A CYBERNETIC PARADIGM FOR ORGANIZATIONAL ASSESSMENT

Raul Espejo

September 1976 WP-76-28

A CYBERNETIC PARADIGM FOR ORGANIZATIONAL ASSESSMENT

Raul Espejo

August 1975

Abstract

International Institute for
Applied Systems Analysis

The main purpose of this paper is to focus attention in organizations on a cybernetic viewpoint. From this point of view organization and planning are homologous. What a system does does not depend on what it would like to do. A system does what its organization allows it to do, no more, no less. The organization of a system in one way or another represents a measure of the level of environmental situations that it is capable of controlling.

The criterion of effectiveness is viability in the long run. To make this criterion of assessment operational, I shall elucidate my concept of organization as opposed to an institution, and provide a cybernetic language to refer to complexity and control.

The basic elements of the analysis are variety, or the number of possible states of a system, Ashby's law of requisite variety or the fact that variety can only be absorbed by variety (Ashby, 1952) and Beer's organizational model of any viable system (Beer, 1972).

Under this conceptual framework three steps are developed to analyze organizational effectiveness, and they are presented in order of generality.

The first is the organizational consistency. It is in general a metasystemic analysis of relevant institutions and their subsystems. Is it possible or not for them, considering their metasystemic relationships, to fulfil their 'established purposes'?

The second step after testing the consistency is the structural effectiveness. It is concerned with the distribution of variety along the organizational structure. Some structures are more effective than others in matching environmental variety. This step is concerned with the traditional dichotomy - centralization versus decentralization.

The third step is the organizational epistemology or the particular way in which systems acquire knowledge about their relevant environment. The necessary filtering of complexity suggests that systems select a set of variables or quantities which define the system-environment area of stability.

1. Introduction

For the past few years I have been applying the cybernetic approach to different social systems. At present I am concerned with regional development. Integrated Regional Development has been defined as one of the cornerstones for coordinating the different research areas of IIASA. Without doubt, regional studies provide a manageable framework for interdisciplinary efforts, i.e. the region represents a common 'system' for studying the interactions of the different areas of the so-called systems analysis approach. From my point of view the region is just one instance of a large organization, where we find problems that are of a similar nature to those in any other complex system. For practical reasons, I shall refer to the 'region' as the system of my interest in this paper. The invariable concept is that of the system's organization that is common to every complex situation where information and energy are involved.

The need for a new paradigm for organizational assessment arises from the practical recognition that even in places where the 'system' should be the principal concern, our attention is focussed mainly on the 'sub-system', i.e. clearly there is an emphasis on the planning and management techniques in themselves, and not on their effective integration with the system they are trying to influence.

I believe that this aspect is of great relevance and therefore I have prepared these notes which are intended to present a paradigm for a systemic study of large organizations. Their aim, if they are to be successful, is to provide a meta-language for studying the systemic relevance of different planning techniques.

I acknowldege that a good deal of the ideas I shall develop in this paper are a result of my interactions with Stafford Beer and Humberto Maturena.[1] Moreover some of the most relevant ideas I am trying to convey here were presented by Beer in his Irvine Memorial lecture at the University of St. Andrews in Scotland.[2] Nevertheless, of course, the shortcomings of the paper are of my own responsibility.

2. General Approach

My personal purpose for this paper is to focus the attention in organizations on a cybernetic viewpoint. The aim is to offer a paradigm for studying 'the systems' that are affected by the development of planning techniques. From the point of view of cybernetics, organization and planning are homologous. What a system does does not depend on what it would like to do. A system does what its organization allows it to do, no more, no less. The organization of a system in one way or other represents a measure of the level of environmental situations that it is capable of controlling. The extreme cases are organizations that are overwhelmed by the environment or are in complete control of it. In the first case, irrespective of the planning technique the future of the system is determined by the environment. In the latter case, the system can create its own future. In reality, the situation is in between these

---

[1] Chilean Biologist and Cybernetician, disciple of Warren Mc Culloch

[2] Stafford Beer, Laws of Anarchy, Irvine Memorial Lecture, March 1975

extremes and the problem is to make organizations effective. The criterion of effectiveness is viability in the long run. Whatever increases the organization's capability of controlling its environment is fulfilling this criterion of effectiveness. Seen in this prespective the different regional planning efforts are ways of controlling the environmental complexity. Since these processes can be more or less effective we need a conceptual framework for this assessment. What I have in mind is not a quantitative method for ranking planning efforts in the order of effectiveness but to provide a language invariant to the complexity and particular characteristics of the environment for recognizing their weaknesses and strengths.

The integrated development of a region is without doubt more complex than any institutional integrated plan or plans for the region. More realistically we can think of it as a consequence of the interactive operation of a complex network of organizations affecting the region. Therefore in this conceptual framework the assessment of a regional planning institution should be related to the operational capabilities of this network,(i.e. the system that the planning institution is supposed to affect)and one measure would be the extent to which this planning body is changing the different organisations' purposes and perceptions. To make the criteria of assessment operational I shall elucidate my concept of organisation as opposed to an institution, and provide a cybernetic language to refer to complexity and control.

The basic elements of the analysis are variety, or the number of possible states of a system, Ashby's law of requisite variety or the fact that variety can only be absorbed by variety (Ashby, 1952) and Beer's organizational model of any viable system (Beer 1972). Variety is the cybernetic measure of complexity. The law of requisite variety means that either by filtration or amplification two interactive systems should balance their varieties if the interaction is going to remain over time. The characteristics of these filters and amplifiers are the very substance of the assessment of how complexity organizes itself. The model of any viable system is the reference level for assessing organizational effectiveness. The more effective a system is, the more it is capable to cope with its relevant environmental variety, and the more it needs to rely on self-regulation and self-organization. Cybernetically this is precisely the way to become a viable system. One of the main expressions of viability is the ability of a system to respond to a stimulus which was not included in the list of anticipated stimuli when the system was designed (Beer 1966).

Under this conceptual framework three steps are developed to analyze organizational effectiveness, and they are presented in order of generality.

The first is the organisational consistency. It is in general a metasystemic analysis of relevant institutions and their subsystems. Is it possible or not for them, considering their metasystemic relationships, to fulfil their 'established purposes'? Metasystems define to a great extent the systemic level of perceptions and purposes. When discrepancies occur between them and the established purposes the systems are spending energy without producing expected results. This is affecting learning and adaptation. If institutions are bound to established purposes' they become the expression of

'self-producing' power centres which benefit from these purposes, and not the 'self-producing' organisations capable of absorbing people's changed purposes and perceptions that learn, adapt, and finally evolve.The organizational consistency is therefore related to the mechanisms of 'autopoisis' or self-production. Autopoisis is the particular case of homeostasis when the relevant variable which is kept under control is the organization itself. (Maturana 1973)
The second step after testing the consistency is the 'structural effectiveness'. It is concerned with the distribution of variety along the organizational structure. Some structures are more effective than others in matching environmental variety. This step is concerned with the traditional dichotomy - centralization versus decentralization. The nature of the different filters and amplifiers that define the homeostatic relationships between an institution on the one hand and its metasystem, relevant environment and subsystems on the other hand is the key aspect of this step. The suggested reference for analysis is the model of any viable system applied at the different recursion levels. By recursion is meant that the whole is always encapsulated in each part. (Beer 1972). This is a result of the self-organizing mechanism (i.e. homeostasis) natural to complex systems. The three aspects suggested to be tested in different regional contexts are coordination, control and institutional planning.
The third step is the organizational epistemology or the particular way in which systems acquire knowledge about their relevant environments. The necessary filtering of complexity, suggests that systems select a set of variables or quantities which define the system-environment area of stability. The behaviour of the system is oriented all the time towards the control of these variables with respect to specific reference conditions (Bateson 1973, Powers 1973). Therefore this third step is concerned with the mechanism of feedback. Whatever

the internal distribution of variety may be, there is a hierarchy of feedback mechanisms from the lowest level of perception to the appropriate level of decision. There is a 'complete circuit' that links the perseptions to actions. From the epistemological viewpoint this is the organization's mechanism for gathering its knowledge from the environment. Although it may be difficult in particular situations to elucidate these feedback mechanisms, this model is suggested as a helpful tool for studying the process of collecting and handling information at the organizational level.

3. Organizations and Institutions

In our culture there is a tendency to talk indistinctly of institutions and organizations. Although this may help our perceptions of social systems it has the drawback that it may focus our attention on arbitrary entities from the systems viewpoint.

Institutions are social systems that our culture has reified with particular purposes. In other words to institutionalyse a system is to define a purpose for it, independent of the human beings which are the parts of that system. On the other hand an organisation is just a set of dynamic relationships between the parts of a system which make up its unity with no reference to the nature of the parts, which can be any as long as they satisfy these relations.

Organizations cannot have more purposes than the purposes of their individuals at different organizational levels that

of course change over time. If they change there is no use in perpetuating these purposes as objective expressions either of the parts or the whole organization. Without doubt we shall find large gaps between what the system is supposed to do and what it actually does (i.e. people are pursuing their own purposes). Although in this perspective the understanding of social organisations becomes indeed very complex, there is no use in dealing with simplified versions of them if this means to deal with surrogates which take us further and further away from reality. Institutionalization is a trick for reducing the environmental complexity. It may work in highly stable environments but in changeable situations it is dangerous because it leads to rigid organizations, i.e. we keep them tied to unreal purposes. In other words the claim for more flexible, adaptable organizations is the claim for des-institutionalization.

To explain why purposes change over time is to explain the learning and adapting process of a system. As there are environmental changes that are buffeting it (normally we talk about the system's input) their components react for absorbing these changes and therefore preserving - according to the criteria of viability - the internal equilibrium of the whole system. This naturally means changes in power relations. Under the environmental buffeting, the different parts of the system have selected new positions (observed as the system's outputs) compatible with the overall viability. They do not wait

for someone's order to change their purposes. It expresses an internal need for viability.

Buffeting has produced a change in people's levels of perception and their reaction is the mechanism to give way to the organisation's learning and adaptation. They have now restated their purposes. The process can also happen the other way round - people's increased levels of perception are a lever for organisational change.

The problem arises when institutional centres, which are more concerned with their own viability than that of the system, interfere with these mechanisms. Institutionalization adds to the emerging of these centres. They stop environmental buffeting at the organization's periphery. They act as buffers not allowing the rest of the subsystems to adjust their positions of equilibrium in accordance with the adapting mechanism stated above and therefore harden the whole organization. They keep systems artificially alive with unchanged purposes. By preserving themselves, the long term viability of the whole system is jeopardized. The outcome of all this are weak organizations, strong 'institutions' and a higher probability of step changes or 'catastrophes' in the long run.

The conclusions I draw from this analysis are the need to study the underlying organization of the systems of our interest and not just particular institutions, and also the need to assess people's perceptions and purposes as opposed

to the institution's stated purposes. The results of this analysis would be in the line of elucidating the relations between planning efforts and the learning and adaptation process of social organizations in different political, social, and economic contexts. Of course it is extreme in the sense that it may not be possible to overcome institutionalization but this is no good reason for focusing our attention just on the institutional level. Towards this end I shall develop the following parts of this paper.

4. Self-organization of complexity

No doubt regional systems are a complex of interactive organizations all of them being the result of different common purposes and fulfilling interactive roles. The last part pointed out the need to unveil as far as our limitations let us how complexity is self-organizing. The types of organizations operating in a region differ widely from culture to culture. They can be agencies of the Departments of State, independent appointed agencies, local authorities, community organizations, private organizations and so forth. In this context it does not seem possible to find out well defined boundaries where to focus the attention, the regional organization has a loose structure and it is difficult to develop a model of the so-called regional system. Agencies in the region are embedded in institutions that may not recognize the regional boundaries and so forth. Therefore the context of integrated regional programs seems to be

defined by the stated purpose for planning its development. The success depends on the extent to which this purpose is shared in the regional entities. No doubt one should also consider the implementing powers vested in this planning effort. The results of this regional planning, of course, are not just the observable outcomes of the planning institution but the dynamic changes in perceptions and purposes it is producing in the rest of the regional agencies, e.g. those concerned with social, cultural, industrial, etc. development. I suggest that the assessment of regional planning efforts should consider this organizational dimension i.e. our attention should be on the general organizational aspects of the region if we want to understand the potentiality of planning and not just the planning institution. As an example the relation between different local agencies (not just those concerned with planning)and central government may be an important parameter for assessing how effective planning can be. A rigid structure of this vertical dimension may impose constraints on the horizontal dimension (i.e. the integrated regional planning) to the extent of jeopardizing the whole effort. On the other hand a regional planning agency that develops well structured interactions either directly or indirectly with the other agencies in the community is making way for regional integrated planning.

So far it has been suggested that the regional system is fuzzy and that it is not possible to relate it to particular

institutions, but to a complex of organizations overlapping to a different extent with the geographical region. Nevertheless all of them are to different degrees sensitive to environmental changes and therefore readjusting their equilibrium positions, i.e. adapting for preserving their viability. If so, it seems relevant to know to which extent these organizations are committed to their regional viability, and whether the whole system is itself viable. If it is not viable, we have a gathering of organizations that de facto do not recognize an overall planning and decision process at regional level nor other structural constraints, although some of them may do. If it is viable, the region has developed de facto an intelligence and decision capacity, therefore is capable of dealing with unexpected changes, although this does not necessarily mean that structurally there is an institution governing the region. This criterion has a high explanatory power for the assessment of planning, and moreover we can make it operational. One of Beer's fundamental contributions to the study of complex systems is that all viable systems develop a unique pattern of organization. Consequently, he has proposed the already mentioned model of the organizational structure of any viable system, i.e. the organization that results from the self-organization of complexity. This model defines the operational framework for the study of systems. It does not mean that the structures of all organizations fit in the same model, but that they organize themselves according to the same laws that govern complexity.

This criterion of viability, for approaching integrated regional planning efforts, does not intend to say a priori that regional systems should be viable. It just says that the regional complexity should be absorbed by the different organizations (which do not necessarily map the region), and to asses how effectively it is absorbed is our concern, no matter what the structures are, and this is precisely what the criterion of viability is all about, i.e. viable systems are the most effective mechanisms for absorbing complexity. No doubt in different contexts we will find completely different patterns for absorbing the regional complexity; in some of them (the simplest cases) the process will rely only on one organization embedded in a unique higher order system; in some others on many regional systems, viable or not, embedded in one or more higher order systems, and so forth. The problem is to assess how effective all these arrangements are for the purpose of controlling regional complexity, where their weaknesses and strengths are. As I see it, the task is to elucidate these mechanisms, how well or badly they are related to the overall organization in which they are embedded, to what extent they are cultural expressions or the artificial result of a misunderstood system. In the end we should be capable of pointing out the systemic role of the different planning techniques and how they can be developed for a more effective process of controlling the regional complexity.

5. Assessing Organizations

So far I have developed a conceptual framework for organizations, and suggested that Beer's model gives us a tool for assessing the role of planning in complex systems. In the following I shall try to unfold this criterion of viability and give some insights into its practical use.

5.1 Measuring and Controlling Complexity

In the last part I concluded that viability is related to the control of complexity. The cybernetic measure of complexity as mentioned before is variety. It is not the absolute measure of variety that really matters, because even for very simple systems, its value will be high enough as to be non-operational. Ashby's Law of 'requisite variety' gives meaning to this measure. This law simply says that 'only variety can absorb variety', or in Beer's words 'that the variety of a given situation can be managed adequately only by control mechanisms having at least as great a capacity to generate variety themselves'[1)]. Although it may sound obvious, it is not difficult to find examples of organizations going against this law, particularly when they are concerned with planning.

If we think of the proliferating variety in the environment of modern organizations the great threat to their viability is the control of this variety. In other words, if there are constantly relevant environmental events that are not matched by control mechanisms in the organization as the law of requisite variety suggests, these organizations are overpowered by these events and

---

1 Stafford Beer, Platform for Change, p.231.

therefore no longer create their own future but are tied down by the given situation. Under this perspective planning is specifically aimed at designing organizations capable of matching the environmental variety.

The fact that we see institutions working irrespective of the proliferating environmental complexity suggests that they do exist as viable entitites. Why should we worry about all this if they manage to survive anyway? Although from time to time we may hear about collapsing organizations, almost all of them survive, and one is tempted to say that they are perfectly viable. Right, they manage to survive, and this would be a sign that present organizations, but only a few of them, have the internal mechanisms for absorbing environmental variety, and they comply with the law of requisite variety. If so, it would be better to formulate the problem in a different way: how effectively are the organizations concerned absorbing environmental variety? For a solution we have to develop criteria of effectiveness, and we get to the problem of the 'modes of control' which are inherent in every society. No doubt we should have some parameters for testing them in these different contexts. I am thinking of a metalanguage capable of overcoming the ideological barriers that so often render this task impossible.

5.2 Organizational Consistency

One of the fundamental organizational mechanisms, as mentioned before, is self-production (autopoisis). If the organization is flexible enough to recognize the changed purpose of its

members, it will succeed in making effective its internal self-organizing and self-regulating capabilities. It will be an organization capable of learning and adapting. It will internally generate a useful and large variety. On the other extreme, an institutionalized system adhering to old purposes will lose this learning and adapting capacity, just because it will not up-date its reference points to support these processes. This means that the organizational capacity for generating variety will be tuned to the evolving purposes of those concerned with preserving the so called 'institutional purposes'. Of course, the observable behaviour will be defined by the former purposes. These institutional centres are worried about their own and not the organization's survival, and therefore they interfere with the smooth development of the whole organization. These institutional centres, for their own survival, need the whole system to be viable, and its cost is the development of artificially viable subsystems (just because there is no learning or adaptation in them as proved before). The end result is a reduced organizational effectiveness. This seems to be a normal mechanism in our social institutions, therefore the extremist character of the present analysis is just to point out the nature of the problem and a direction for the organisation's assessment.

Naturally, if a subsystem is artificially alive, it does not develop a viable organization either because it does not need to or it is not allowed to by the systemic constraints. Therefore, the use of the model of any viable system ought to help us as a practical tool, to recognize to which degree this situation is present in different socio-cultural environments.

I have done this exercise before in large organizations, (Espejo 1975) and it was clear where these artificial systems were, and that they represented in a metasystemic context 'pockets of useless variety', although they were fulfilling useful and important roles at the systemic level. It was evident how incapable these organs were for developing a learning process and how useless their sophisticated planning techniques were.

I would suggest this as the most general test of effectiveness we can submit an organization to. No doubt it may come out to be a very difficult task but this does not seem to me to be a good reason for ignoring the problem. Underlying this analysis is the model of a viable organization embedding viable subsystems and embedded itself in a higher order viable system. Therefore, I am not just talking of two levels of recursion, but of as many relevant autonomous decision levels as we can find in the system of our interest.

In regions we shall find different relevant institutions (from the governmental or planning point of view) that are part of higher order organizations and they themselves have many subsystems. Therefore the analysis of information flows and communication channels that are actually operating and their mapping in our recursive model of a viable system would help us to recognize the healthiness of the regional institutions. Although this analysis considers different organizational tiers, it is not related for the moment to the well-known problem of centralization and decentralization. I am just pointing out the eventual development of artificially viable subsytems and not the practical

(i.e. political) decisions about the extent of centralization or decentralization. One can argue in scientific terms about the convenience/advantage of vesting central government more or less with the power of planning regional development or any other sort of planning, and I shall refer to this again later, but it is a completely different matter, after the decision is taken, to set up consciously or unconsciously mechanisms or constraints that frustrate de facto the potential role of the organizations that have emerged as a consequence of that decision. So far I have focused my attention only on this last point. Thus, it is an analysis that operates whatever the practical level of centralization or decentralization is. Fundamentally I am trying to highlight an explanation for understanding the gap between what the different institutions claim they are doing and what they actually do. What they claim to do is evident from the analysis of their established purposes and goals, and what they actually do needs a deeper analysis of the actual information flows and behaviour. (Beer's model is suggested as a useful paradigm for the latter purposes). It seems to me that this organizational assessment from the point of view of the institutions' role at the regional level, if possible, would provide a metasystemic framework for the assessment of the relevance of different planning efforts. By that I mean: are these planning efforts capable of absorbing effectively the relevant environmental variety? The meta-answer appears to be the organization itself, and not in the quality of the planning techniques.

5.22 Structural Effectiveness

The last part was very much concerned with the underlying relationships that define an organization as an entity. Now I shall focus the attention on the structures, i.e. the relation between the parts as well as the identities of the parts which constitute a whole.

My aim is to develop a practical approach to assess structural effectiveness, and on the side to explicit further the suggested tool for testing the 'organizational consistency'. No doubt there are more or less capable structures for generating control variety, and more or less effective mechanisms for controlling variety. The question is whether there is any criterion of effectiveness. Beer's answer is the criterion of 'viability'. "Whatever makes a system survival-worthy is necessary to it" and he even argues that it is sufficient to it[1]. Therefore as expected we are again referred to the model of any viable system. If we analyse institutional structures and compare them with this model, we should be able to assess their effectiveness. Now I am explicitly talking about particular institutions and not of the underlying organizations affecting, let us say, the regional development. Those institutions or structures that define in practice the 'modes of control' in different socio-political contexts. I am focusing the analysis on the mechanism of selforganization: homeostasis, i.e. the tendency of a complex system to move towards an equilibrial state. (Ashby 1952, Beer 1966, 1975).

[1] Beer, 'Platform for Change'. He develops this argument in the last paper of the book, concerned with praxis.

Different structures are reflecting different 'modes of control' although essentially as was said before it would be possible to map their underlying organizations in the same model if they are really viable systems. Of course there are many different ways of expressing viability. The concept of variety should help us again. As far as I can see, it is in the distribution of organizational variety where the different modes of control express themselves. This I consider the core of the centralization-decentralization argument. The many different levels of recursion defined by the institutional set-up is the most relevant way for distributing organizational variety. Each one of these levels works like an amplifier of the institutional variety reacting by themselves to the environmental buffeting and at the same time as filters because in doing so they match variety that otherwise would go to upper tiers. In different socio-political contexts the 'modes of control' take on different expressions. Are there any sort of organizational parameters for testing the effectiveness of them?

Cybernetics, the science for effective organization can give us some clues. One critical aspect is coordination. By that I mean the structural transmission of information between the different 'autonomous entities' of a system. If it works it should be one of the most powerful mechanisms for filtering environmental variety. But coordination may consume a good deal of the organization's variety. It works as a filter by reducing the courses of possible actions of each subsystem (i.e. helping to recognize the boundaries of stability between themselves and with the environment), however, this involves costs and the organisational effectiveness consists in minimizing them.

For example, an information system in real time may be much more effective as a coordinative device than the traditional coordinative meetings which are so time-consuming.
It seems that new levels of recursion are going to emerge if coordination in a given condition is not enough to absorb environmental variety. The new levels serve as the natural valve for the self-organization of a complex system. But, of course, we can find a whole range of possible combinations of recursion levels and coordinative mechanisms.
A second critical aspect is 'operational control'. It is not enough to have well coordinated subsystems. They are part of a system which is striving for its overall viability. The variety that comes up from the subsystems plus the system's own environmental variety should be controlled by its management structure. Again there is a whole range of possibilities from very little variety, coming up from and going down to the subsystems (highly decentralized system) to a large variety (centralized system). Different cultural aspects affect this loop. For example, if an institution relies for these purposes on the so-called 'management teams' which include managers both of the systemic and sybsystemic levels, it would not be difficult to find out that they become a 'coordinative team' which means that the systemic management has collapsed into the subsystemic level, and that in practice there is no flow of variety between two levels, just because there is only one, namely the subsystemic level. On the other hand, managers who do not have enough perceptions of the operations under their control may be affecting the implementing capacity of the whole system, by managing

without feedback. It is common that the perceptions of both sides of the loop about these situations are in conflict, just because there is no recognition that they are at two different systemic levels, which means a language and a metalanguage. Therefore, the 'variety balance' between controllers and controlled should be studied. Actually, centralization or decentralization is a matter of degrees, and clearly not of extremes. No extreme is viable. It would be interesting to find out more about the area of higher effectiveness and the concrete situations in different socio-political contexts.

A third aspect is the'planning' process. It is not enough for effectiveness to have well coordinated and controlled institutions. This aspect is concerned with absorbing environmental variety at the systemic level. What the cybernetic model tells us is that for higher effectiveness 'planning' should be in the line of command as an independent function dealing with the future. It is ineffective either to have 'planning functions' under the control of 'operational managers' or to have them just as advisors of policy-makers. In the first case, the future will be relegated by the overriding variety of today's problems. In the second, the necessary 'variety balance' between present and future problems would be missed.

The political level should solve the natural contradiciton arising from this balance. I think that, for example, institutions in socialist countries are much more aware of this problem than in other contexts. Planners are not just advisors, but are responsible for their decisions. They are feeding directly into the political level the outputs of their programs, structurally by-passing the typical operational oriented 'managers'

At least this means an interesting structural difference from similar Western institutions.

But it is not enough to have well-structured planning. There are some 'informational' complementory considerations that should be considered for a comprehensive analysis of planning effectiveness, and they are the subject of the next part.

To sum up so far, I have developed a framework pointing out coordination, operational control and planning as a set of interrelated aspects for studying the structural effectiveness of any institution. The dynamic interaction of these three aspects in particular contexts, define the different 'modes of control'.

5.2.3 Organizational epistemology

The exposition has been concerned with the organizational structure of large systems. I have developed criteria for assessing organizations in terms of the relationships between the parts, focusing the attention first on the nature of these relationships, and secondly on the concrete parts of an organization. Now I want to explore some criteria for assessing the way organizations structure their knowledge of the external environment. No doubt the complexity is so huge that we also can talk of 'modes of grasping reality'. The fact that we can observe systems in equilibrium with their environments suggests that in one way or another, consciously or unconsciously, organizations have developed particular epistemologies. Supported by the cybernetic paradigm, I make the hypothesis that organizations filter environmental information in very much the same way as human beings do. There are filtering processes which lead to

psychotic situations or to fairly stable recognitions of the relevant environments. For example, an organization that has not developed mechanisms to recognize transient situations compared to normal states will probably be overloaded with details provoking its instability, and all the ensuing consequences. In epistemological terms the concept of information I have in mind is that developed by Gregory Bateson (Bateson 1973). He suggests that the mental world, the mind, the world of information processing - is not limited by the organisational boundaries, and that the delimitation of an organizational mind must always depend upon what phenomena we wish to understand or explain. Obviously, there are lots of message pathways outside the boundaries, and these and the messages which they convey must be included as part of the mental system wherever they are relevant, and finally he states: "In principle, if you want to explain or understand anything in human behaviour, you are always dealing with total circuits, completed circuits".[1]

He has developed this epistemology as an explanation of human knowledge, but its cybernetic connotation suggests that it is also valid for any viable system. He is pointing to the main self-regulative mechanism: feedback. In practice, I suggest it is useful to recognize the expressions of these 'total circuits' in particular organizational set-ups. The focus of attention should be in the links between organizations and their

---

[1] Bateson, Gregory: "Steps to an Ecology of Mind" Paladin, 1973 p. 423.

environments and the internal continuity in the flow of information. Systemic breaks of continuity lead to a wrong epistemology and I think that this problem, for reasons that should be explored, is more relevant in bureaucratic institutions. The model I have in mind to explore these circuits is the one developed by William Powers in his book 'Behaviour: the control of perceptions'. (Powers 1973). He has developed this model from the psychological viewpoint, nevertheless it is a cybernetic model and therefore we can expect its mathematical expression to be an isomorphism of the behaviour of all viable systems.

When he refers to perception he means in general the entire set of events, following stimulation that occurs in the organization, all the way from the sensory receptors to the highest relevant decision centres in the organization. The sensory receptors get signals from the environment. The perceptual functions are the computing networks that transform various signals into one signal of higher order, and therefore they can be represented in a block diagram by a box receiving several signals and emitting <u>one</u> signal.

The main proposition of the model is that all behaviour is oriented all the time towards the control of 'certain quantities' with respect to specific 'reference conditions'. This means that feedback is the central and determining factor in all observed behaviour. And he states: "The purpose of any behaviour is to prevent 'controlled perceptions' from changing away from the 'reference condition'. Purpose implies goal: the goal of any behaviour is defined as the 'reference condition' of the

'controlled perception'."[1]

The model consists of a hierarchy of feedback controls, where higher level organizations counter disturbances of the controlled quantities by changing the reference conditions for lower-level organizations.

This model of behaviour provides an explanation and the mechanisms for the transmission and aggregation of data in a complex organization. Therefore, I think that it is a useful paradigm to study 'complete circuits' in Bateson's sense, although it does not provide criteria for recognizing the 'certain qualities' under control. But they are a result of the homeostatic equilibrium of the organization with its environment, i.e. they are variables that define the area of equilibrium. This process means an impressive filtering of environmental variety. The system actually selects a set of variables that seem to be vital to it.

If for any reason an organization perceives relevant data at a higher rate than the feedback mechanisms are capable of processing, or if it is perceiving data for which there are no feedback mechanisms at all, these additional data would be disturbing the systems operations until the mechanism is improved or built up, or else the system enters in oscillation. Viable systems are all the time in this process. The assessment of how this process happens and the nature of the mechanisms themselves in different institutional contexts is where I have focused the attention in this part. They are going to give us

---

[1] W. Powers "Behaviour; the control of perceptions", page 48

a picture of the institutional cognitive process. I think all this conceptual framework gives a paradigm for assessing in particular, the information systems already in use. The nature of the operating communication channels, the systemic selection of control variables, the time lags, the mechanisms for aggregating data, the setting of reference levels, etc., are elements of this analysis and point out the nature of the system's knowledge.

6. Summary

The three proposed steps for organizational assessment are not different in the sense that one has to be done first to continue with the following. Although they are systemically integrated, it is perfectly possible to study each one of them alone. Of course the cost is a loss in depth and synergy, but still I think the analysis is useful. The 'test of consistency' is pointing to the role of the parts in the context of the whole, and as mentioned before, not to the centralization/decentralization issue. The argument is centred on the concept of self-production. It was suggested that a healthy organization is oriented to its own self-production, as opposed to organizations tuned to the self-production of particular 'institutional centres'. In the latter case we can find parts 'artificially alive', and therefore the criterion of viability was suggested to render this test operational. The aim of the test is to provide an explanation for why institutions behave differently from what they claim to do.

Of course we can give a negative connotation to this mechanism of self-production of particular 'institutional centres', and therefore being afraid of even suggesting this sort of analysis. But it seems to be a very natural mechanism that makes the difference between the 'ideal organization' and our 'real

organizations', and its presentation was intended to find out methodologically a feedback loop to bring closer these two situations. At this stage its practical consequence would be to focus the attention on the underlying organization of the systems we are concerned with, and not just on the institutions. Its application to different cultures may bring to our attention an interesting area for suggesting organizational changes. Regional planning systems, if not highly sensitive in political terms, would be suitable for this purpose.

The test of structural effectiveness is oriented towards institutional assessment and pointing to the balance between the different structural relationships. Coordination, operational control and institutional planning are the three suggested factors to be tested and measured in each institution. Each one can be analyzed from the point of view of the variety it generates and absorbs. A healthy institution develops balanced relationships between the organizational parts that come out as a result of the self-organization of complexity (of course this has nothing to do with the organizational chart). There is a whole range of possibilities in the flow of variety; they define different 'modes of control'. This argument deals with the core of the centralization/decentralization issue.

The last suggested step is to test organizations from the viewpoint of the nature of the perceived information from the environment and its internal processing in the organization. It points out the need for assessing the characteristics of the loops that link perceptions to decisions. The nature of these loops define the organizational cognitive process. In particular the time lags and the mechanisms for aggregation of data are parameters to help the elucidation of these processes in different contexts. A particular area of interest for this test are the information systems in use, although its scope is wider than that.

Finally I want to stress the systemic interrelations of the three suggested tests. While the first is intended to provide an understanding of the role of the parts in the whole and the constraints for change, the second is concerned with the structural effectiveness of each part, which is in turn very much defined by the nature of those constraints; in particular the potentiality of these structures. The last test is taking into account the dynamics of the structures and organizations thus assessed.

References

(1) Ashby, Ross "An Introduction to Cybernetics" Chapman and Hall, 1956

(2) Bateson, Gregory "Steps to an Ecology of Mind" Paladin, 1973

(3) Beer, Stafford "Decision and Control" Wiley, 1966
"Brain of the Firm" Allan Lane, 1972
"Platform for Change" Wiley, 1975

(4) Espejo, Raul "Local Government; is it a viable system?" WP 14 Manchester Business School

(5) Powers, William "Behaviour; the control of perceptions" Aldine, 1973