Chapter 6
The Viable System Model: Effective Strategies to Manage Complexity

Abstract In this chapter we build on the concept of organization as a closed network of relations having identity to explain in detail the Viable System Model (VSM). This model offers a systemic form of observing collectives and institutions in today's societies. The VSM clarifies the quality of the strategies used by a collective to manage the complexity of its self-defined tasks and is a particularly helpful instrument for organizational diagnosis. This chapter develops complexity management strategies for policy-making and policy implementation and explains processes to maintain the organization's cohesion and support its adaptation in a problematic environment. Though the Viable System Model is used most commonly as a tool to observe and describe organizations it also supports, most importantly, the design of effective communication structures.

In Chap. 5 we developed the concept of organizations as a closed network of relations having identity. We also made a clear distinction between collectives and organizations. In this chapter, we explain a systemic model that allows us to observe and describe organizations as human communication systems; this is the Viable System Model (VSM) (Beer 1979, 1981, 1985).

The VSM offers a systemic form of observing collective behaviours in today's societies. Its history goes back into the 1960s when it was developed by Stafford Beer in the context of the earlier work in cybernetics by Wiener (1948), McCulloch (1989), and Ashby (1952, 1964).

The VSM allows us to diagnose the structural mechanisms of an enterprise and use them as a platform for organizational design. This chapter shows the VSM as a powerful tool to steer interactions in directions that produce effective organizational processes. Organizational design has to go beyond tinkering with local improvements in the direction of improving resource allocation and relationships to produce enterprises capable of creating, regulating and producing espoused purposes and values. Most current approaches (see for instance Galbraith 2002) used in designing or re-structuring organizations run short of braiding business and value chain processes with a myriad of organizational processes producing together with them the emergent organization. We need a holistic framework to relate value

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creation, business processes and organizational processes as well as local and global processes. This is what the VSM is all about.

The VSM helps diagnosing the actual bounding of people's interactions in closed networks of relationships or *shared communication spaces for knowledge creation* (Nonaka and Konno 1998), whether real or virtual. Often these shared communication spaces are populated by people with uneven power that produce hierarchical structures, which become the media to constitute interactions with uneven distribution of power. This is a social structure that leaves in the hands of the few most of the influence to produce knowledge and disregards the huge knowledge creation capabilities of the most. As we discuss below these are relational problems in organizations, which imply a poor management of complexity or bad cybernetics. The declarative power of the 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.

The VSM provides a means of observing the structural context constraining people's communications as they experience problem situations. A lack of awareness of this context often produces both *unintended consequences* and *performance problems* (Beer 2009). 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 enabling connectivity and structuring the system to facilitate the healthy development of relationships and ultimately effective performance.

Finally, in this chapter we explore how organizations can release the potential 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 distributed creativity.

Viable systems are those that are able to *maintain a separate existence*. Such systems have their own knowledge creation and 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 of highly improbable occurrences (Taleb 2008). The latter capacity is the hallmark of viable systems; it gives them the capacity to adapt to changing environments. While the emergence of the improbable may throw the viable system off balance, the fundamental characteristic of viability lessens its vulnerability to the unexpected, making it more adaptive to change.

In the previous chapter we highlighted that the hierarchical organizations, which in spite of all the management developments of the 1980s and 1990s still dominate management practice, structure enterprises 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 centralized control.

We said that the VSM 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-organizing 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-organizing 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. It is like picturing Russian dolls within Russian dolls, only that there is not only one within each of the larger dolls but potentially many, which most importantly, for social organizations, can defect. All autonomous components amplify the complexity of their embedding wholes and share their structural and management requirements to remain viable. This is a recursive structure with huge complexity amplification capabilities, where components are functionally differentiated but share an invariant structure. This structure is a powerful strategy for complexity management; 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 functional requirements of higher levels of evolutionary complexification.

Social systems may evolve from the simple to the more complex, but often we experience the opposite process; a collective of people with some sense of what they want but unclear functional differentiation find themselves without the requisite structures to carry out something that is still not well defined. They interact, 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 and collective viability. 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 without unnecessary fragmentation of the global task. Now we are opening the Russian dolls, and learning how it is that autonomy within autonomy can be enabled; we are unfolding the enterprises' complexity. Naturally we can also encounter examples of organic growth, where individuals or small cohesive units develop synergistic relations with other previously independent people or units and produce new organizations. Of course, we may find many other forms of complexification where new organizational 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 of a collective is more often than not the outcome of local processes of self-organization, rather than purposeful design. The formal organization 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-organization 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 adaptive components while respecting their autonomy. For collectives, as meaning producing social systems, this implies aligning the meanings produced locally by

small teams with the purposes they collectively ascribe to their joint enterprise. The better is this alignment, we will argue, the more effective is the enterprise's organization.

A balance should be achieved between the actions *producing* collective purposes and the actions *creating* these purposes and *enabling* their 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; we call those actions producing these purposes *primary activities* and those enabling them *regulatory/support functions* (Espejo 1989c). Viable systems emerge from the connectivity (i.e., communications and interactions) among primary activities and regulatory functions (see Chap. 9 for a detailed account of this connectivity). 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 keep collectives together are relationships rather than explicitly 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 unaligned purposes to their collective's actions.

The activities carried out by the library in a university, for instance, would normally be taken as regulatory/support activities. Academics and students may see them as an important support for their research and learning goals. However, if people working in the library see themselves as part of a unit whose purpose is keeping the state of the art in their traditional collections (books and journals) independently of the changing interests of lecturers and researchers, then it is likely that conflicts will arise. As a regulatory activity, the purpose ascribed to the library should be aligned to the purpose ascribed to the primary activities it supports, in this case research and teaching. In practical terms this means that the criteria to choose collections should be heavily loaded towards the interests of researchers and lecturers.

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. In a way these purposes are the 'problems' they want to solve in their surrounding or environment. Complexity emerges from the collective's relations with environmental agents, which may be the trigger for an organization. Demanding environments can stretch the collective and put pressure on their ingenuity. This stretching may transform the collective into a cohesive organization with problem solving capabilities.

The organization needs to find ways to amplify its own variety to match the variety of a demanding environment and ways to attenuate, but not 'kill', the environment's relevant variety to cope with it, hopefully making 'more with less' (i.e., reducing residual variety). This is a driver for problem solving and ingenuity. A powerful way to achieve amplification is to enable individual and teams' autonomy within the organization. Autonomy releases individuals' creativity and

increases the organization's flexibility to deal locally with environmental variety. As for attenuation, the environmental complexity is not completely chaotic; it has structure itself. It comes, for instance, in chunks of connected customers and suppliers, or chunks of geographic needs or chunks of time in which services are required and so forth. These are the complexity drivers we mention in Chap. 4. An effective organizational structure maps these chunks of complexity (for a methodological recognition of these chunks see Chap. 8). How people in the organization chunk their environmental complexity is a matter of ingenuity. For instance, some may exploit creatively the difficulty 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 visualise and decide to respond to, the organization's structure should map them. This mapping is a consequence of Conant and Ashby's theorem that states 'every good regulator of a system must be a model of that system' (Conant and Ashby 1970).

An interesting case of a practical application of this theorem in a complex institutional set up took place in Colombia as part of a project to redesign the auditing processes of the National Auditing Office (NAO) (Espejo et al. 2001; Reyes 2001). The main purpose of NAO was to guarantee the transparency, efficiency and effectiveness of the resources used by public institutions in the country. In other words, for the State's organization this was a support/regulatory function. On the other hand, the State provides public goods and services to the population like education, health, justice, defence and so on. Over time institutions of different kinds have been created to produce these services: state industries, public universities, public hospitals, airports, schools and so forth. As we can see there is a natural way to group these institutions regarding the production of public goods and the Conant and Ashby's theorem tells us that NAO's structure should map the State's unfolding of complexity, as a regulatory function of the State's primary activities; in other words it should map these structural chunks that reflect the organization of the State.

Since, in general, individuals cannot cope in isolation with these chunks, organizations foster structurally their collaboration to form *autonomous units*, accountable for chunks of environmental complexity; these are the organization's primary activities. Each of these autonomous units is functionally specialised in producing an aspect of the organization'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. Equally they may find the need to break an existing autonomous unit, say their total organization, 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 or primary activities, suggesting even further specialisation. These are all learning processes, dynamically producing the organization's structure (see Chap. 8). These processes of *complexity unfolding* are at the core of how collectives structure the management of their purposes (see Fig. 6.1).

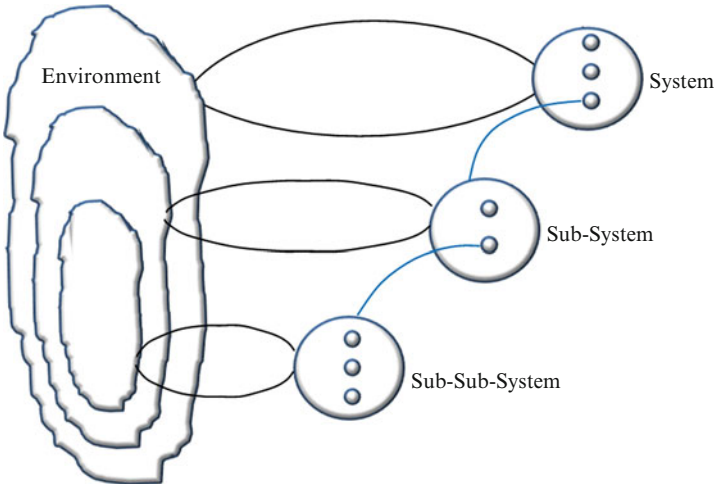

Fig. 6.1 Unfolding of complexity

The organization's total transformation is thus produced by the synergistic communications of multiple autonomous units. Whether these autonomous units are designed or are the outcome of self-organizing processes sensitive to the structure of the environment's complexity, is a complex question that requires empirical observations. However, some form of complexity unfolding happens in most complex situations and the challenge is to hypothesise alternatives that increase the organization's fit to the, to some degree, self-created environment; considering existing, available and new technologies.

The potentially large number of autonomous units or primary activities within the organization, structured in whatever form, define the organization's performing 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 Fig. 6.1). And all autonomous units experience the same challenge, that is, to solve an often self-constructed problem, 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*. When the identification of autonomous units is directly related to a clarification of the purposes ascribed to an organization we name them primary activities.

Achieving the cohesion of primary activities within an organization requires regulatory capacity, which is produced by regulatory/support functions. 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 decentralization do members of the collective want

and are prepared to accept? This is often a political, but also technological, social and cultural question. A highly centralized structure can be viable, but only at a high cost of coordination and support activities (see details in Chap. 9).

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 this question define an organization's espoused purposes. In a diagnostic mode it is possible to observe the actual organizational forms or structures matching the environmental complexity implied by these espoused purposes; if there is a mismatch it is possible to diagnose a dysfunctional organizational structure (see identity and structural archetypes in Chap. 12).

Functions such as personnel, finance, marketing, information services, etc. tend to fall in the category of *regulatory or support* functions. They produce the regulatory functions giving cohesion and adaptability to the primary activities and are crucial to the viability of the overall organization and of each of its embedded autonomous units. Regulatory/support functions are performed at different levels depending on the balance between centralization and decentralization accepted within the organization. Functions such as quality assurance and human resources management may need to be devolved in one form or another to each primary activity. Also, functions like finance and research and development may be kept more centralized. Making decisions about centralization/decentralization define the interactions between regulatory functions and primary activities. These decisions are central to the type of emergent organization, and the VSM is used to assess this emergent structure. 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 (see Chap. 9).

The concept of a recursive organization 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), regulation (i.e., management and services) and meaning production (i.e., implementation). It is not unusual to find that some of these capabilities are not embodied in the primary activities of modern enterprises. Unfortunately, these enterprises 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) as well as implement them. Etymologically autonomy means to govern oneself, but in this context autonomy means also to produce one's products.

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. The other is the mechanism that supports the organization's co-evolution with agents in its environment; this is the mechanism for adaptation. In what follows we will describe how these two mechanisms operate. For the sake of simplicity in the presentation, we will refer, for the most part, to the operation of these mechanisms for an 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.

For a collective to become an organization they need to achieve cohesion (see Chap. 5). Cohesion requires 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 collectively ascribed to the organization. Of course we may expect that organizational purposes constitute individual purposes in a cycle of mutual production and constitution. The cohesion mechanism explains how to achieve structurally this alignment at the same time of respecting autonomy. In other words, it explains the kinds of stable forms of communication that increase the chances of articulating the autonomous units' programmes with the organization's purposes. For the purpose of explaining this mechanism we distinguish between those resources and relations *producing* the organization's purposes, we call them the *implementation function*, and those resources and relations *steering* the implementation function in the direction of the collective's purposes; we call them the *cohesion function*.

All primary activities, whether real or virtual, formal or informal, *producing* the collective's purposes 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 (see archetypes in Chap. 12). In this situation the collective either adjusts its espoused purposes or creates the conditions for the emergence of desirable autonomy and the elimination of undesirable autonomy.

It is common that these discrepancies are the outcome of a series of contingencies in the historic development of the collective. They can also take many different manifestations. For instance the National Registry of Colombia (NRO) is a public institution with three primary activities: keeping records of the population (births, civil status and deaths); giving national identification cards (identity cards to people younger than 18 years old and citizen cards to people older than 18); and organizing public general elections (presidential, parliamentary, municipal and others). The identity espoused in the law and written in the official documents and strategic plans of the NRO were consistent with these three primary activities. However, there was an emergent fourth primary activity that nobody at this level had recognised.

Indeed, because the NRO kept records of all citizens, including fingerprints, other institutions were regularly asking for the identity records of people they were dealing with. For instance, the police needed to know the identity of a person whose fingerprint had been found in a crime scene; banks requested fingerprint checks of some customers and so on. Failure to respond to these requests accurately and in time could have undesirable consequences (e.g., letting a criminal offender go). Eventually the NRO found that it was dedicating significant resources (people, technology and money) to these requirements. The effect of this was that a primary activity had emerged de facto making the purpose-in-use of the NRO different to its espoused purpose. However, this espoused purpose remained unchallenged and unchanged for many years, affecting the autonomous development of this *unseen* primary activity and most importantly affecting the proper debate about its legitimacy.

Managing the coherence of established policies and their implementation is the purpose of the *cohesion function*. The cohesion function is constituted by resources whose purposes are, first to negotiate programmes and resources with its embedded primary activities or autonomous units in order to make local policies coherent with the organization's global policies, second to monitor the development and performance of these programmes over time to ensure that the local and global understanding of policies remains aligned and third to contribute to the definition of the organization's policies (see mechanism for adaptation below). Its fundamental concern is the organization's internal complexity, that is, the 'inside and now' (Beer 1979), of which it has to be an effective attenuator and enabler. It is pivotal in constituting a *cohesion mechanism*. For this the cohesion function needs an accurate appreciation of first the achievements and capabilities of primary activities, and second, their coordination potentials and requirements. In this sense the cohesion function is a *form of control* that respects and enables the autonomy of primary activities in the organization.

Unfortunately, as introduced earlier in this chapter and discussed in Chap. 2, control is a loaded term often related to hierarchical relationships and structures, which reduce the knowledge creation of an organization. Here we explain why this type of relationships is so prevalent and then we explain the cohesion mechanism, which is the VSM's response to this inadequate management of complexity.

Cohesion managers and people in primary activities often experience the *control dilemma* (Espejo 1989c): managers, having less variety about implementation activities than the people in the primary activities they control, cannot possibly maintain awareness of all that is going on with them, particularly if these units are increasingly challenged by environmental complexity. There is a natural 'information gap' between cohesion managers and people in primary activities; but managers know 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 (questions such as, 'what is going on down there?' 'How do I know whether they're telling me the truth?' are likely to emerge in the context of their traditional hierarchical upbringing). This anxiety to know more tends to increase demands for information and reports and the undertaking of more investigations to keep 'in control'. However, in reality these demands and instructions only serve to reduce the response complexity of people in primary activities, making them less flexible, as they struggle to fulfil increased management requirements at the expense of responding to their local environmental demands. At the very time that these autonomous units need more flexibility to respond effectively to environmental pressures, managers' behaviour is reducing this flexibility. However, the Law of Requisite Variety asserts itself and managers in the cohesion function cannot win with this type of control strategy. This strategy reduces the complexity of implementation units, hindering their autonomous development and performance, and at the same time it increases the residual complexity that managers need to deal with. This kind of relationship is the hallmark of hierarchies and bureaucracies.

Sometimes this control dilemma is very difficult to observe. The general manager of the City of Bogotá's Audit Office (CAO) decided to support a new discourse

about control, one based on the idea of self-regulation; he sent a memorandum to his subordinates telling them to inform managers of the City's institutions about this new policy. Each institution had to run a self-diagnosis at the end of the year to report its main drawbacks. By the end of the first year CAO's general manager, pressed for results by the political party that had appointed him, started to get nervous. This party wanted to build a case against the City's Mayor who belonged to the opposite party. CAO's general manager decided then to send another memo to all managers of local public institutions asking them to include in their reports a form with some additional information. This form had over 250 variables, most of them of no use whatsoever for the management of each individual institution. However, being an official requirement from the auditing office, they had to assign resources to fill in the form. Of course they did not believe in CAO's self-regulation discourse anymore. On the other hand, at the end of the reporting period people in the CAO received so much information from the 50 regulated public institutions that they did not have the capacity to process and check it all. At the same time, quite naturally these public institutions were increasingly challenged by more demanding customers. The quality of CAO's report produced out of all this was heavily questioned. Managers of the 50 public institutions realized this lack of processing capacity and increasingly carried out their activities concealing information. Of course people in the CAO realized that as well and started to check all information in detail. After all these cat and mouse exchanges people felt that there were two main lies in the auditing practices. The first lie was what auditors used to say when they first visited the manager of a public institution: 'Sir/Madam we are here to serve you'; the second lie was the answer of the manager: 'You are very welcome!'.

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.

In summary, as primary activities feel the pressure from agents in their environment to become more flexible and sophisticated, managers sense larger information gaps and respond with traditional control strategies that reduce flexibility and produce larger bureaucracies, precisely when there is a need for greater flexibility. A proliferation of control games is the likely result.

From the perspective of complexity management strategies the challenge is how to achieve the cohesion of primary activities despite corporate managers experiencing these unavoidable information gaps. Or more precisely, how is it possible to match effectively the desirably large amplification complexity of autonomous primary activities with the unavoidable low variety of management? Indeed, autonomy is a requirement to make units more responsive to agents in their relevant environment, and the low variety of managers is in their very fabric as human beings. This question leads to another question, how to reduce the residual variety that is relevant to management at the same time of increasing the organization's response capacity. Indeed, the more local problem-solving is enabled within autonomous

units the less implementation variety is left unattended by those close to the task, and therefore the smaller is the residual variety left for the attention of management. The VSM gives us advice for this purpose; the design of the *cohesion mechanism*, which assumes that the collective has evolved into a number of primary activities, embedded in the collective enterprise, itself a primary activity at a more global level (e.g., the industry). This design is driven by three guiding principles (Espejo 1989c).

1. *Negotiate operational programmes minimising the use of direct commands*

Figure 6.2 shows the operation of the cohesion function in relation to three primary activities (e.g., operational divisions in an enterprise), which are to a greater or lesser extent interdependent by virtue of the fact that they belong to the same organization. Indeed, defining primary activities and working out their interdependences challenge the ingenuity of the cohesion function. Primary activities 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 ingenious 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 primary activities by fostering their self-regulation and self-organization through these overlaps.

The central vertical channel between the cohesion function and the management of each of the three primary activities (e.g., divisions in a company) is the communication channel through which senior management negotiates programmes with

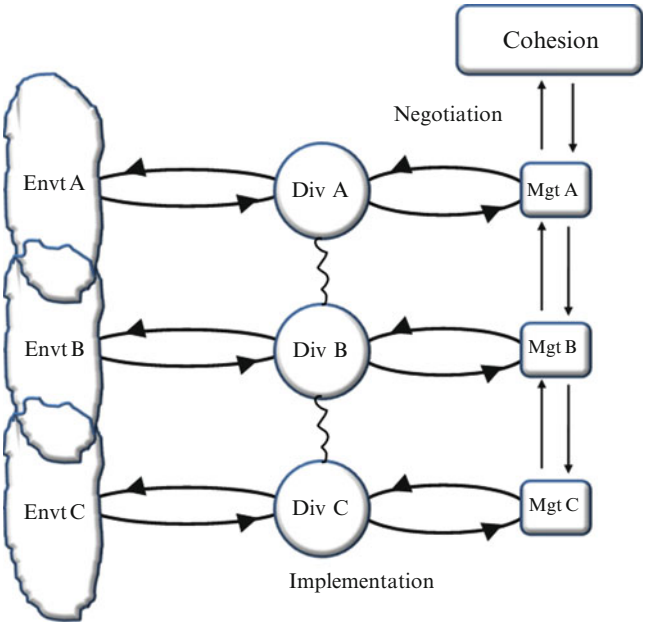

Fig. 6.2 Negotiation of resources

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 with a command channel, only leads to control dilemmas. No doubt, one way of reducing direct commands is making use of 'exception reporting', common in most organizations today, and equally 'management by objectives' that avoids too much interference and helps 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 communication problems of maintaining organizational cohesion and developing synergy among autonomous units. The next two 'design criteria' address these issues.

2. *Use sporadic monitoring – with discretion*

The communication problem emerges from primary activities at two different structural levels; the enterprise and the autonomous divisions, trying to communicate with each other. Enterprise and divisions as autonomous units have their own structural determination. Neither side can assume that the other assigns the same meanings to the information they share. 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 crossing sporadically the boundaries of the autonomous units, and learning firsthand the context from which they produce the information. This is the meaning of monitoring in this framework.

For cohesion managers this grounding of flowing information in the operations of the primary activities is achieved by developing a monitoring channel that runs *directly* between the enterprise's management and the primary activities (e.g., divisions) themselves, bypassing – if necessary – their management (see Fig. 6.3).

People in the cohesion function need 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 the received information properly. Monitoring can take a variety of forms, from the obvious auditing programmes, to informal conversations, unscheduled visits, sharing common tasks and many more. However, they must adhere to the following more specific principles:

(a) They must be infrequent, otherwise they risk undermining the authority and trust vested in the management of the autonomous units.
(b) They must be open and everyone concerned should be aware of these events. The intention is not to play 'big brother', employing secretive tactics and games of subterfuge; it is simply learning about what is going on at first hand. If employed sensitively, monitoring should communicate a message of caring to those involved, without resulting in defensive behaviours from the 'by passed' level of management. It must support trust building processes that produce responsible and not naive trust. People at successive structural levels trust each

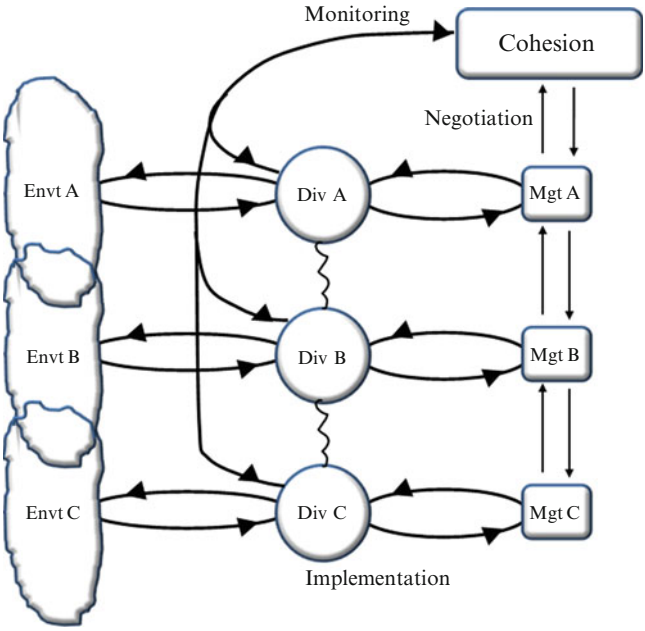

Fig. 6.3 Monitoring of primary activities

other because they are communicating and through these communications they are assessing the competence and sincerity of each other.

(c) 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 communications in between. However, it may be necessary when local structural levels experience situations that go beyond their own management and therefore need the attention of higher levels of recursion; these exceptions are Beer's algedonic signals (Beer 1979).

Negotiation of programmes and their monitoring are the two sides of the same coin, that is, two sides of the same cohesion function.[1] One without the other is meaningless. Programmes for which there is no negotiating capacity are not negotiated. 'Negotiation' without understanding the other side is gaming and not negotiation. *Trust between negotiating partners is what monitoring should bring into the cohesion function* (Espejo 2001).

[1]In Beer's terminology the Cohesion Function is System 3 and monitoring is System 3*; in our view these two systems are the two sides of the same coin and therefore treating them as independent of each other is an inadequate fragmentation.

3. *Maximise coordination among the primary activities*

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 it is also a means to increase the opportunities for a coherent development (see also Galbraith 2002). Sharing the same culture, setting common procedures and standards in all those aspects *that are not central to the primary activities' own purposes* can play this role. This strategy, based on enabling the *mutual regulation* of autonomous units over time has far more variety than hierarchical regulation. Naturally, a degree of *coordination by direct supervision* may also be necessary. This is a useful coordination strategy for aspects where the connectivity among autonomous units is not high and the requisite complexity to overview them is low, or in other words, the complexity of an aspect of their connectivity can be contained by a low variety resource of a corporate administrative unit. Otherwise, being a centralized form of coordination, the variety of the primary activities 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 organization depends on a *coordination function* to enable autonomy. It is a critical function to enable connectivity and therefore cohesion. The stronger is the coordination function the less residual variety is left for the attention of the cohesion function, and the more space primary activities have to assert their autonomy. The coordination function provides a common language that facilitates lateral communications among autonomous units and thus enables local problem solving. Coordination 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.

Unfortunately, it is not unusual for those operating in traditional hierarchies to perceive the setting of standards as bureaucratic interference with their personal freedom. This is partly because standards appear as instructions coming down the line ('Here we go again, management throwing its weight around!') instead of lateral support, designed to make their lives easier in the longer term. However, if people in regulatory (support) 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.

Summing up, the *coordination function* is a powerful, high variety function: the stronger it becomes, the greater 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 cohesion, coordination and implementation constitute the *cohesion mechanism* (see Fig. 6.4).

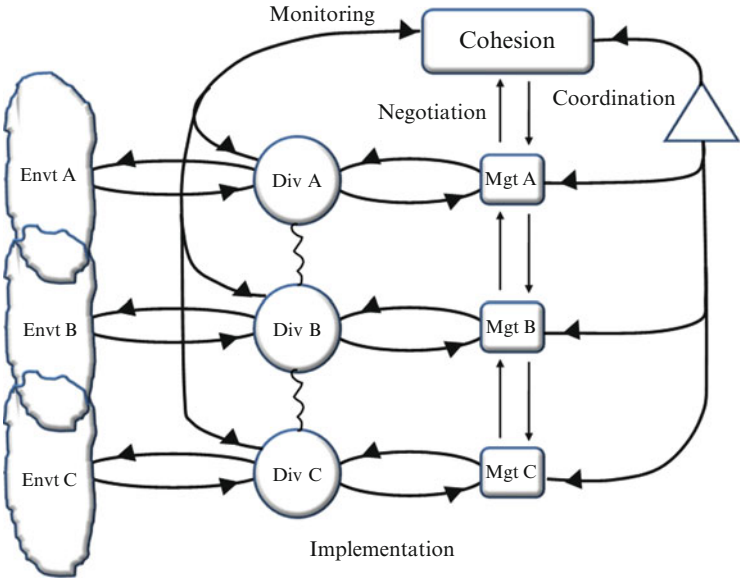

Fig. 6.4 Cohesion mechanism

The cohesion mechanism is a mutual control strategy, in the sense of achieving a dynamic but stable relationship between corporate managers and primary activities at a high level of performance.[2]

But it is not enough for the collective to become a cohesive whole to maintain viability; 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 organization. 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. Capacities 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' (Beer 1979) and third, those giving closure to the organization. These last two are referred to as the *intelligence function* and *policy function* respectively. These resources together with their relations constitute the *mechanism for adaptation*. In what follows we discuss the complexity management strategies and structures required for adaptation.

[2]Earlier versions of this model (Espejo 1989c) talked about the monitoring-control mechanism; however the socially negative connotation of control suggested the convenience to talk about the cohesion mechanism. What is apparent is that the above discussion has offered a *control strategy* that is very different to the hierarchical, coercive strategy.

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 organization's long-term viability? How can they be sensitive to the organization's capabilities and potentialities?

Policy-makers 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 unfeasible; or that the new salary policy that they recently approved has led to damaging industrial relations and social disapproval. In such cases, hopefully managers will have the implicit awareness not only that they were deciding on issues beyond their competence, but also that existing people in the organization, with the necessary knowledge, were left out of the debates that led to the critical decision now in question. Unfortunately, it is common that managers only realise that their decisions were inadequate after the event, possibly when they have already moved to another policy role.

Often they just rubber-stamp what has already been decided within the organization without them being involved in steering the appropriate debates. Also the management briefings they receive may require judgments about issues for which they do not have the required in-depth knowledge. In these conditions, policy-makers may either abdicate their responsibility completely by blindly following internal advice, or they may take a 'strategic decision' (i.e., a leap in the dark), and hope for the best.

If policy-makers are often in the invidious position of deciding issues that are beyond their competence, either because of the inadequate processes followed in their study or because their content is too complex for their scrutiny, how can they keep control of these policies? In other words, how can they be accountable for the organization's policies?

Quite naturally the complexity of policy-makers to deal with policy issues is much lower than the organization's complexity focused on these issues, therefore, they must have effective attenuators to reduce this complexity and bring it within range of their limited response capacity. In practice this means that most of the complexity 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: that of the inside organization now, or its *internal environment*, and that of the outside organization challenging its longer term viability, or its *problematic environment*. The former is concerned with the conditions occurring within the organization; the quality of its structure, the configuration of 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 organization's gliding in its environment, and the corridors for free and exhilarating flying. We have referred to these two structural attenuators of complexity as the organization's *cohesion* and *intelligence* functions (see Fig. 6.5).

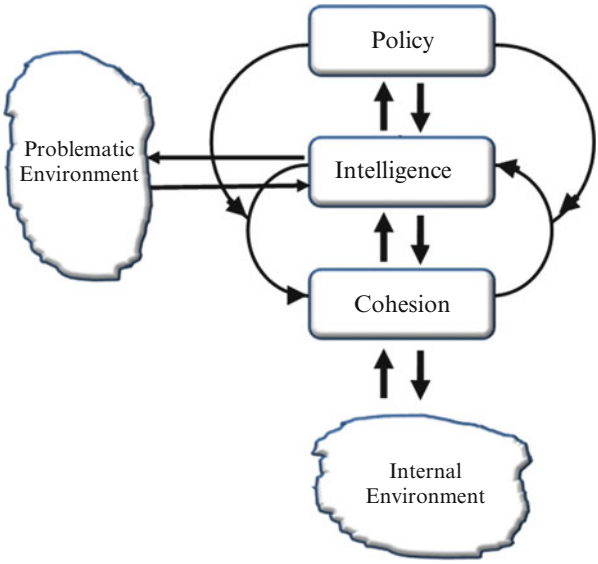

Fig. 6.5 Adaptation mechanism

These functions exist in one form or another in any *viable* organization, but are not necessarily related to well-defined entities in the organization chart: it is perfectly possible, for example, that one department within an enterprise has both intelligence and cohesion functions, and that in a small organization one individual fulfils both functions. The essential question is how to relate these resources in order to make policy-making more effective? The basic principles are as follows:

1. *Reduce the residual variety relevant to 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 should avoid meddling with content; the details of organizational issues are complex enough to be beyond their personal attention. The likelihood is that the study of options and related checks and balances need the participation and contributions of many people within the organization. These people are the ones in the end offering the options for policy-making. Policy makers should provide clarity about the overall direction, values and purposes of the organization, as well as design, at the highest level, the conditions for organizational effectiveness. Whether their understanding of technical issues is good or otherwise, they will not have time to go deep into them. Their appreciation of these issues should be sufficient to maintain an informed communication with intelligence and cohesion resources, after these resources have gone through the necessary checks and balances among themselves to articulate options. Policy makers should only manage the residual variety left unattended by the interactions between cohesion and intelligence resources. Indeed, to remain in control of the policy processes the briefings reaching them need to make limited demands on their attention, consistent with their contextualised response capacity.

2. *Design debates with balanced contributions of the cohesion and intelligence functions*

The challenge for policy-makers is to understand the systemic contributions of people in the organization (are they focused on the 'outside and then' or the 'inside and now'?) and steer their interactions along the lines of the organization's purposes and values. It is in this steering, which should aim at the balanced contribution of cohesion and intelligence resources, that selecting among options gives closure to the organization. The intelligence and cohesion functions offer alternative perspectives on shared adaptation problems.

Policy-making is a process, the outcome of which is the choice of courses of action for the organization. Which are the transformations the organization intends to produce in its relevant milieu? The issues of policy concern may stem from the policy-makers themselves or from within the organization. In the former case, there is a need to substantiate these issues with further detailed research from different organizational 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 organizational debates in such a way as to enable people to contribute to the best of their abilities to organizational adaptation and survival. This is the meaning of the arrows that start from the policy function and go to the arrows that relate the intelligence and cohesion functions in Fig. 6.5. It follows from this point, and the concept of structural recursion that the policy-making process should happen not just at the level of the global enterprise but also within all primary activities, at all structural levels. Extensive debates within the organization 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 intelligence and cohesion resources for a policy issue damages the performance of the policy function. For example, if intelligence produces issues of policy relevance at a higher rate and detail than the cohesion function can cope with, then policy-makers will 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 functions are likely to be both costly and ineffective.

3. *Make intelligence and cohesion highly interconnected*

The effectiveness of the intelligence and cohesion functions depends not only on purposeful and balanced debates *among managers* or senior people *representing* the 'inside and now' and the 'outside and then', but more to the point by the on-going interactions and communications of *all* people constituting the cohesion and intelligence functions. These are the resources, for instance, doing research and development and monitoring of primary activities. The allocation of resources for these purposes and their balanced interactions also influence policy-making.

If communications between these resources were weak then policy-makers would not only be receiving unchecked information independently from both sides, but they would be in the invidious task of having to make the checks and balances themselves. The policy-makers would be the main communication channels between two separate sets of people, which, in enterprises of any size, deal 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 centralized research and development departments far removed from those managing their 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 offer a hope in overcoming these structural problems.

Both functions, therefore, need to be highly interconnected at the operational level. This is the meaning of the arrows that relate the intelligence and cohesion functions in Fig. 6.5. 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 policy options for 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, by identifying key issues of organizational concern; second, by recognising the contributions that different people and groups of the organization 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 organization structure works with reference to the organization's purposes); third, by monitoring the interactions of all those constituting these functions as they debate, cogitate and appreciate issues and structure options in the light of the organization's purposes and values. This is the mechanism for adaptation, which of course is far more chaotic and complex than the above description may suggest (Fig. 6.5).

We have now completed our discussion of complexity management strategies for the organization's cohesion and adaptation, now we will relate them to offer a view of the Viable System Model.

Figure 6.6 shows how the two main mechanisms for viability – those of adaptation and cohesion – are combined to define the organization structure of a viable system. Figure 6.7, in turns, shows these mechanisms taking into account the unfolding of complexity. This figure makes apparent the principle of structural recursion; this is the complete model, which shows a simple structure of an organization with two primary activities, each of which contains two primary activities. For the purpose of a more detailed study, a separate VSM can be drawn for each of the primary activities at each structural level, using a simple labelling system to relate the models to the unfolding of a complexity model.

The key proposition arising from our study of viability is that in truly viable systems, policy, intelligence, cohesion, coordination and implementation are distributed at *all* structural levels (Beer 1979, 1985). In complex environments, people's limited capacity to handle variety makes recursive structures a necessity rather than

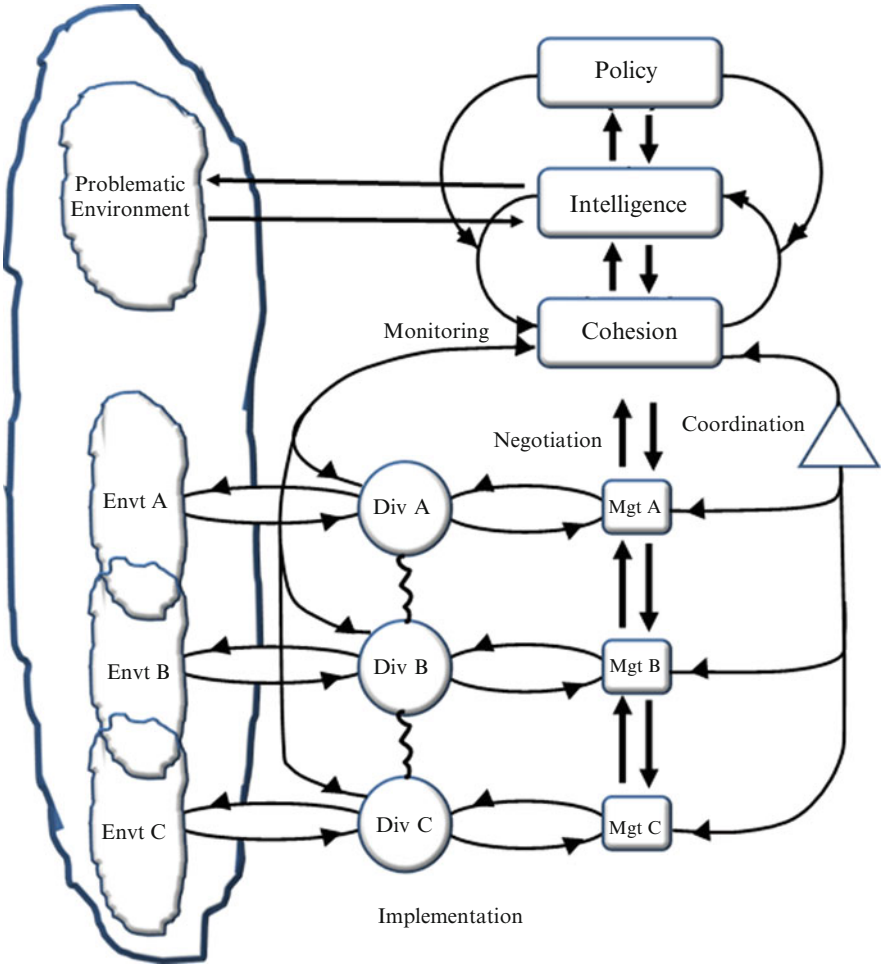

Fig. 6.6 The viable system model for one autonomous unit

an option. If all autonomous units within an organization are designed to contain these self-managing properties, then the organization's capacity for adaptation and learning is widely enlarged.

The Viable System Model is primarily a tool to observe an organization's strategy to manage complexity and to support the design of effective control and communication structures. As a problem-solving tool, it provides a common language to help groups within an organization to learn and interrelate more effectively. The use of the VSM as a framework for diagnosing and design has been extensive (Espejo 1989b; Espejo and Reyes 2001; Reyes 2001; Christopher 2007; Perez Rios 2008). It has been applied in a wide variety of organizational problem-solving contexts. This range has been from large private companies and public institutions to small companies and NGOs in many different countries. This

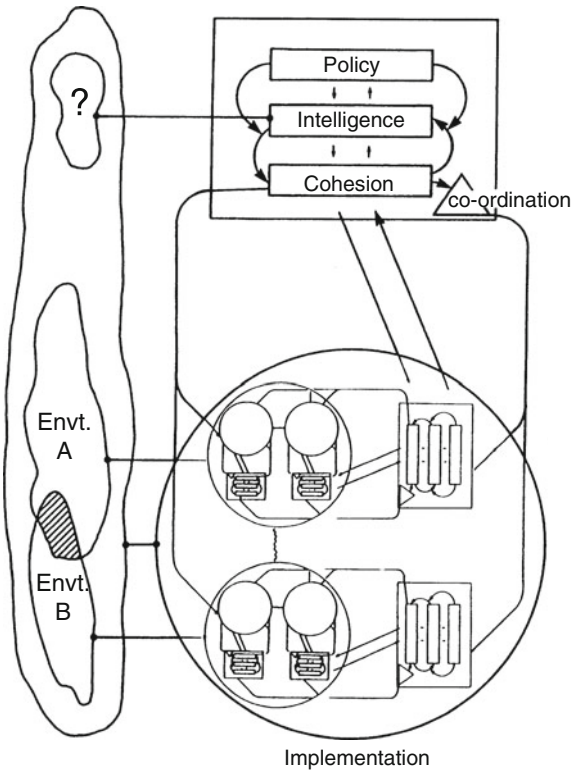

Fig. 6.7 A recursive organization

extensive application of the model and their supporting concepts has allowed us to recognise a group of recurrent problems that we identify as archetypical (Espejo 2008). These archetypes are explained in Chap. 12.

On the other hand, explaining in detail how to use the VSM as a diagnostic and design tool for effective management is the purpose of the Viplan Method (Espejo 1989a; Espejo et al. 1999). The following chapters explain this method.

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