limited capacity to handle variety makes recursive structures a necessity rather than an option. If all autonomous units within an organisation are designed to contain these self-managing properties, then the organisation's capacity for adaptation and learning is widely enlarged.
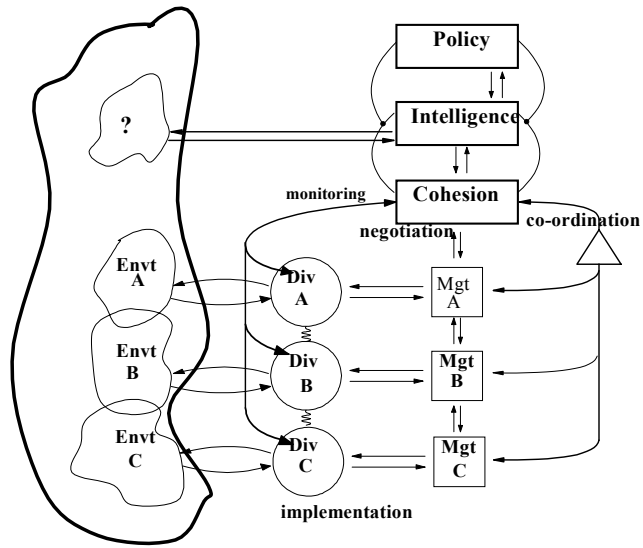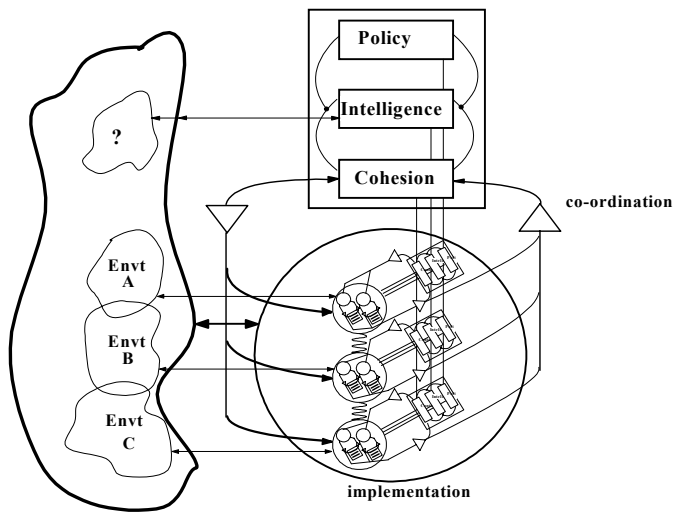
Figure 9   The Viable System Model

Figure 10: Recursive Organisation

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The approach to applying the Viable System Model outlined in this management brief has been used in a wide variety of organisational problem-solving contexts. We have worked with major institutions worldwide supporting their policy processes. In general our concern is to establish if they have the functional and structural capacity to produce their policies.

Other organisations have been assisted in making crucial decisions on which activities to outsource, or which to centralise or devolve to lower level units. By proposing and implementing structural adjustments - for example, by bringing together those activities which naturally 'belong' to the same level of recursion and which logically should be highly interconnected - we have been able to facilitate the adoption of more effective organisational arrangements and working practices.

We have also worked at a purely 'local' level to help solve particular problems that at first sight seemed to have little to do with organisation design; however, it is often the case that problems in the implementation of any kind of change are not the 'fault' of particular individuals or groups, but are systemic in nature. Once the constraints are recognised and removed, and the necessary supporting mechanisms provided, the 'system' can operate with both intelligence and newly directed energy. Organisation should be seen primarily as an enabling device.

Since the Viable System Model deals with the structure of communications within and between enterprises, we have used it to provide a framework for corporate information and communication systems that are more closely related to the organisation's ascribed purposes. Indeed, it caters for information and communication needs of people at *all* levels of recursion.

As a problem-solving tool, the VSM also provides a common language to help groups within an organisation to learn and interrelate more effectively. We have used it to help break down barriers that often exist between functions that see themselves as being at 'loggerheads' with one another, rather than as complementary parts of the same 'system'. Moreover, the rewarding work of

designing effective organisations becomes a *shared* process, rather than being perceived as an externally or managerially imposed threat to autonomy and continuity.

In summary, the VSM is primarily a tool to observe institutions and to support connectivity in the quest for desirable transformation.

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