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**STRATEGIC INFORMATION
SYSTEMS AT THE COLOMBIAN
PRESIDENT'S OFFICE (1990-1992).
A Managerial Cybernetic Approach.**

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JUNE 1994**

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THE UNIVERSITY OF ASTON IN BIRMINGHAM

Strategic Information Systems At The Colombian President's Office (1990-1992). A Cybernetics Approach.

**Angela María Espinosa
Doctor of Philosophy
1995**

SYNOPSIS

This research studies the issue of using strategically information technology for improving organizational effectiveness. It analyses different academic approaches explaining the nature of information systems and the need organizations feel of developing strategic information systems planning processes, to improve organisational effectiveness.

It chooses Managerial Cybernetics as the theorethical foundation supporting development of a "*Strategic Information Systems Planning*" Framework, and uses it for supporting the analysis of a documented story about the process lived by the Colombian President's Office, in 1990-1992. It argues that by analysing the situation through this new analysis framework we may enlighten some previously unclear situations lived, and noy yet properly explained through other approaches to strategic information systems planning.

The documented history explains the organizational context and strategic postures of the Colombian President's Office and the Colombian Public Sector, at that time, as well as some of the strategic information systems defined and developed. In particular it analyses a system developed jointly by the President's Office and the National Planning Department, for measuring results of the main national development programmes.

Then, it reviews these situation, at the light of the new framework and presents the main findings of the exercise. Finally, it analyses the whole research exercise, the perceived usefulness of the chosen frameworks and tools to enlighten the real situations analyzed that were not clear enough, and some open research paths to follow for future researchers interested in the issue.

Key Words: managerial cybernetics, strategic information systems, strategic information systems planning processes

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LIST OF ABBREVIATIONS

BRED	Budgeting Results Evaluation Division
AO	Advisor's Office
CONFIS	National Fiscal and Economic Policy Council
COMPES	National Socio Economic Policy Council
CPS	Colombian Public Sector
CSA	Critical Success Areas
CSF	Critical Success Factors
DASC	Civil Service Administrative Department
DAS	Public Security Administrative Department
DAAC	Aerospace Management Administrative Department
DANC	Cooperative's Management Administrative Department
DANE	Statistics National Administrative Department
FOSES	National Fund for Social and Security Emergencies.
IS	Information System
ISPO	Information System for the President's Office
IT	Information technology
NDP	National Development Plan
NPD	National Planning Department
PO	President's Office
PNR	Presidential Programme for the Rehabilitation of the Poorest and Most Affected by Violence Local Communities.
PPO	Presidential Programme's Office
SI&S	Secretariat of Information and Systems
TGA	Territorial Government Agencies
VSM	Viable System Model

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1. INTRODUCTION

1.1. RESEARCH BACKGROUND

Since social organizations became the main users of computers, people have often expected that computer usage will significantly improve organizational effectiveness. However, many organizations that have used computers for several years will not state, at this time, that there has been a clear improvement in their organizational effectiveness, mainly due to the use of computers. Nonetheless, most organizations still hope that computerization should be a direct step towards having more effective organizations.

This research is an analysis of the relationship between developing strategic information systems and improving organizational effectiveness. It studies the way we may strategically use computers and information, in order to foster organizational effectiveness and to support organizational development.

The interest that the researcher found in these issues resulted from many years of experience working and lecturing in the systems field. In particular her most recent experience as the Director of the Information and Systems Secretariat (referred to as "*SI&S*") at the Colombian President's Office (referred to as "*PO*") during 1990-1992. She left with many questions posed about the nature and impact of strategic information systems.

During this period the office developed a strategic information systems plan for the PO and it also guided the implementation of some of the strategic information systems. However, after the initial stage of implementation of the plan, it was felt that the results of implementation did not seem to have a clear enough impact on the efficiency of the President's Office.

One of the strategic information systems developed was a system of

indices for following up the results of implementation of the main socio-economic development projects defined in the national development plan (We shall refer to it as "*the index system*"). It was a pioneering project in the country and provided very important experiences and cultural changes in many organizations at the national level. Nevertheless, its results have not been significant enough for decision makers of the Colombian public sector and they are using it only occasionally.

1.2. RESEARCH AIM

This research is designed to identify the causes for success or failure of these and other strategic information systems suggested by the strategic information systems plan at the Colombian President's Office, during 1990-1992 and to suggest an approach to prevent similar problems occurring in the future.

The researcher considers that there were both technical and organizational mismatches in the definition and design of the strategic information systems in the real situations studied. She considers that the methods employed did not work properly either. She also feels that in order to minimize the inevitable problems, which such a mismatch causes, an approach to strategic information systems planning (SISP) is needed that promotes people's agreements about the organization's mission, strategic processes and required structural adjustments, as the starting point of the definition of required SIS support.

A review of the literature related to strategic information systems planning shows that there is recognition of this problem but few clear ideas about how to overcome it. The only well-documented approach fulfilling most of these requisites was that of organizational cybernetics, as suggested by Beer and Espejo, as well as some methods and tools from soft systems thinkers.

A detailed analysis of these issues requires the creation of a suitable comprehensive framework to provide the necessary structure for the analysis.

1.3. THE CONTEXT FOR DEVELOPING THE RESEARCH

A detailed investigation of this kind was possible as the researcher had previous experiences of the problem and worked in the Colombian President's Office, having direct access to needed information.

The researcher had previous experiences as a system analyst, a systems consultant and a systems manager. Then she went into research as a doctoral student and undertaking studies in the fields of system analysis and strategic information systems planning. She also became interested in managerial cybernetic ideas on organizational effectiveness.

The focus of the study changed from an initial focus on systems analysis, to a focus on SISP. It also changed from the idea of using managerial cybernetics criteria of effectiveness for supporting information systems development, to a focus on using it to support the formulation of information systems development's needs (i.e., the SISP process).

It was after the experience of developing a first case study to support the need for developing such a framework, that the researcher understood that the use of managerial cybernetic ideas might well offer criteria for defining strategic information systems and for creating the conditions to implement them. Her later experience with the SISP process at the PO confirmed her to focus the research in such direction.

The studied carried out consisted of the following steps:

1. A review of possible sources of theory to guide the analysis. This identified writing that was sufficiently comprehensive, giving rise to the need to formulate an analytical structure specifically for this study, in the first instance. The use of such a structure was also seen as a test of the theories on which it was based.

The main theoretical developments studied were those on re-designing organizations, organizational effectiveness and strategic information systems planning.

2. The development, by linking and modifying elements of established theory, of the basis for making the analysis. For reasons explained

later, this was centered on the managerial cybernetic approach.

3. The description and analysis of the real situations lived at the PO by 1990-1992, when formulating the SIS portfolio and when developing some SIS (particularly "*the index system*".)
4. The evaluation of the quality of the developed structure. Using past analysis, the researcher assessed the quality of the conceptual framework used, its contributions for professionals and researchers in the field of SISP and the future research paths which this research might open up. Such evaluation of conclusions led her to consider suggestions for changes in practice and additional subjects requiring further analysis.

The next chapter reviews the nature of the problem addressed and the range of theories and approaches to the problem capable of providing analytical guidance and procedural support. It does outline the bibliographical review made on the issues of information systems (IS) use, a company's need for strategically using IS, current SISP frameworks and methods as well as the questions they leave open to practitioners and researchers.

Chapter 3 describes the context in which the research was undertaken and details of the approach taken. It first offers an overview of the organizations and offices involved in the real situation described, its purposes, roles and strategic posture. Then it summarizes the approach to corporate strategic planning, SISP and organizational effectiveness taken. Finally, it introduces the structure of the remaining of the thesis.

1.4. SUMMARY OF THE RESEARCH'S CONCLUSIONS

The researcher considers that her main contribution was the development of a managerial cybernetic based framework for SISP processes and its testing as an analysis structure for assessing the situations described.

By the end of the process of developing these analyzes and framework, the researcher feels that it was worth doing the whole exercise. The main finding was that such a framework provides a coherent language that

might well be equally valid for managers and systems analysts while developing an SISP process and may help them to uncover strategic issues that other frameworks leave uncovered. The steps it recommends may well lead an organization into development of coherent debate about its structural, strategic and informational needs.

However newer research efforts would be required to test the framework as the one guiding development of SISP processes at practical situations in order to test this intuition, by now only confirmed by the researcher's own experience in using it as an analytical structure. Also, more research efforts seem to be necessary to develop educational tools for making easier to understand and to use main ideas from managerial cybernetics, that nowadays require much time to assimilate properly.

Nevertheless, having into account the organizational impact of information technology on current organizations, and the perceived needs of soft tools like the one proposed here, to guide harmonically and coherently SIS planning and organizational development processes, it seems worth doing further efforts contributing to such purpose.

2. REVIEWING CURRENT KNOWLEDGE ON STRATEGIC INFORMATION SYSTEMS PLANNING.

2.1. INTRODUCTION

This chapter outlines the bibliographic review made by the author on the issues of SIS and SISP, as the starting point of the research. The purpose of this literature review is to identify a suitable framework for real situations lived when developing the SISP process at the PO.

The chapter's development includes discussions about what the reported professional needs are, what has been done before by other researchers on these issues, as well as what techniques and methods are available for developing SISP processes and which ones have not been properly worked out.

To start with, the first section presents a background on the most relevant approaches among the community of IS researchers, in particular the so called hard systems, soft systems and managerial cybernetic approaches. It also comments on the main strengths and weaknesses of each approach.

Then it presents the main definitions of IS and IS types, as found in the IS research literature. It introduces some ideas about strategic information systems (SIS) and offers the researcher's own comprehension of SIS. It also describes the managerial cybernetic idea of management support system (MSS) and explains the purpose of developing this type of system.

Later on, there is a section explaining how IT has evolved in the last decades, and how organisations have learned to use IT. It describes the researcher's view of the SISP process, as a felt need from enterprises which are investing many resources in strategically using IT, looking for improving their own competitiveness and development. Then it offers a summary of the questions left open by SISP for SISP researchers on the

most common problems they find while developing an SISP process.

Later on, there is a section summarizing and critically reviewing the main frameworks and SISP tools currently offered by SISP researchers from different approaches. The presentation reveals the lack of a coherent systemic framework of SISP taking into account both content and contextual aspects of the process.

The chapter closes by introducing the main ideas and tools proposed by the managerial cybernetic researchers and presents the reasons for choosing it as the most suitable approach to guide the development of the proposed SISP framework.

2.2 BACKGROUND ON SYSTEMIC APPROACHES

For readers who are not familiar with systemic approaches, a summary of the development of systems thinking follows below. It describes what the Hard Systems Approach, the Soft Systems Approach and the Managerial Cybernetic Approach are. For more experienced readers, Section 3.2.4 presents a summary of the different perspectives of the systemic approaches.

2.2.1. The Hard Systems Approach

One usually relates systems ideas to computer-based information systems; perhaps because the first disciplines one hears about which were working and developing them, were those of systems engineering and systems analysis.

Systems engineering studies the set of activities required to design, build and implement computerized information systems. Systems analysis describes the set of activities required to define information systems requirements, evaluate alternatives in designs and costs, and the selection of a particular system. <Sager, 90>

Because these disciplines focus on solving highly structured and well-defined problems, some researchers grouped them as the "*Hard Systems Approach*" to information systems. They argue that it is easier to find

these rather well-defined problems in the physical world, but it is not that easy to find them within the human and social worlds. <Checkland, 81>

Original followers of the Hard Systems Approach studied machine-like situations where they could preview their structured and recognizable input, outputs and behaviors. They made little effort to analyze the social problems underlying these formal, defined patterns of interaction.

Therefore, most of the traditional systems development techniques focused on data collection and definition of procedures. Systems engineers used to study most of the information needs at a low operational task level that was highly formalized, while rarely covering the management level needs that were highly unstructured.

Later on some researchers applied ideas coming from this approach to many types of organisational problems, aiming to find more efficient ways of processing the existing data. Their efforts signal the origin of systems analysis.

By the 1970s and 1980s, the emphasis on IS was not only on data processing but on decision processes, understanding the latter as the central task of managers. As a consequence, some researchers on IS began to define them as tools to facilitate the decision making process.

From this point of view, they considered an information system as a system for processing all the routine and managerial data, for making pre-programmed decisions when necessary, and for giving the required information at all managerial levels for effective planning, control and decision making. <Burch and Strater, 74>

Other researchers then began to apply systems engineering and systems analysis techniques to organisational systems that dealt with business and social welfare problems. According to these researchers, who used to be very critical of the Hard Systems Approach, there were too many limitations in its underlying model of an information system because it focused almost exclusively on technical systems, underestimating the importance of human factors. <Jackson, 88>

While developing systemic ideas, some researchers identify their thinking to "*holism*". Holism is a philosophical approach contrary to

reductionism, aimed at understanding problems of complexity that are the problems of living and social systems. Original ideas coming from cybernetics have greatly contributed to holism (see Section 2.2.3).

Whatever criticisms there have been of the so-called "*Hard Systems Approach*," it has dominated the last 30 years of information systems research and systems practice and it is still the one with the most acceptance and uses in the commercial world.

2.2.2. The Soft Systems Approach

It was in the 1980s with the "*Soft Systems Approach*," led by Checkland, that the systems movement began to focus more on the soft aspects of social organisations. The emphasis of this new approach is on the understanding of the diverse perceptions that people have of social organisations as the basis for debating the nature of a particular social situation. <Checkland, 81>

It offers the idea of "*Human Activity Systems*" as that of "*a group of human beings undertaking purposeful activities*." Using the idea of Human Activity Systems, one may re-understand information systems not only as technological tools for data processing, but also as a particular form of social organisation where some human beings relate to each other with the help of IT tools.

In terms of the systems development process, this new understanding of IS opened up new ways of confronting the beginning and later stages of the development process; They are stages in which the appropriate management of related social problems seems to be a key variable in a successful development process.

As suggested before, the traditional approach to systems analysis takes as given the manager's understanding of the problem that (s)he attempts to solve when commencing the analysis of information systems. Checkland points out that this is the Achilles heel of systems engineering. He argues that even if system engineering is useful enough in developing solutions to highly structured problems, it is not necessarily the most convenient road to take when one works with ill-structured situations. <Checkland, 91>

He also suggests that, when a situation is not felt to be easy, the manager's responsibility is to speculate about the "*what to do*" as well as about the "*how to do it*," in order to clarify the very nature of the problematic situation. Finally, Checkland concludes that well-structured situations are more the exception than the rule from a managerial point of view.

The methodology developed by Checkland, called the "*Soft Systems Methodology*" serves to facilitate change in social organisations. It serves as an analysis tool to help the analysts (change agents) to coordinate the social and technical changes introduced in the organisation as a result of the implementation of information systems or IT tools.

It also reveals the need for analysts to assume a "*non-protagonist*" role in problem solving situations; and clarifies their role as facilitators in promoting social learning within the group of participants involved in the situations, in order to achieve re-accommodation of the social order and to maintain cohesion. <Jackson, 87>

Before Checkland's approach, there was an assumption that systems engineers were able to develop an appropriate model of the required IS, both in terms of data structures and organisational procedures. This assumption underestimated the importance of users' knowledge and of users' learning capacity about their information-handling structures and processes. Several researchers have demonstrated the importance of user participation in the IS development process. <Mumford, 83>

From this perspective, what traditional approaches have not distinguished is the relevance of the meaning-giving process that would convert data into information for any user. *Soft Systems Methodology* might be useful for coming to terms with the users about what they would define as a purposeful system. Then, one could apply more traditional approaches to IS formulation. <Checkland & Scholes, 90>

Soft Systems Methodology becomes particularly useful as a tool for the early stages in an information systems development process, such as the formulation of the information systems' requirements. Even if other researchers have also suggested it as a relevant tool for aiding in the SISP process, there are few references describing how to do it, rather there are just a few isolated proposals to integrate these ideas with the ones required for guiding this kind of processes <Doyle, 91>.

In the last few years there has been an increasing acceptance of the Soft System Approach. More than generating computerized systems, this approach puts its emphasis on general problem solving. <Wilson, 83> <Flood, 88>

Nevertheless, the soft-oriented methodologies have an obvious academic background and the public has used them less, although the scientific community has discussed them and studied them widely. <Wasserman, Freeman and Portella, 83>

From a critical viewpoint, there are some restrictions in soft systems' conceptual models and tools. In particular, they fail to recognize the relevance of the existing organisational structure in aiding or disrupting change implementation.

They do not explicitly address the relationship between communication processes and information management, or the relationship between communication tools and organisational structure. They even lack coherent conceptual models to represent, study and analyze the social organisation in which the problematic situation occurs.

From the viewpoint of this research's purposes, the researcher considers it very useful to integrate some of the ideas and tools coming from this approach with ideas coming from managerial cybernetics, in terms of guiding a SISP process. In particular, the soft systems methodology seems to be a good approach for guiding debates on issues such as those for formulating corporate plans or even the IS portfolio.

The researcher considers that, even if the soft systems methodology as a whole might not be useful for guiding an SISP process, some of its tools and the more general ideas for guiding the learning process of a group are very valuable for supporting an SISP process.

In particular, it seems to her to be very important to take into account the tools for naming systems (root definitions, rich picture and modeling the transformation) from Checkland, as well as Wilson's tools for modeling organisational activities, when defining the desired SISP process. Also Rockart's tool for defining critical success factors and Porter's ideas on strategy, competitiveness and the value chain appear to be very valuable

for same purpose. <Checkland, 88>, <Checkland and Scholes, 90>, <Wilson, 84> <Porter, 85>

In terms of the context for developing the SISP process, the researcher considers that an analyst guiding it should be properly trained in soft system's ideas, in order to improve his(her) skills in leading the implied social learning process.

2.2.3. The Managerial Cybernetic Perspective

Wiener (1964) defined cybernetics as "*the science of communication and control in machines and animals.*" He, says that

It is my thesis that the physical functioning of the living individual and the operation of some of the newer communication machines are precisely parallel in their analogous attempts to control entropy through feedback. <Wiener, 54>

The basic ideas studied by cybernetics were the concepts of communication, information, feedback and learning. They came as a result of the joint work of neuron-physiologists and mathematicians who tried to uncover the general principles guiding the behavior of living systems when interacting together. In particular they studied learning mechanisms and social behavior related to learning processes. <Ashby, 60>, <Wiener, 61>

Stafford Beer later took the main cybernetic principles (feedback, the law of requisite variety developed by Ross Ashby and so on) and used them as the basis for developing a model of social organisation. In order to develop the model, he used Warren McCullough's work on the structural characteristics of the human nervous system and made an analogy with the organisational structure of a social organisation. <Mc. Cullough, 65>, <Beer, 81>

After several years of research he tested some general principles that suggested isomorphism or systemic laws in both the individual and social system. Such principles constitute the fundamentals of the "*Viable System Model*" (to be referred to as the "VSM") as he called his model of social organisation.

His model explains the main structural arrangements that operate in any

social organisation and the mechanisms for learning and adapting to a changing environment which a social organisation develops in order to survive. <Beer, 79> <Beer, 81>

Many of Beer's followers have applied his ideas to the analysis and diagnosis of social organisations. Beer himself offers comments on the usefulness and limitations of the model <Beer, 84> and offers us detailed recommendations for its use. <Beer, 85>

This body of ideas, originally proposed by Beer and then tested by his followers, gave birth to the new discipline called Managerial Cybernetics, or Organisational Cybernetics. Beer defined it as "*the science of effective organisation.*" <Beer, 85>

At the present time there is a broad choice of selective applications of managerial cybernetics ideas, in particular, applications of the viable system model for organisational diagnosis, most of them coming from people with academic backgrounds in this area: There are fewer examples of applications of managerial cybernetics ideas at the commercial level. <Espejo & Harnden, 89> <Espejo & Schwaninger, 93> Appendix # 1 presents a more detailed background on the Managerial Cybernetics Approach.

Even if this set of scientific ideas has been available to the scientific community for many years, only recently has it begun to show a clearer interest in them; it has also begun to recognize the importance they might have for improving current managerial practices.

There are many critics of the managerial cybernetics' ideas, in particular researchers from other systemic approaches, like the soft system's approach or the critical approach. At the philosophical level they argue that managerial cybernetics' structuralism leads it away from the perspectives that the new paradigm of the systems approach is looking for. <Jackson, 92>

Other critiques argue that it concentrates too much on structural problems, misunderstanding the importance of "*meaning-giving*" types of problems in creating a social context. Others would even argue that it takes for granted the organisational identity and purposes, and attempts to model the organisation from the viewpoint of the observer.

The researcher considers that Espejo has contributed to solving most of these arguments against Beer's original work, by introducing soft systems ideas and tools for guiding the learning cycle of an organisation, as well as for guiding the conceptual learning loop while dealing with a complex situation. <Espejo, 89>

2.2.4. Summary of the Systemic Approaches

As explained in the previous sections, the Hard Systems Approach has been the more widely used approach in the last thirty years of information systems research and practice. It focuses on the technological aspects of IS analysis and development.

On the other hand, the Soft Systems Approach broadens the understanding of social learning processes by describing the idea of human activity systems that take into account both the technological and the human aspects of social learning processes. This approach has received increasing acceptance within the scientific community in the past few years, but the public is less acquainted with it and uses it less often. Its main area of application is in problem solving and in the preliminary stages of IS development.

The Organisational Cybernetics approach started as a way to understand the complexity of living systems. Then, Stafford Beer and his followers applied its main findings to uncover the nature of social organisations, creating the field of Organisational Cybernetics. <Beer, 75 ... 88>

Its main difference with the Soft Systems Approach is in the emphasis which Organisational Cybernetics gives to the understanding of the context in which a social learning process (as is the SISP) occurs. Its followers would argue that SSM does not provide the necessary tools to deal with the operational domain of the participants. In Espejo's own words,

"effective problem solving makes necessary an effective operational domain for problem solvers to create issues of concern and to implement the change implied by these issues" <Espejo, 93a>.

Jackson argues that VSM has a more structuralist nature than the interpretative nature that Harnden and Espejo want to align it to.

<Harnden, 89> He says that Espejo's methodology for using VSM does not help to deal properly with the complex nature of social discourse. Nevertheless, he recognizes, that,

... "Soft systems thinking is certainly not equipped, in the way organisational cybernetics is, to enhance the steering capacities of organisations and societies, and this is central to their successful evolution." <Jackson, 92>

From my own viewpoint as a researcher, I consider that Espejo's methods and tools complement Beer's ones in the way they recognize the nature of VSM as a tool for guiding social debates about particularly complex issues.

Summarizing, the focus of organisational cybernetics clearly differs from soft systems thinking; yet, both of them give complementary answers to many organisational problems. The researcher considers that is highly advisable to re-understand VSM in the way suggested by some researchers from the soft systems approach. <Espejo, 89a>

From a technical viewpoint, neither the cybernetic nor the soft systems approaches pretend to question the relevance of hard system methods in developing information systems. On the contrary, they are all complementary approaches and they all present useful ideas and methodological tools for working out information and communication problems in social organisations. Moreover, it seems unlikely that we can solve managerial problems only with the tools provided by one of them, due to the complex nature of these problems.

With regard to the discipline of SISP, the reader will find that most SISP researchers have taken most of their ideas from other researchers following one of these approaches. Given the importance of both the technological and managerial components of the SISP process, the researcher feels that all of them offer insights for the development of this new discipline.

From the viewpoint of this research's objectives, the researcher considers that managerial cybernetics' ideas offer a sound theoretical background for developing a framework for guiding a SISP process. In particular, the researcher considers the VSM to be very useful as a language for guiding discussions about organisational structure, organisational strategy and about organisational effectiveness. In this respect, she agrees with

Harnden's suggestion of using VSM as a conversational tool to grasp the nature of complex problems in the real situations people deal with in their social interactions. <Harnden, 89>

Due to the holistic and abstract nature of VSM language, the researcher considers that it would not interfere but rather support understanding of day-to-day situations, if properly understood by analysts and or people from the organisation. As a language for debating organisational effectiveness, VSM concentrates discussions on issues that people consider the most problematic ones for operating effectively. Other models concentrate debates on possibilities for changing current difficulties but give less importance to making people aware of their current problems.

In terms of debating strategy, the researcher considers that if these issues are not properly debated there are less opportunities of creating proper conditions for effective learning, as required in a strategic planning process. The researcher considers that most of the strategic planning frameworks used currently over-emphasize the debates about likely futures and do not promote debates about creating conditions for making these futures viable, according to the organisations current skills and resources.

However inspiring these thoughts seem to the researcher, it is important to take into account that the level of abstraction of VSM and managerial cybernetic ideas is still quite high, which might make the experience of using them frustrating for steering practical situations, unless one has the permanent support of an expert.

2.3. INFORMATION SYSTEMS, STRATEGIC PLANNING AND STRATEGIC INFORMATION SYSTEMS PLANNING

This section will summarize the literature review made on the subjects of strategic planning, information systems and strategic information systems planning. It presents what the researcher feels to be the best-known ideas and frameworks, and comments on their strengths and weaknesses.

2.3.1. What an Information System is

As suggested earlier, this section summarizes the different ways to

comprehend Information Systems presented by some researchers from the main approaches described before. Figure 2-3-1 summarizes these different but complementary views on information systems chosen from the literature review.

As it makes clear, most researchers first defined information systems as sets of data and computer-based procedures for more effectively processing data for some organisational functions. Then as the importance of information in the decision making process became apparent, other researchers reviewed the idea of information systems as tools for helping the management function.

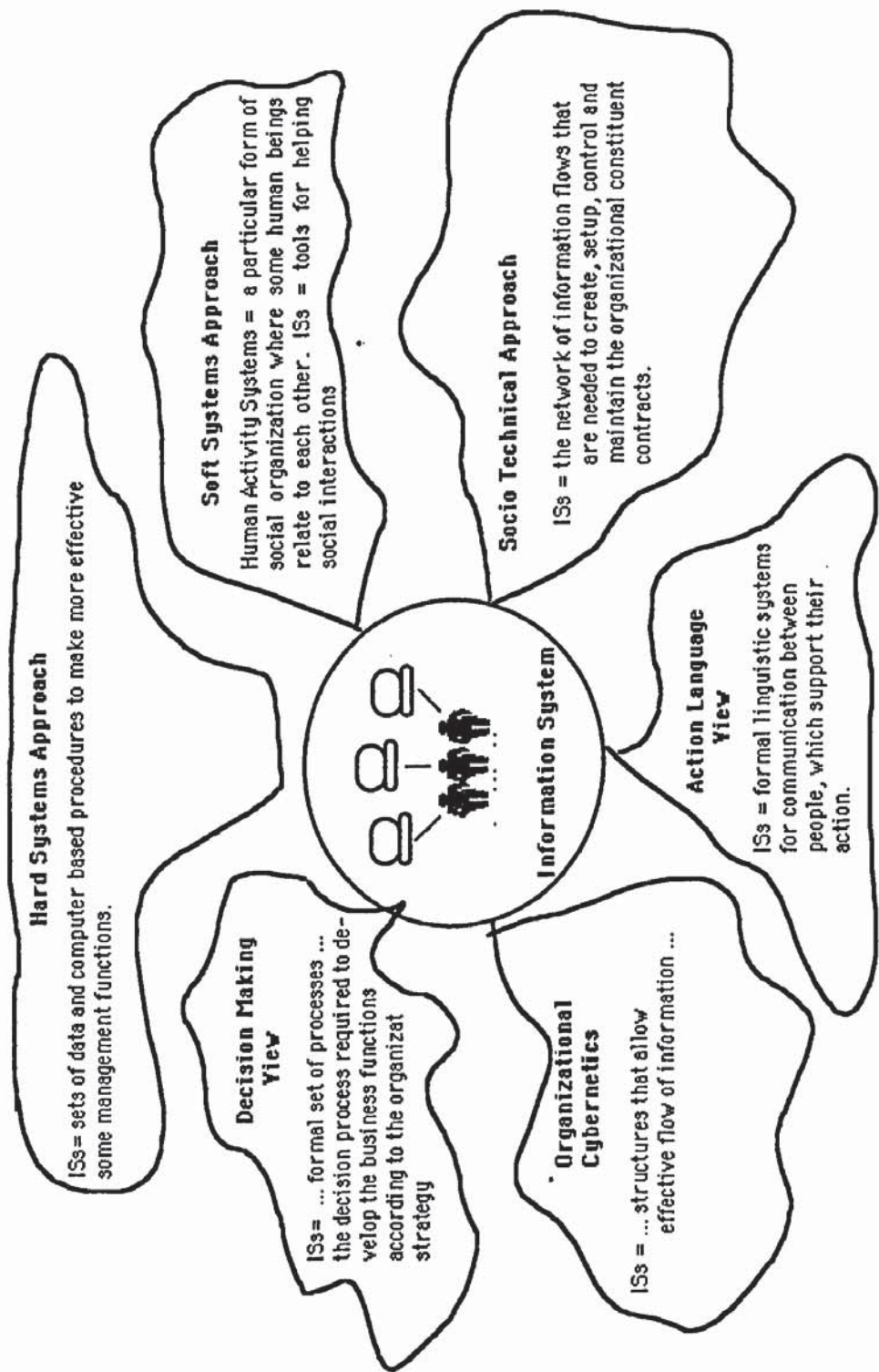
Another, a more recent, view of ISs is the "*socio-technical approach*" which argues that the technical aspects of information systems are not the main ones, but rather the human and organisational ones. They view systems as "*evolving social forms of sense-making, by which different groupings relate to each other in an uncertain environment*" <Keen, 81> <Hirshheim & Klein, 87>.

From their perspective, the learning process followed when formulating and implementing ISs is as important as the result. One reason which makes it as important, is that during the learning process we are able to create new meanings that are eventually likely to gain social legitimacy. They also agree with Ciborra's definition of ISs as "*the network of information flows that are needed to create, set up, control and maintain the organisational constituent contracts.*" <Ciborra, 84> <Ciborra & Lanzara, 89>

Newer approaches to IS research have stated alternative forms of viewing an information system: For example the "*Action Language View*" defines ISs as "*formal linguistic systems for communication between people which support their actions.*" <Goldkhul & Lyytinen, 1982>

Espejo recently defined ISs as "*structures that allow effective flow of information.*" This suggestion about the nature of ISs opened up new questions for the researcher, but she found no later development of the idea. It leads her to conclude that there appears to be an area open to investigation for interpreting the idea of ISs using managerial cybernetic language. <Espejo, 93b>

**Fig. 2-3-1 INFORMATION SYSTEMS AS VIEWED FROM
DIFFERENT CONCEPTUAL APPROACHES**



Finally, it seems convenient to make a distinction between Information Technology (IT) and Information Systems (IS). Generally speaking, people have the tendency to understand IT as the set of electronic data processing tools that help the implementation of tasks in social organisations. The idea of IT makes us think of electronic data-processing tools like computers, hardware tools, printers, scanners, modems, ISs and so on.

Even while ISs will normally have a strong component of IT based tools, newer definitions of IS are helpful for understanding them on a wider basis than the traditional one which saw them as purely technologically-based systems. In order to avoid misunderstandings, the researcher will use the idea of IT, in the rest of this study, as a component (but not necessarily the main component) of ISs.

The researcher will also consider the issue, often coined "*information technology planning*" as a particularly important issue to be dealt with when following a strategic information systems planning process.

2.3.2. Information Systems: Use and Evolution

At the earliest stages of IS use, most organisations first computerized the accounting and operating functions. Currently, most medium or large organisations have solved their needs to manage information at the operational level. Now they are developing or acquiring more sophisticated IT tools and IS types for fulfilling their information needs.

There are now more and better office automation tools available like spreadsheets, databases, word processors, graphics tools, mailing systems, notebook systems and filing systems. The most important effect users have felt from using this sort of tools is that they contribute significantly to closing the gap between them and the use of previous technological tools.

Spreadsheets are particularly useful for helping people with responsibilities for budgeting or simulating economic scenarios. They also serve most people if they want to replace paper, calculators, pencils and erasers in all kinds of tasks.

Databases serve most people because they manage information on certain matters such as clients, suppliers, products or whatever category of information they deal with permanently. Also, word processors are useful because they replace typewriters and offer all kinds of additional help that typewriters did not provide, while graphics tools serve to represent all kinds of situations in a pictorial way, facilitating communication.

Mailing systems serve to send or receive messages to or from anyone who has electronic communication links. Filing systems serve to create, update and use electronic files with all types of electronic documents. Some authors denominate "*transaction processing systems*" as a category of information systems solving traditional managerial procedures such as accounting, inventory, and so forth. <Davis & Olson, 84>

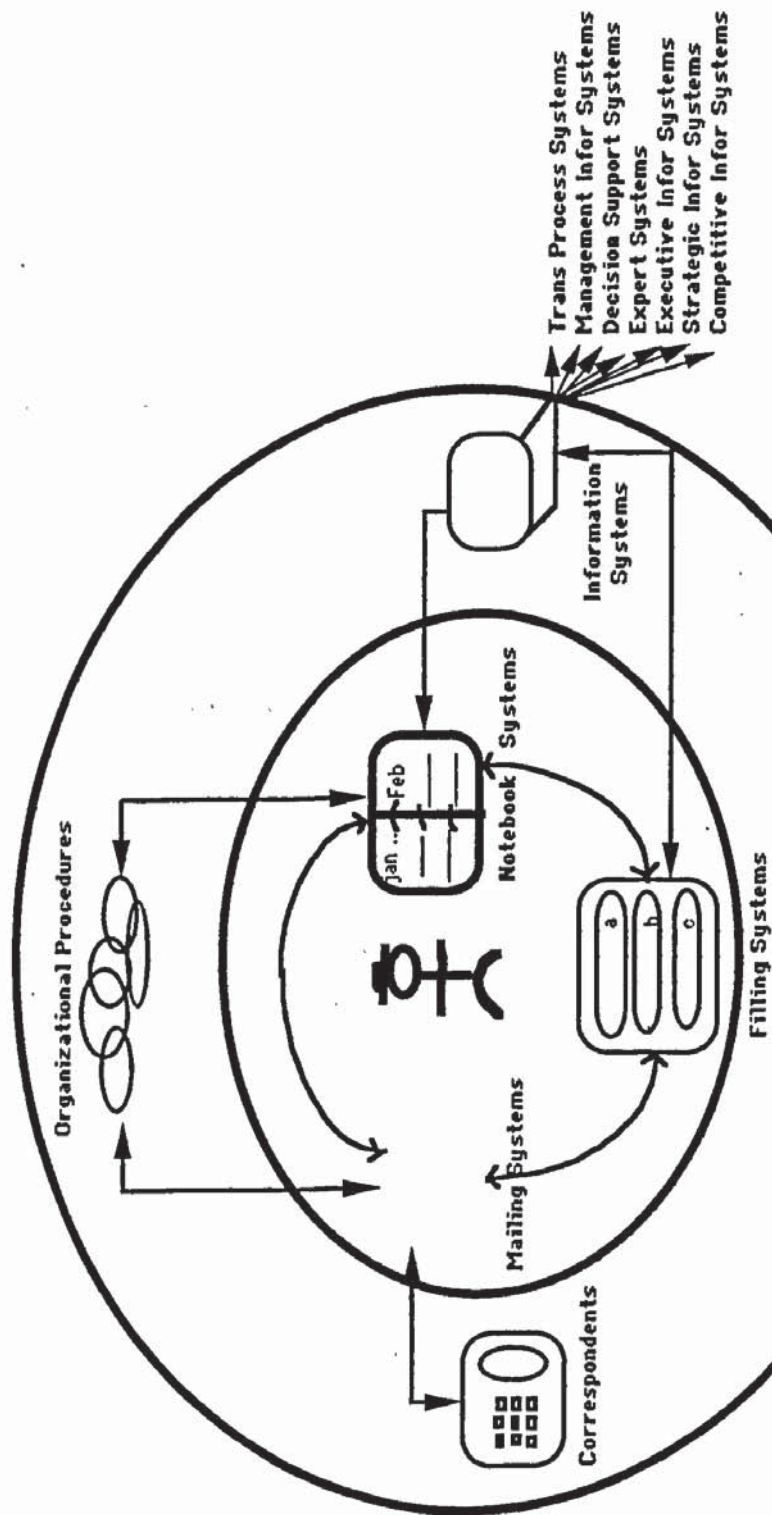
Once business people have used and experienced these types of systems, newer and more sophisticated types of ISs become interesting to them. In particular, the development of ISs for solving management and executive needs becomes an important goal in the development of the IS function.

Figure 2-3-2 presents a selected typology of IS tools, resulting from the bibliographic review. It includes tools such as filing systems, mailing systems, networking systems and others (i.e., spreadsheets, word processing, data bases and graphics tools). It also describes the different types of ISs, such as transaction processing systems, management information systems, expert systems, executive information systems, group decision support systems, strategic information systems (SIS) and competitive information systems.

Some researchers have noted that there are different definitions in the literature of terms such as management information systems, decision support systems, and executive information systems; and they also note that these terms are often used synonymously. <Rockart & DeLong, 88>

In order to provide a common understanding of the typology presented in the figure, the researcher presents some definitions of the different types of ISs that she considers as precise interpretations of each term.

Fig. 2-3-2 Information Systems' Types



Adapted from (Ramirez &
Steer, 92)

2.3.2.1. Management Information Systems

Andrew, et al, define them as follows:

"Management Information Systems are the formal set of processes, which, operating over a structured data collection based upon organisational needs, collect, process and distribute (part of) the information required for the enterprise operation, control and direction of activities; it does support (at least partially) the decision process required to develop the business functions, according to the organisational strategy." <Andrew et al, 91>

In general, systems practice has made broad use of this term. Most of the generic systems in organisations could be considered systems of this type.

2.3.2.2. Decision Support Systems

A Decision Support System has been defined as:

"A system which uses models of the relationships between decisions and outcomes to support problem solving" <Millet & Mawhinney, 92>

While Management Information Systems are "*task-oriented*," the more formalized and structured Decision Support Systems are more "*decision-oriented*" and we may expect managers to use them. David and Olson present in their book a complete description of the characteristics of these systems.

Traditionally, researchers and professionals have seen their purpose as that of providing rational tools to aid managers in the decision-making process. The resulting tools are mostly office automation tools or data bases designed for aiding a manager's particular task.

Nevertheless, some researchers have understood that decision making is a process of social interactions, where each manager's rational models of a situation would not necessarily define the form the decision takes. Some of them also recommend considering the process of negotiation of meanings between all the participants in the decision making process. <Keen, 81>

More appropriate to this trend's view are newer research and technological developments in the field of group decision support systems

and computer- supported cooperative work. According to researchers in the new fields, they are concerned with providing IT intervention to support interacting groups-making decisions. <Whitaker, 92>

2.3.2.3. Expert Systems (ES)

Michie defined them as:

"An Expert System is a computing system which embodies organized knowledge concerning some specific area of human expertise, sufficient to be able to do duty as a skillful and cost effective consultant." <Michie, 80>

2.3.2.4. Executive Information Systems

A definition for an executive information system is:

"An Executive Information System is a system that integrates information from internal and external data sources enabling executives to monitor and request information of key importance to them via customized presentation formats" <Millet & Mawhinney, 92>

Millet & Mawhinney state that professionals use EISs predominantly for monitoring purposes: EISs present indicators that show executives important aspects of the organisational aspects and/or the environment conditions. They also conclude that Executive Information Systems need a good Management Information System's basis in order to provide relevant information and that their development should primarily assess whether the existing basis is able to provide the required information.

Other researchers point out that users do not always sense the advantages expected from the implementation of Executive Information System. For instance, Korzeniowsky relates that half of this type of systems set up in the 1980s has failed to provide real advantages for their users. <Korzeniowsky, 90>

Failures of this systems implementation are both technical and managerial. Some researchers point to the difficulties in getting quality information to the managers using them. Crockett describes as a relevant problem in their formulation, that most existing frameworks focus on one strategic decision and the information needs to make it, instead of

monitoring the key process of strategy implementation. He notes the importance of taking into account both types of information so that the resulting Executive Information System could be an early warning system and not a conveyor of periodic results.<Crockett, 92>

2.3.2.5. Networking Systems

The Action Language Approach has coined the term "*networking systems*." This new orientation to computer systems focuses on interventions in the recurrent patterns of linguistic communications that provides coordination between actions.

As an example, the Coordinator is a networking system developed by Action Technologies Inc. It is a system for managing action in time, based on a theory of linguistic commitment and completion of conversations. Its aim is to monitor the progress of conversations. It understands the typical office as a structure of "recurrent patterns of conversations associated with formal, detected roles." <Florez et al, 88>

2.3.2.6. Strategic Information Systems (SIS) and Competitive Information Systems

Huff & Beattie have made a distinction between them as follows:

"Strategic Information Systems" (SIS) are those which directly support the creation and implementation of an organisation's strategic plan ... Competitive Information Systems directly support the execution of strategy by improving the value/cost relationship of the firm in its competitive environment." <Huff & Beattie, 85>

However, it seems important for the researcher to re-define the idea of SIS: The idea introduced earlier leaves open a crucial question about the nature of SIS. One may read the definition of SIS as tools for helping managers to support strategy creation and to follow up its implementation; in this case, they would be a special type of EIS.

The next section introduces the idea of systems of the EIS type which that researchers from Organisational Cybernetics have coined Management Support Systems. For this research's purposes, we shall refer to this type

of systems as MSS, as the following definition makes clear.

Nevertheless, there is another reading of this definition of SIS and CIS that needs further clarification. It is the understanding of SIS as IS to support the implementation of strategic processes defined by the organisational strategy, a definition that would then be closer to the later one of CIS. The next section presents the researcher's own view of SIS in the sense mentioned here, and the definition that would be employed in the following chapters when referring to SIS.

2.3.3. This research's view of Strategic Information Systems

Having discussed the use and evolution of IS as well as the main IS categories, , this section discusses the researcher's chosen definition of SIS. It is as follows,

"SIS are systems to support the implementation of processes that are seen by managers as processes having an strategic value for fostering organisational development and competitiveness."

According to this definition, one may view the SISP process as an on-going activity developed by managers and information systems professionals at all levels in the organisation, debating the required SIS that would offer the best support for the implementation of processes considered as the most strategic ones for improving organisational development and competitive position.

In order to properly debate such issues managerial cybernetics researchers suggest that it is as important to look for proper conditions to guarantee the effective implementation of the organisational strategic processes as it is to debate the required technological tools for supporting them.

Accordingly, many implementation failures of SISP processes may well come from defining an IS plan that does not mirror the management processes it intends to support, or by not designing the right organisational adjustments for the effective implementation of the strategic processes that the SIS attempt to support.

In order to avoid this occurring, researchers from managerial cybernetics created "*Cybersyn*" as a model of effective management supported by a management support system, ideas that next section introduces and that are going to be further described by the next chapter.

Cybernetic researchers point out that a MSS would always have an strategic nature as a learning facilitator, for they define it as the system required to guarantee that managers be able to analyze organisational performance and to assess their own effectiveness in implementing the strategy. The researcher considers that the use of such a system may even offer criteria for the managers on the IS required to strategically support management processes.

2.3.4. Cybersyn and The Managerial Cybernetic idea of a MSS

Espejo defines Management Support Systems (MSS) as "*systems to support effective management.*" From the description he makes of such a system, it seems to the researcher that he refers to a particular type of EIS, which helps managers relate strategy and operational results, through index information. <Espejo, 91>

Cybersyn has two main components. The first one is a computer system, *Cyberfilter*, whose intent is to support the individual activities of a manager, by providing him with appropriate information management tools. The second is the *Cybersyn* methodology that uses VSM as a design paradigm for defining an effective communications network of all the interrelated management tasks required to produce the organisational results.

Stafford Beer originally designed and used the Cybersyn Methodology in the design and implementation of an index system to follow the development of the industrial sector in Chile during Allende's administration. He also comments on other experiences such as implementing Cybersyn at the top government level in Uruguay. Syncho Ltd., a British company chaired by Beer and managed by Espejo, developed the project and the Cyberfilter software. As commented earlier, Schuhmann reports more recently on a practical use of Cybersyn, developed with the support of Syncho, at the Film Division of Hoechst, AG, Germany. <Beer, 81>, <Espejo, 89e> <Beer, 89> <Schuhmann, 93>

Summarizing, we have defined a MSS as a special-purpose type of EIS. Its function is to serve as a tool for strategists, managers and executives responsible for the formulation and implementation of a strategic corporate plan

The researcher considers that the ideas of Cybersyn and the related MSS offered by researchers from the managerial cybernetics approach adds to current understanding of EIS in that it comes together as a holistic approach for relating the use of this type of systems with the required structural and technological conditions to guarantee improvements in organisational effectiveness.

Because "*the Index System*" developed by the Colombian President's Office and the National Planning Department was intended to be a MSS, this idea of Cybersyn and its related MSS introduced here and further described in the next chapter will serve for analyzing the index system defined by the CPS. The next chapter presents Cybersyn and Cyberfilter as the conceptual framework suggested for generating proper structural and technological conditions for developing the SISP process.

2.4. THE NEED FOR INFORMATION SYSTEMS PLANNING RESULTING FROM EVOLUTION IN INFORMATION TECHNOLOGY USE

2.4.1. Information Technology: Use and Evolution

IT development has fostered impressive changes in the life of social organisations in the present century. Its first use in social organisations was in the computerization of operations such as accounting, payroll, bookkeeping, inventory, billing, securities as part of assets, suppliers and payments, among the most common ones.

By that time (1950s-1960s) the information technology available consisted of large computers with batch information systems and individual station data processing. It served mostly for the computerization of operations based on simple transactions.

Then, when newer and more reliable IT tools became available (i.e., on line computers, multi-user operating systems or direct access files), there appeared the possibility of supporting other organisational functions with IS.

By the late 70s and early 80s the IT market provided new development languages (4th generation languages), data bases and personal computers, which contributed importantly to offer individual users the possibility to process their own text and some of their own data.

The new generation of programming languages helped to solve the technological bottleneck of IS development because they simplify the programmers' job. By using them, programmers are now able to develop in a few months the same technically qualified information systems that used to take them a year or more of programming work, just a few years ago.

Later and more influential IT developments were more effective hardware and software tools and the communications-based computer networks and operating systems. Rockart has coined this new era as the "*Wired Society*." <Rockart & DeLong, 88>

Figure 2-4-1 presents a summarized view of the principal IT tools available on the IT market for social organisations' use over the last three decades (starting in 1973). As shown in the figure, the most relevant issues in the last two decades in IT development were the appearance of microcomputers, the miniaturization of available IT tools, the exploding availability of software tools for office automation and the appearance of networks and communications devices.

Nowadays, image processing, voice processing, multimedia environments for learning, artificial intelligence, expert systems, robots, electronic games and other tools are broadening the list of IT applications for social environments. Organisations are using tools based on data communication technology and are increasingly depending on them for effective operations. In the area of technological research, the most important efforts are in developing tools for the transmission of voice and image through electronic networks.

The increasing availability, standardization, communication facilities and

user friendliness of contemporary IT tools have contributed to making its use widespread, as well as to increasing the strategic nature of the IS function in social organisations.

Today, the IS manager in complex organisations normally has the responsibility for coordinating IT development and for providing the criteria for choosing appropriate tools according to the nature of the business and the leading-edge technology available.

Although there have been too many expectations on the effectiveness that organisations might gain by using ISs, the reports we find in the literature on professionals' experience do indicate that their feeling is often one of non-fulfillment of such expectations.

The scientific community has tried to answer the question of the technical and managerial reasons for the failure of ISs to improve organisational effectiveness. As an example, some scientists found that there were technical reasons for failures in IS implementation that may be mainly rooted in the complexity of the IS development languages and consequently, in the engineer's limitations to produce user-friendly interfaces.

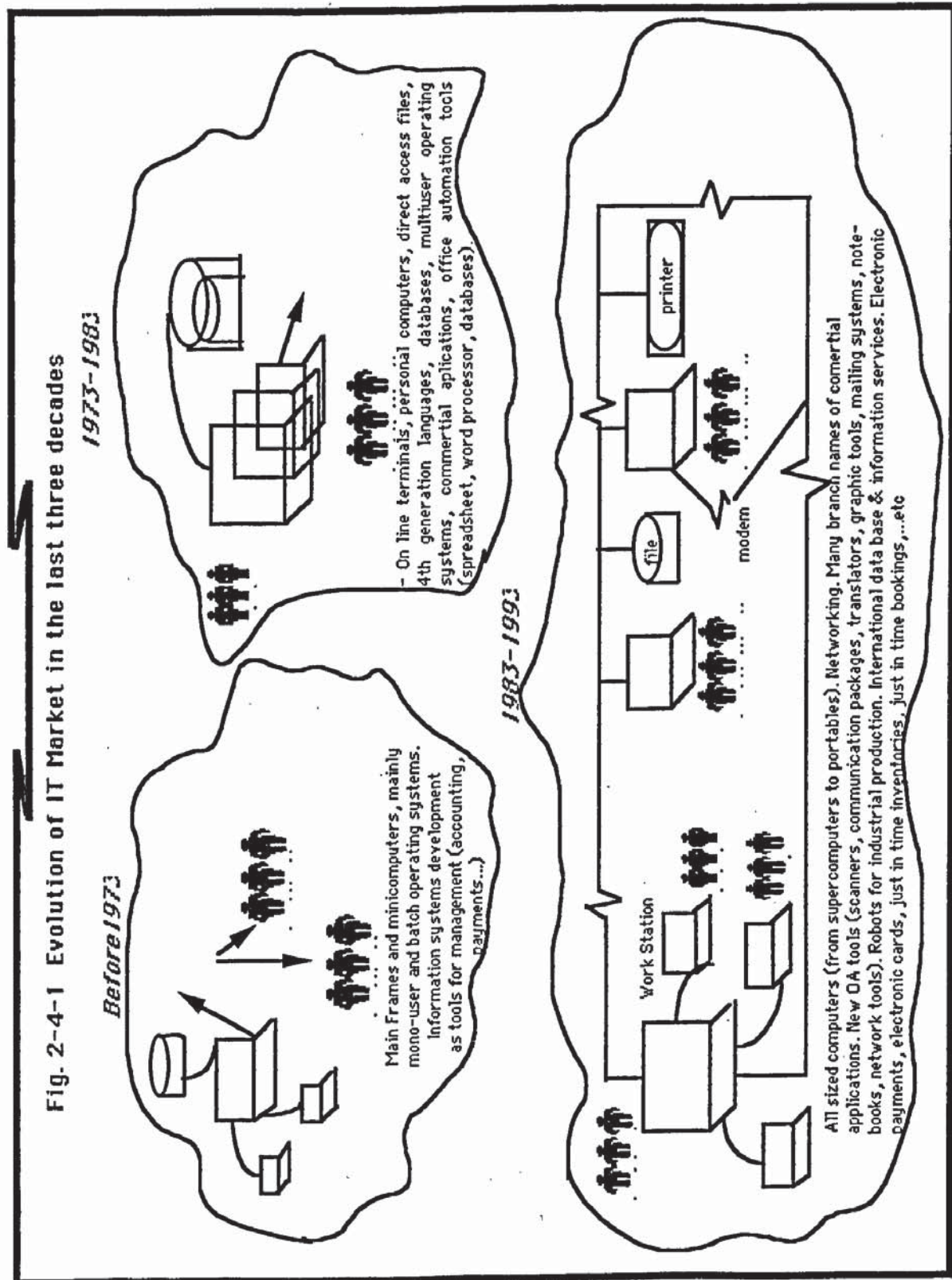
On the other hand, other scientists found that there were, among others, managerial reasons linked to cultural change which IT implementation fostered in terms of working practices. The next sections explore some current answers to these questions.

2.4.2. The Learning Cycle in Enterprises using Information Technology

Most of the social organisations that have entered the information technology era have had similar experiences. First, they taste the new technology, with some fear and some feeling of uneasiness. Most of them start by computerizing accounting or other basic management procedures.

According to Nolan's description of the growth process, the organisation learns and adapts to the new tools and feels an increasing need to be in control of its use and acquisition. Then, one may see a shift in the organisation's interest from developing computer resources to developing the organisation's data resources. Finally, the organisation might achieve

Fig. 2-4-1 Evolution of IT Market in the last three decades



maturity in IT use.

Nolan has described these different stages which an organisation moves through when introducing IT as initiation, contagion, control, data administration, integration and maturity. He suggests that organisations can plan, coordinate and manage this growth process in order to move through the stages effectively and efficiently.

He recommends following a set of steps in order to analyze both the companies as a whole and each department or unit of the company in terms of its stage of data processing growth. By the end of the analysis, the analysts would prepare a multilevel strategy for data processing development based on current and expected stages of growth for each organisational unit. <Gibson & Nolan, 76>, <Nolan, 79>

As Nolan points out, most companies follow a natural development process of the IS activity. Each organisational unit could follow divergent stages of data processing growth. For each one there is a need for coherent IS planning, particularly in stages 2 and 4; also for the organisation as a whole, there is a need to coordinate the IS development process for all units.

Galliers and Sutherland proposed a more recent view of Nolan's Stage of Growth Model. Their revised model describes the characteristic of each of the following aspects of the IS function, at each of the growth stages: IS strategy, IS management's structure, type of ISs developed, staff required, management style, required skill from the staff and goals.

They refer to the successful use of the revised model in some British organisations over the past few years. The advantage they see over the original model is that the revised one recommends the analysis of more organisational and managerial aspects, as also suggested by other researchers from the socio-technical approach to SISP. It also describes more explicitly the different stages at which IS types become relevant for developing the IS function. <Galliers & Sutherland, 91>

By understanding the stages of growth of the data processing function, in particular stages 2 and 4, it appears easier to understand the increasing need that complex organisations have for developing SISP activities. On the other hand, many researchers have pointed out other strong reasons

that would motivate organisations to develop SISP activities, as the ones summarized here:

- The importance that IT has for organisations of specific industrial sectors if they want to gain competitive advantage over their particular sector. <McGee & Howard, 90>
- The need to integrate IS plans into the business plan in order to support the strategic objectives of the firm. <Herbert & Hartog, 86>
- The advisability of integrating the development of different technological islands (data processing, office automation, communications, etc.) within each organisation. <McKenney & McFarlan, 82>
- The growth of end user computing and the consequent need of the IS management to act as a coordinating function of independent IT developments. <Boynton & Zmud, 87>
- Within this new role of the IS management, the SISP activity will be clearly one of the most critical responsibilities of the IS manager. <Fergusson et al, 91>

Section 2.5. will present the main frameworks and tools offered by researchers in the SISP field.

2.4.3. Current View of the IS Manager Role

The availability of all the mentioned IT tools and IS types in contemporary organisations, has increased the organisation's need to adjust its IS function. Going back in history, the first way that the IS management role was understood was as the one responsible for coordinating information systems' development and implementation processes.

Many complex organisations are currently trying to re-orient this role so that instead of concentrating only on these tasks, IS personnel also becomes responsible for coordinating IT development, for the acquisition of IT based tools and for training users from other organisational units.

Contemporary IS managers have also to assume coordination, development and implementation of the IS plan as part of their responsibilities. However, it is not always clear how the IS manager may

relate to other organisational managers and experience has demonstrated that the lack of a common language makes it often difficult to achieve adequate communication levels, in particular when debating issues of using strategically IS to foster organisational development.

2.4.4. Problems Reported by SISP Professionals

Some researchers have done case studies in order to analyze the effectiveness of IS planning and the way in which they might improve the available conceptual frameworks of SISP. For instance, Andrew, et al, summarize the most common complaints expressed by IS planners and organisational managers on the effectiveness of IS plans and the strategic impact of IT, as follows: <Andrew et al, 91>

- There is a lack of coherence between the IS plan and organisational development strategy.
- Many experiences show a divorce between the strategic formulation of IS and the organisational activities considered as the most strategic.
- There is no systematic procedure for IS planning.
- There are organisational failures within the IS department and in relation to organisation (i.e., communication problems).

Galliers adds other factors to the list from the research he conducted on SISP practice in the UK; he refers to IT as we have previously done to IS:

"The main problems found in formulating IT strategies were the lack of planning experience and credibility of the IT personnel, lack of a clear business plan for the company, planner over optimism, reliance on reactive IT strategic formulation, difficulties in measuring the benefit of IT and the impact of IT strategies and the inflexibility of the IT strategy itself." <Galliers, 88>

In a later piece of research, Galliers interviewed several SISP experts and reached several conclusions on SISP practice. He argues that,

"It has been demonstrated that (SISP) practice is deficient, particularly in respect of:

- *gaining appropriate commitment to, and involvement in, SISP on the part of senior and middle management;*

- *implementing IS strategies, due to an inappropriate choice of strategy, from a feasibility as well as desirability standpoint;*
- *reviewing and assessing the benefits of SISP in the context of the differing expectations of different stakeholders;*
- *The linkage with business strategy."* <Galliers, 91>

He concludes that, among other things, one should not see strategy formulation as an entirely rational or formal process, but instead, the person responsible for managing the SISP process should give more attention to management and organisational issues. <Galliers, 91>

The researcher summarized in Figure 2-5 the "*rich picture*" she has gotten from reviewing the literature on the problematic situations described by researchers in SISP practice. Many of these points are familiar to the researcher's own experience of the SISP process developed for the Colombian President's Office during 1990-1992. This situation is not surprising, if we consider that the conceptual models supporting the development of the SIS plan clearly came from conventional approaches to SISP planning.

2.5. THE RESEARCH FIELD OF STRATEGIC INFORMATION SYSTEMS PLANNING: Concepts and Frameworks

Having described the situation of SISP practice in contemporary organisations, this section summarizes the different approaches to SISP research developed by the community of researchers. The section's purpose is to see whether or not current frameworks and concepts are fulfilling the requisites contained in the thesis' objectives. Figure 2-5 summarizes the different views on SISP.

2.5.1. First Researchers in the Field of SISP

Anthony first defined "*strategic planning*" as the process of choosing objectives and deciding how to achieve them. <Anthony, 65> With him, there were three well-known researchers, who first proposed the main ideas, definitions and methodological tools on strategic planning: Kenneth R. Andrews, Alfred D. Chandler Jr. and H. Igor Ansoff. In recent decades one has to include in the list the name of Michael E. Porter for the important contribution he made for understanding the issue. <Moore,

Accordingly, most IS researchers have used these definitions to explain the idea of strategic planning information systems. SISP has been seen as a process that includes the following activities: the definition of objectives for information systems, the process by which people make such objectives operative in organisational activities, and the plan for achieving these objectives. <Mc Lean and Sodden, 77>

As mentioned earlier, previous SISP researchers' main concern was on issues of improving computer systems and managing the computer's resources. Later researchers concerned themselves more deeply with defining business driven goals for the SISP. As an example, when referring to the subject of aligning business strategy with IT strategy, King comments that,

"The process of MIS Strategic Planning is one of transforming the organisational strategy set into an appropriate, relevant and consistent MIS Strategy Set."<King, 78>

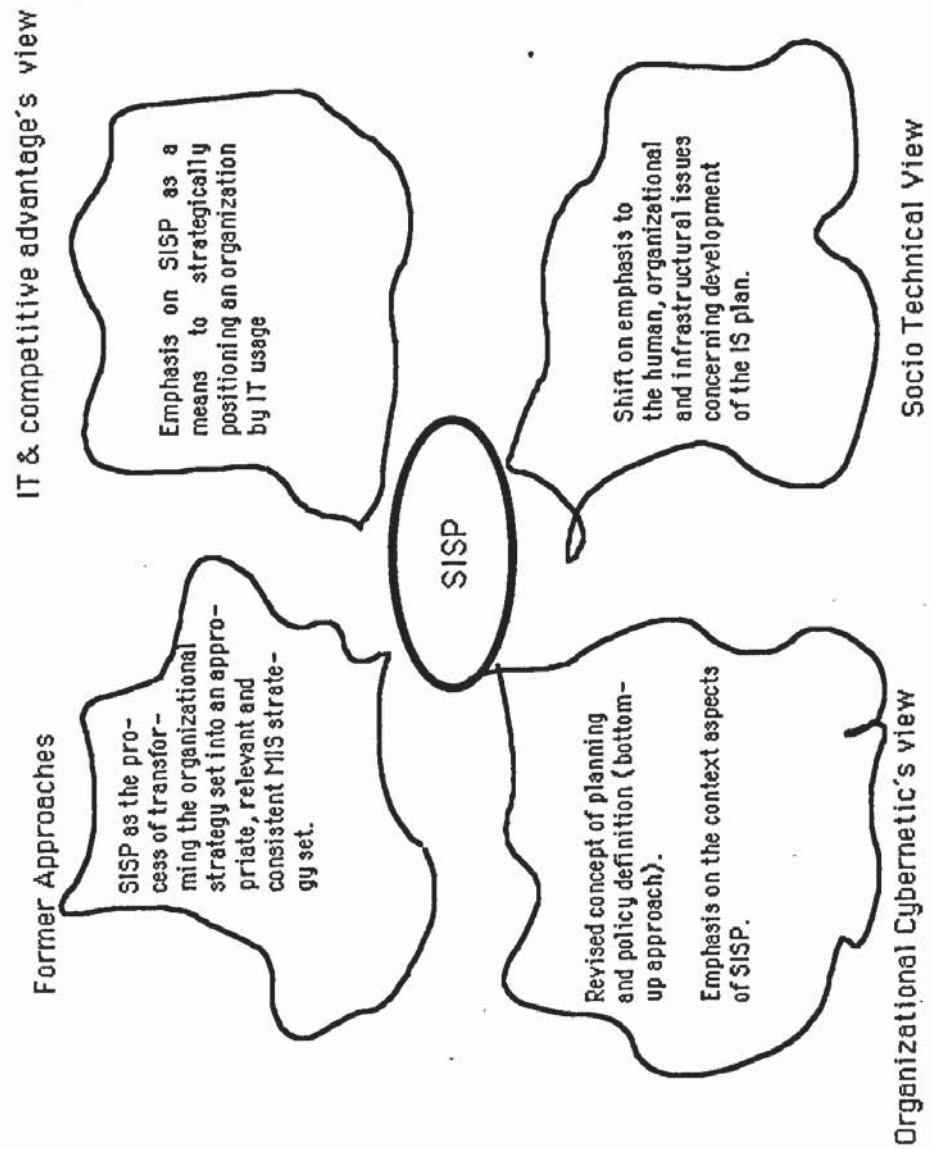
Within the most accepted methods for developing an SISP process suggested by researchers of this approach (the Total Systems Approach) is the Business Systems Planning method. <Zachman, 82>

There have also been several researchers on SISP who have used Rockart's ideas on Critical Success Factors for proposing their own approaches and methodological tools for developing an SISP process. <Rockart, 79>.

A goal of the SISP process, commonly stated in the literature, is to find a way of defining IS which might substantially contribute to improve organisational effectiveness according to the organisation's goals and purposes. SISP researchers and professionals clearly found that IS planning stands a greater chance of achieving desired benefits if it is closely linked to the overall organisational business plan. <Davis & Olson, 84>

In order to link SISP to business plans, argue McKenney and McFarlan, we need to consolidate the definition of integrated paths for IS development at the policy level of organisations. <McKenney and McFarlan, 82>

Fig. 2-4-4 Different views of the SISP process



Critics of earlier approaches focused on their emphasis on top-down planning and on the issues of the "*day to day*" instead of "*future*" scenarios. As a response to such criticisms, some of the more current SISP frameworks became more pro-active by giving more attention to the analysis of organisational environment and future scenarios, as the next section makes clear. <Galliers, 91>

2.5.2. The Emphasis on Information Technology as a Means to Achieve Competitive Advantage

The work by Porter on strategic management and competitiveness serves to study the business environment and to identify successful strategies of action. It clearly underlines the role played by technology in creating structural change in industries and in creating competitive advantages within them. <Porter, 80> <Porter, 85>

McFarlan, one of his followers, adapted these ideas to support some of the SISP activities in social organisations. He argues that if we analyze organisational processes by using Porter's model of the value chain, we might find that IT has a significant place in nearly all points of the value chain and offers a technique for making this kind of analysis. <McFarlan, 84>

According to Sager, the reason for developing systems has to be to improve the firm's competitive edge and so it is necessary to integrate the new systems' development into the organisation's strategy. <Sager, 90>

The results produced by SISP researchers of this approach show different emphases. Some of them give more emphasis to analyzing the strategic positioning of an organisation resulting from IT use. Others prefer to analyze in depth the reasons some IT development processes have had a very strategic impact for some organisations while most of them have not had that impact (i.e., management of innovation literature). However, none of them have yet offered a coherent framework for developing SISP processes based on these ideas.

Another topic of particular interest for current SISP researchers is the alignment between organisational strategy and technological development

strategies. Earl recognized that the need to exploit the strategic opportunities offered by IT and to align IT with business strategy pointed out a new area for research. He refers to the issue, in the following way:

"Strategic Planning for IS of course is not a new idea. It has been advocated and developed by some years, as works by King (1978), Mc Lean and Sodden (1977) and others demonstrate. However, to the former rationales of ensuring top management direction, defining a hardware path and systems framework, forecasting resources requirements, allocating scarce resources effectively and controlling information processing, are now added the needs to exploit the strategic opportunities afforded by IT and to align IT with business strategies. ... A new research area thus has arrived, potentially combining at least the bodies of knowledge about information systems, business strategy, organisational behavior, technology management and industrial economics." <Earl, 87>

In view of the broad aim of this work, the researcher has adopted Earl's terminology for defining the research area of SISP, considering it to be the most precise one in terms of the research's purpose. In order to be consistent with this decision, previous and later chapters refer to the research issue as the SISP instead of the ISSP.

Critically reviewing this and other approaches to SISP, McGee and Howard, in a research review on technology and strategic management, conclude that,

"the link between achieving sustainable advantage in the market and exploiting the information derived from technological change, depends on a number of factors including most importantly: coherent strategy, good inter-organisational communications, the nature of the technological change and the technological skills of the organisation." <McGee & Howard, 88>

On the other hand, Galliers gives a critical view of this approach to SISP, when saying that:

"It may be that improved competitiveness is a by product of the Information Technology strategic formulation process, but it would appear that if this does occur, it is likely that competitive advantage is gained as much by chance as by good planning." <Galliers, 88>

This comment makes the researcher feel that the new discipline of SISP still leaves us with more questions than definite answers to the many aspects it covers.

It is left to us to test if it happens due to our lack of understanding of the very nature of the planning activities, or due to the lack of influence they have for promoting organisational effectiveness. We will see later that the

cybernetic view of planning, better supports the former hypothesis than the later and coherently describes the reasons for supporting the first hypothesis.

2.5.3. The Socio-technical Approach to SISP

By the mid-1980s there were newer ideas coming from the "*socio-technical approach*" influencing the conceptual development of the field of SISP. According to this point of view, previous approaches to SISP overemphasized the activity of defining an IT strategy, regarding it as the definition of how to provide required information.

Instead, researchers from this approach recommend giving more emphasis to the IS strategy by defining what the required information is for each organisational process from a personal and organisation perspective. <Earl, 89> Keen also recommends that we accept the social and political nature of the SISP process instead of observing it as a purely technological event. <Keen, 81>

From another point of view, Galliers notes that the SISP process should not be seen as an entirely rational or formal process. He suggests that it should also aim to capture creative, intuitive thinking. In order to design an effective IS plan, Galliers would say that we would need: <Galliers, 91>

- To design the issues of desirable and feasible opportunities,
- To get the appropriate commitment and involvement from managers,
- To take into account the organisational state of growth in IT,
- To review the benefits of SISP in the context of differing expectations of different stakeholders, and
- To link SISP with business strategy. <Galliers, 88>

Also Waema and Walsham state that the strategy formulations in most organisations have "*formal-rational*" elements and "*power-behavioural*" ones at different levels and that strategy formulation depends on both the internal and external organisational contexts. They present a holistic approach to SISP by integrating the social systems of IS and the importance of context with the socio-political process view. <Waema &

According to the socio-technical perspective, the output of the SISP should not only be the traditional portfolio of applications, but the human, organisational and infrastructure issues concerning the development of an information systems plan. Figure 2-5-3 presents the components of the SISP process as seen from the socio-technical perspective. <Galliers, 91>

Michael Earl has made an ambitious attempt to create a "*framework of frameworks*" on the different methodological and conceptual tools suggested by the researchers on SISP from all approaches. Its aim is to help consultants and researchers in making up their minds about the appropriate framework to choose in accordance with the situation and the organisation's needs when following an SISP process.

This framework distinguishes among:

- the "*awareness frameworks*" which are useful for heightening executives' awareness and re-focusing perspectives on IT;
- the "*opportunity frameworks*" to ascertain and verify the firm's driving strategic assumptions and posture in relation to the opportunities offered by IT use and development; and
- the "*positioning frameworks*" aiming to assess past and future strategic impact of IT on the business, to define IS management accordingly and to understand the learning curve of IS function. <Earl, 88b>

Earl also proposed his "*three-pronged*" methodology called the "*Multiple Methodology*". Each prong relates to an aspect that he recommends studying when defining the SIS portfolio. The researcher considers very valuable this methodology, which might be summarized as follows:

- The first prong leads one to revise the directional IS needs, on the basis of business objectives and critical success factors.
- The second prong suggests tools for evaluating current IS investments, from the viewpoints of coverage surveys, impact, ease of use of current systems and technical value of the applications.
- The last prong offers criteria to produce recommendations on strategic use of information technology "*to hitherto unforeseen competitive advantage.*" <Earl, 88a>, <Earl, 88b>

Fig. 2-5-3 CONCEPTUAL MODEL OF THE SISP
--- SOCIO TECHNICAL APPROACH ---

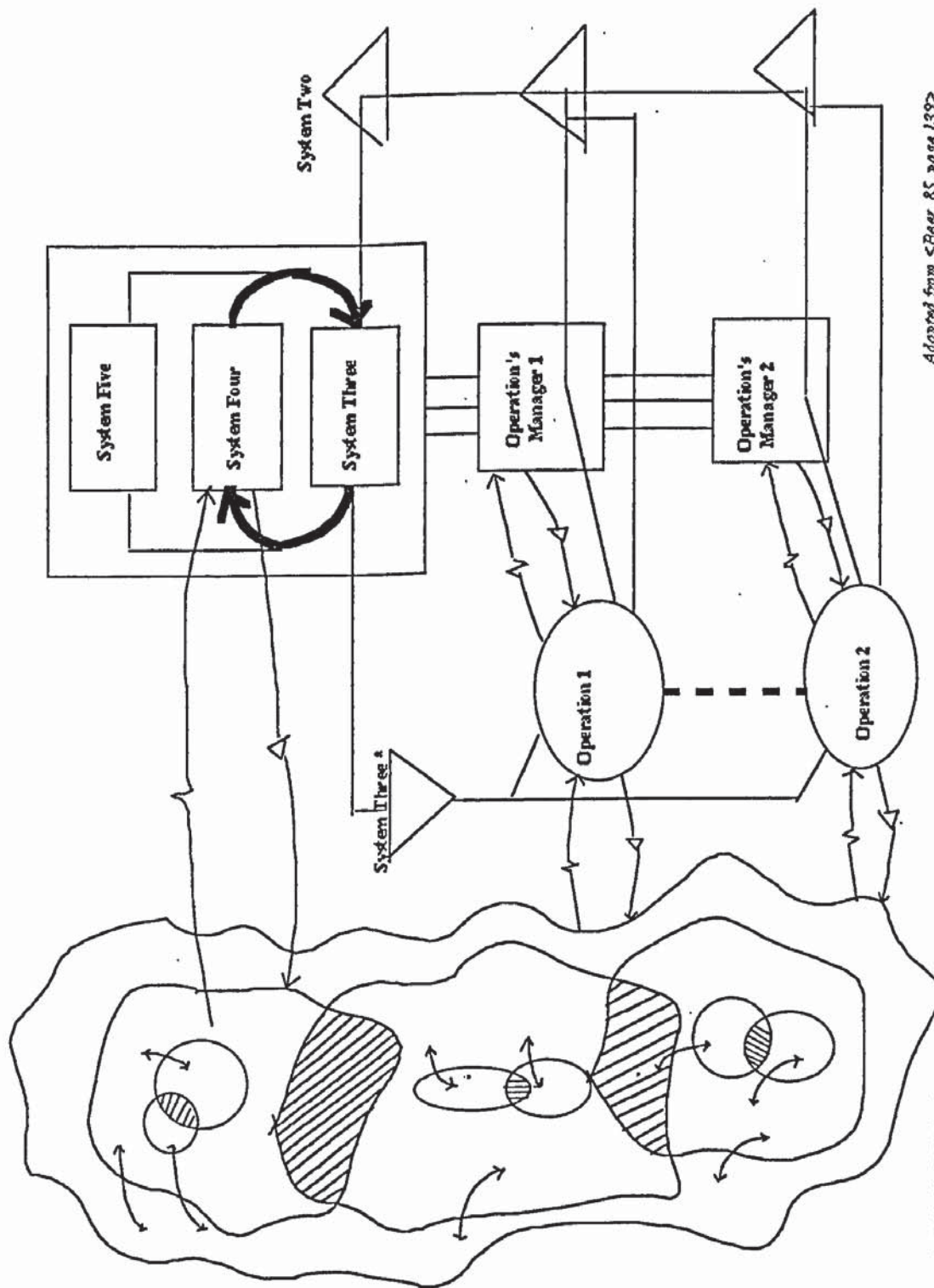


2.5.4. The Managerial Cybernetic Contribution to Strategic Planning and to SISP

Appendix # 2 presents the researcher's views on main managerial cybernetics- suggested ideas and tools. It introduces, for non experts, the main ideas of feedback, learning, modeling, managing complexity and the Viable System Model of a social organisation (the VSM). Figure 2-5-4 presents a pictorial representation of the viable system model. As Appendix # 2 makes clear, the most important characteristics of the VSM are:

- It serves for representing a social organisation as a set of viable systems within viable systems arranged in a recursive organisation. The most important characteristic of the arrangement is that it works on the basis of a balanced distribution of autonomy and regulation at each recursive level.
- Beer refers to the management of complexity as the main variable to take into account when designing and operating an organisation. Complexity is the measure of the variety that each of the organisational tasks has to deal with in the interaction with a changing and sometimes uncertain environment.
- In order to achieve this balanced distribution of complexity, it is recommendable a proper design of the required "*variety operators*." This means that we have to define adequate mechanisms for managing the complexity implied in each of the organisational tasks. <Mohammed, 90>
- Beer also describes the main systemic functions that we need to analyze when observing a social organisation, at any recursive level. He calls them systems one, two, three, three*, four and five. They represent, respectively, operations, the coordination of operations at each recursive level, the regulation and monitoring of operations, the research activities for analyzing environmental conditions and the policy making activity.
- VSM's criterion of effectiveness describes in detail the way these systemic functions should interact in order for an organisation to be

Figure 2-5-4. The Viable System Model



Adapted from <Beer, 85, page 139>

effective and to keep viable whatever changes happen in its environment.

- One may use the model for diagnostic purposes by analyzing the way each organisational task's design compares with this criterion of effectiveness. It may be done by assessing the way each task develops the systemic functions, in order to identify those tasks that are not operating effectively.

The next sections describes the main contributions from Managerial Cybernetics to the understanding of strategic planning processes and, in particular to SISP processes.

2.5.4.1. The Managerial Cybernetic Contributions to the Field of Business Strategic Planning

Traditional management theories viewed planning as a process for defining goals and implementing the projects to achieve them. There was an implicit -- but widely understood -- assumption that planning was a rational exercise and an executive function. <Moore, 92>

Most of them did not distinguish between planning and policy functions and did not explain the required mechanisms for effective policy definition and policy implementation. On the contrary, organisational cybernetics revised these very ideas of planning.

On the other side, VSM criterion suggests that each primary activity (the way to call the activities in the value chain), should have autonomy in their own organisation, while responding, at the same time, to established meta-level behavioral or operational restrictions (given through the monitoring control mechanism).

It also suggests that the intelligence function from each primary activity should study the environmental variables regarding its clients, suppliers, competitors, technological environment and so on. We find that VSM also offers criteria for defining a diverse function, called System Five, responsible for defining the mechanisms for communicating the intelligence and control functions, so that the homeostasis of the organisation as a whole is maintained.

In other words, System Five should attempt to balance the negotiations for possible courses of action, so that they include both the experience of those currently making the operations, (System Three) and the insights of those researching better ways of doing them (System Four). According to VSM criteria, this is how it guarantees negotiations that result in more feasible courses of action. <Beer, 75>, <Beer, 79>, <Beer, 81>, <Beer, 84>.

VSM offers us a criterion for effectively designing communication mechanisms so that we contribute to improving the organisation's learning rate at all recursive levels. It offers us a language for debating survival issues. The language helps us to distinguish and to name some devices required for effective learning as well as the essential nature of any learning process.

VSM does not describe intelligence activities only as rational exercises of observing the environment, but rather it accepts the intuitive nature of this sort of activity. It also refers to them with respect to the observations of the environment and of the organisation itself; and it also offers criteria for improving structural arrangements for guaranteeing the effective implementation of strategy.

The VSM describes in detail the required characteristics of the "*Homeostat 2-4-5*" as shown in Figure 2-5-4-1. It recommends the designing of such characteristics at all recursive levels in the organisation in order to create a viable organisation. <Beer, 85>

The VSM criterion of effectiveness suggests that only by designing this Homeostat would system five (the one responsible for the policy function) achieve appropriate management of complexity; consequently, the action path resulting from making operational the policy definition would have the requisite variety.

In order to do this, analysts and managers should debate the issues of organisational strategy and those of the context for negotiation of such issues; it implies that the organisation should create the appropriate communication channels for negotiations among the responsible of the 3-4-5 Homeostat.

Since the interactions between Systems Four and Three always occur with

reference to specific issues of policy concern, one may recognize that it is for these later issues that the policy function can monitor the interactions between the other two functions.

In contrast, traditional management theory gives all the emphasis to the activity of formulating competitive action paths, while underrating the importance of designing the required structural arrangements for providing the organisation with successful implementation schemes.

Researchers from organisational cybernetics have already explored these ideas, both from theoretical and practical viewpoints. From the theoretical perspective, the work of R. Espejo on methodologies for applying Beer's ideas to problem solving (See <Espejo, 88>, <Espejo, 89a>), organisational diagnosis (See <Espejo, 89b>, <Espejo, 89c>) and understanding strategic information systems, is remarkable. (<Espejo, 93a>).

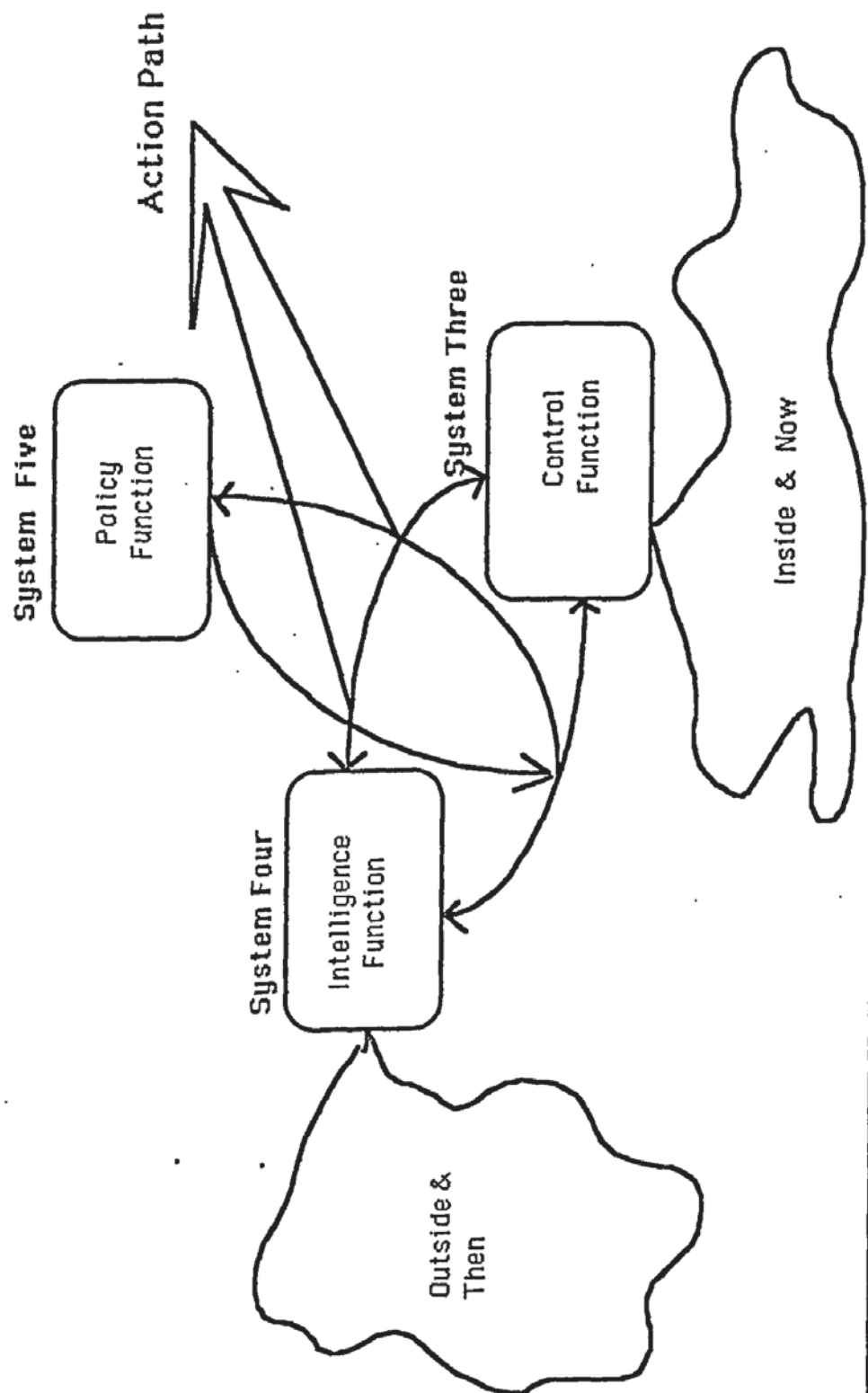
At the practical level many researchers have demonstrated the strength of VSM as a diagnostic tool in organisational diagnosis (See <Espejo & Harnden, 89>, <Espejo & Schwaninger, 93>).

Considering the relevance that VSM's ideas have for understanding a social organisation and, in particular, the idea of business strategic planning, Schwaninger presents his "*evolving approach to organisational fitness*" that has emerged from a synthesis of ideas drawn from the areas of Management Cybernetics and Planning Theory. <Schwaninger, 93>

Schwaninger distinguishes different levels of organisational fitness: the levels of Legitimacy, Capability and Economic Efficiency. He uses the ideas of viability and the techniques for organizing recursively the functions provided by VSM. He also uses Porter's ideas on value potentials. On the basis of these ideas and techniques he suggests a way for developing a holistic approach to strategic planning that might foster viability and development in social organisations.

On the other hand, Malik's purpose, in his doctoral thesis, was to define a methodology for designing an "Office System" for the Prime Minister of Malaysia. Due to the similarities between this case and the Colombian case that the researcher will present in later chapters, Mohammed's experience in applying cybernetic ideas to such an office design has been

Fig. 2-5-4-1. The Cybernetic concept of
the 3-4-5 Homeostat



of great value for the present study. <Mohammed, 90>

Other researchers have shown practical results in using VSM for the strategic planning process. As an example, Ben Eli reports on the use of VSM in strategic planning and restructuring management of Mount Sinai's academic medical center in New York. <Ben Eli, 89>

2.5.4.2 . Cybernetic Suggestions for Developing a SISP process

This section presents the main ideas and suggestions from researchers in the managerial cybernetic approach, with regard to the SISP. It also makes it clear, from the literature review made by the author on the research topic, that managerial cybernetic researchers have not yet published a coherent framework for developing SISP processes.

Even if many researchers have pointed out the relevance of taking into account the organisational context as an important variable for successfully developing and implementing a SISP process, the researcher did not find any framework based on a coherent organisational model or clearly addressing contextual problems in the SISP process (See <Waema & Walsham, 90>, <Galliers, 88>, <Keen, 91>).

This is one of the main reasons the researcher has for supporting the idea of using managerial cybernetics as the foundation for developing a systemic framework for guiding the SISP process. Not such a framework is offered in the literature revised by the researcher, which makes it even more clear, on the researcher's view, the convenience of developing such a framework.

The next chapter describes some of the managerial cybernetic tools and ideas for modeling organisational complexity and tasks as well as for developing an organisational diagnosis. The researcher considers that they might be very valuable for an initial stage of an SISP process, when analysts are trying to model the information needs of each task.

At the conceptual level, the researcher considers that a managerial cybernetic framework leads us to reformulate the very idea of what an IS is. It forces one to consider ISs as tools for managing not only the complexity related to each individual task, but also the complexity implied

in dealing with the required social interactions in the work environment.

In this sense, understanding organisational needs should be the result of organized debates about the nature of each task and about the nature of the relationships between each task and the internal and external environments supporting task's development.

Schuhmann reports an experience in developing an SISP process at the Film Division of Hoescht, in Germany, using the managerial cybernetics ideas, lead by Espejo. Nevertheless, he does not report any suggestion at the methodological level. He offers some criteria, obtained from the experience.

For instance, he supports the view that an effective IS is one mirroring the management processes it models. Consequently, a prerequisite to plan an IS strategically is to define which management processes are those that have a strategic value for the organisation in its current situation.

The author also suggests that by promoting information systems use, one might increase the variety of local management and reduce the complexity of the units to be controlled. He emphasizes the importance of designing ISs that support management processes when he says:

"It cannot be stressed often enough that an important prerequisite for the efficient use of IS technology is the design of control loops, supported by the IS, that makes as much as possible of self regulation." <Schuhmann, 93>

In Espejo's view, the problem when developing the IS function in most current organisations is that they still operate with centralized strategic processes and information systems which might imply that:

- The multiple natural loops between people and environment are likely to be in a non-learning state.
- Corporate people are likely to be dealing with potentially relevant information for which they have no response capacity. <Espejo, 93b>

On the other hand, Espejo presents its "*Cybernetic Methodology*" for problem solving and suggests that, in order to deal with the complexity of a change process, it is necessary not only to design the content of the debates, but also the context in which they would happen.

When defining a new SISP framework from a cybernetic perspective, one may understand the SISP process as a change process of strategically introducing new IT tools in some areas of the organisation. Also, one might take into account this suggestion of studying the context in which the business strategy would be implemented, when determining the required activities for developing a SISP process.

Another methodological suggestion from Espejo and also from researchers following the socio-technical approach, is that of ensuring that each stage of the SISP process should happen in a participative scheme, at all levels within the organisational structure. For instance, they would suggest that only on the basis of the priorities, as well as the criteria of feasibility and desirability of each one of the proposed SIS given by the responsible managers and workers, might an analyst define the final content of the SIS portfolio.

Summarizing, the researcher feels that the approach given by organisational cybernetics -- which gives a sound theoretical foundation to understanding the social context of any organisational activity -- could be relevant for filling this gap in SISP research. It opens up a context-oriented framework which might help to overcome lacks in other systemic approaches when confronting the SISP problem.

2.5.5. Critiques of Current Approaches to Strategic Information Systems Planning

This section presents a summary of the most important critiques made by some researchers and by the researcher herself, on the gaps that most of the current SISP frameworks still present. The next section describes the reasons why the researcher decided to follow the managerial cybernetic approach as the one supporting development of the proposed SISP framework.

Many organisations, including the ones in the Colombian public sector, still see planning as a rational exercise of forecasting the future. Executives normally assume planning as their responsibility and they normally expect it to result in the definition and later implementation of new projects that they think will increase organisational effectiveness. It

seems evident that the root of this idea of planning comes from the traditional schemes for planning given by the rationalistic schools of management.

Therefore, SISP practice still uses this implicit view of planning. It is not surprising then, that many information systems plans result from the isolated interpretation made by the IS management role of the organisational strategy. Neither is it surprising that such a plan does not obtain the interest and commitment of other managers.

No wonder why many information systems plans remain as huge volumes of good intentions in the hands of the IS managers, with the consequent disappointment when they find that other executives do not commit themselves with the expected resources or requirements for the planned project's implementation.

This situation, which is quite current in SISP practice as reported by several researchers, illustrates what researchers mean when they say that current planning practices happen in the "*informational domain*" of the planners, while little attention is given to their "*operational domain*." <Espejo, 93b>

If we pay more attention to the operational domain of the strategists, we should attend issues regarding the appropriateness of the operational context for implementing the organisational strategy, or more particularly speaking, the SIS plan.

On the other hand, the researcher considers that the socio-technical approach to SISP helps us to recognize planning activity as a content-meaning negotiation process which may occur among most organisational members. According to this idea, Doyle suggested, as an alternative to the traditional treatment of the planning activity, using a soft systems framework for defining the guiding principles of the company in relation to the specific topic researched. <Doyle, 91>

This approach would permit analysts to view planning as a social learning process. The organisational cybernetics framework for SISP also takes into account this idea. <Schuhmann, 93>

Summarizing, the main critiques to the approaches to SISP studied in the

literature review, in the opinion of the researcher, are the following:

- Current understanding of planning as a rational exercise -- without taking into account the organisational context in which action occurs -- results in non-adaptive plans (including the IS plan). There is a clear need to reformulate this idea of planning (i.e., through a holistic approach reviewing both content and contextual aspects of planning).
- Most of the IS models underlying the SISP frameworks studied pointed out technological ideas (content-based) giving less emphasis, if at all, to non-technological or managerial aspects (context based). Nevertheless, cybernetic criteria suggest that grave failures in the communication mechanisms may be the reason a perfectly (from a technical viewpoint) designed IS plan, when implemented, does not produce the expected results in terms of increasing organisational effectiveness.
- There is a lack of conceptual frameworks for researching organisational structure problems. Most of the frameworks researched commence the SISP process from descriptive models of the business, including non-structural diagnosis activities. The cybernetic criteria of effectiveness would predict that, as a consequence of this way of developing the SISP process, it is more likely that when implementing the resulting IS portfolio users will need to face previously uncovered structural problems.
- There are many views of the SISP process, but there is no coherent framework for defining what it means or what the relevant activities to be followed are when entering an SISP process. Most of the approaches give partial answers to this question.
- The most widely known SISP approaches emphasize the activities of identifying the information needs of the organisation as well as an associated prioritized applications portfolio and defining the required resources for the implementation of the proposed systems. <Galliers, 88>
- After an in-depth summary of the most well-known frameworks for SISP, Earl's conclusion is that *"all of them provide useful early*

guidance, but they provide but a start; nearly always much detailed analysis and reasoning has to follow, both, in discovering strategic IS and in modifying current management approaches to be more strategic." <Earl, 88a>

- Most of the literature on SISP focuses on the way in which we may formally incorporate technology into a strategic planning logic and on the decision process concerning technology. However, most of it focuses too much either on the macro aspects of the process (formulating a coherent strategy) or the micro aspects (management of innovation, leadership or technological change). <McGee & Howard, 88>
- There frequently seems to be a lack of distinction between "Planning of Strategic Information Systems" and "Information Systems Strategic Planning". <Earl, 88b>
- The literature review made clear that some SISP researchers concentrate their efforts on testing the hypotheses motivating SIS planning activities, while others devote themselves to defining tools for making more effective the related set of activities in an SISP process. Nevertheless, there is not a fully developed framework for SISP, supported by a coherent conceptual approach which studies both content and contextual aspects of the SISP process.

3. RESEARCH DEVELOPMENT

This chapter focus on the nature of the intended investigation as the one that attempts to develop a SISP framework able to through new lights into analysis or guidance of a SISP process developed by an organisation. This investigation aims also to make an initial evaluation of such a framework's own value, through retrospective analysis of SIS developments in the PO during 1990-1992.

It begins by presenting a general background for the situations under study, highlighting those aspects that required further explanation, not easy to get only at the light of current analytical frameworks for these type of organisational processes. In order to do it, it summarizes the organizational and political context where the related SISP process was undertaken and identifies its main actors, as well as the main features and results of the whole process.

It is then followed by a description of the improvements required to current SISP frameworks, in the researcher's view. Her viewpoint has been consolidated through previous experiences in managing such kind of processes as well as through the study of the criteria offered by other researchers in SISP.

Then, it analyzes current approaches to IS research and explains the reasons for choosing the research development path, as presented later on. Finally it sets up a more detailed plan for the development of the remaining of the thesis, that in summary, pretends to:

- present the theoretical basis for the framework,
- assemble the SISP framework coherent to this theoretical basis and to present the details of the framework,
- document the history lived at the PO,
- scrutinize it by using the proposed framework and,
- present the conclusions of the whole research process.

3.1. THE CONTEXT IN WHICH THE RESEARCH WAS UNDERTAKEN

3.1.1. Background of the Colombian Public Sector.

Cesar Gaviria was elected the new President of Colombia for the period from August 1990 to August 1994. He came to the government with a very aggressive political programme aimed at creating a radical change in the model for national development. In order to create conditions for the effective implementation of the new development model for the country, his government team first developed a complete and effective process of constitutional change. This occurred during the first eight months of his mandate.

Last time this nation modified the entirety of its constitution was nearly a century ago (1896), when the intention was to centralize the political, judicial and economic power at the national level in order to avoid internal crisis among local governments. An unsurprising consequence, after a century of centralized power, was that the inefficiency of the CPS was worse than before, while the country remained underdeveloped.

The nation defined its first steps towards decentralization, in the 1980's. Then, the government consolidated the process with the definition of the 1991 constitution, which ordered public sector to decentralize its structure and to create better conditions for the socio-economic development. President Gaviria developed some strategic issues for promoting rapid change in the country.

Some of the strategies that he and his team considered to have a major priority were the internationalization of the economy, a new socio-economic development strategy, a strategy for peace (to weaken narco-terrorism and the guerrilla organisations) and the modernization of the CPS.

The last strategy referred to the creation of the necessary legal and structural conditions for its organisations to function in a more decentralized way. It promoted a complete re-structuring process in the

CPS as well as a massive training programme to improve local's management skills. At the same time, it promoted a complete legal and judicial reform for the country in order to adapt the new legal system to the conditions created by the 1991 constitution.

3.1.2. The Colombian Public Sector, the President's Office and the National Development Strategy

As in most public sectors, CPS has an entire organisation heading it, the PO, which supports the President in effectively fulfilling his responsibilities. During this government period, the aim of the PO was to become a model modern public organisation. The president created new units at the PO, aimed at guaranteeing the required administrative and conceptual support for each of the strategic issues from his political programme. They were offices of different types: Secretariats, Advisors' Offices, and offices for Presidential Programmes.

One of the new offices was a Secretariat called the Secretariat of Information and Systems (SI&S). Its aim was to respond to the PO's needs for information technology support and to offer attention to the information needs of the president and his advisors. It was its responsibility to co-ordinate a strategic plan for developing information systems for the entire President's Office, as well as to design and to implement information services required to improve criteria for policy making.

Taking these responsibilities into account, the SI&S began, in 1991, to think about the strategic information systems (referred to as "SIS") that the President's Office should develop and, by the end of 1992 had developed some of the suggested SIS.

This research will analyse, some of the experiences that it had from August 1990 until December 1992, from formulation through initial implementation of the SIS plan for the PO. Then it will analyse the development and implementation of a SIS for following up the implementation results of the national development plan, called the *"system for following up the implementation of the national development plan"* (which we will refer to as to *"the index system."*). Next section

details the context and requirements for development of this SIS.

3.1.3. The National Development Planning Scheme and the Need for Developing "*The Index System*"

The National Planning Department is the organisation in charge of formulating the socio-economic development plan for the nation, which involves formulating the necessary development projects and assigning the required resources for their implementation. Thereafter, the implementation of investment projects is carried out by the other organisations in the CPS.

The new constitution ordered local public organisations to develop skills for formulating and implementing strategic plans at the local level, in order to respond more effectively to the development requirements from their communities. It even ordered the CPS to design the required technical support for following the effectiveness of its organisations in implementing their development plans.

The National Comptroller's Office traditionally had the responsibility of developing the fiscal, financial and administrative control for all other public organisations. Another constitutional mandate obliged it to reinvent its role as a technical, monitoring organisation that would help other public organisations to monitor their own operations in terms of results and resources' use.

The National Planning Department has always defined the NDP, but once issued, it has been always hard to measure the results achieved by the government, for there were no effective monitoring mechanisms for this type of information. As a consequence, neither the president, nor other executives in the CPS have good quality information to promote the development of this kind of criteria.

Such a lack of reliable information about socio-economic development which could be made available to the president and his advisors, prompted the SI&S from the President's Office, to submit a proposal to the National Planning Department for developing the system to follow up the implementation of the NDP.

The aim of "*the index system*" was to monitor the effectiveness of the CPS organisations in implementing the strategic projects they were responsible for, according to the NDP. The main participants and intended users of the index system were the national planning authorities and, to start with, a selected group of organisations responsible for implementing strategic projects.

The results obtained from the implementation of "*the index system*", were not as successful as expected. In practice, it is not fully serving as a system to support strategic planning and policy decisions at the national level. The experiences of those public officials who participated in the system's development or who are its current users, left many questions unanswered. This research pretends to find out new answers to such problems, by reviewing them at the light of a new analysis framework.

3.1.4. Summarising the main features of the SISP process.

Looking retrospectively, the SISP process lived by the PO at that time contributed to making more clear the role that the SI&S had towards the PO and the CPS. It also contributed to coordinate IS developments of the PO. Some of the SIS developed improved punctual organisational processes at the PO and improved current communications schemes, from a technical viewpoint.

Nevertheless, by reviewing retrospectively the SIS portfolio, there is a question about the relevance that some of the defined SIS had for improving PO or CPS effectiveness, as well as about the coherence between the organisation's strategic posture and the contextual conditions for developing them.

Also, there were left open questions about the commitments from most junior and senior managers towards this SIS portfolio, the planning culture and structural conditions at the PO and the CPS, and their relationship to the problems experienced when developing the SISP process. While there were not proper measures set by this process, to compare achievements from it versus expected results, there is also the question of how to learn from the experience without having previewed

any feedback system.

However, the study of SISP frameworks did not help the researcher to answer these questions, some of which have also been addressed by other SISP researchers. Next section presents the researcher's own view on the main open questions that current frameworks leave and that a new framework should try to answer or better approach.

3.2. CHOOSING THE RESEARCH METHOD

Appendix # 2 presents a detailed description of the meaning of doing research in information systems, the available research methods, and some recommended criteria for choosing a research method. This section explains what is the research method chosen and the reasons for choosing it.

From the descriptions presented in the Appendix, it seems to the researcher that this research could be presented as a case study. However, there is an assumption, when choosing this type of research method, on the pre-existence of a theoretical framework which needs testing.

As previous sections made clearer, there exist good SISP Frameworks describing how to relate processes and IS required support and how to relate them to the organisational strategies. There are also sound frameworks describing coherently what is a social organisation, what is effective management and how do we measure it, by using a management support system. However there are not SISP Frameworks fulfilling most of the criteria presented here for designing the "*SISP Framework*".

However, there are some references from soft systems' researchers and researchers on the managerial cybernetic approach giving enough clues as the best way to link them properly, in order to build up a coherent SISP Framework fulfilling most of these criteria. For these reasons, the researcher decided to write up the proposed cybernetic based framework for SISP ("*the SISP Framework*",) by linking some unlinked references to the SISP topic coming from other managerial cybernetic researchers, and by discussing them with her supervisor.

A limitation for classifying this research's method as a case study is that this case and its analysis demanded both kind of jobs, that of defining the framework for analysis, and that of testing its explanatory force by using it to review or to intervene a practical situation. Therefore, the researcher will describe at next section the research method chosen, that keeps some of the characteristics of the Case Study and also new characteristics required for this particular case.

The researcher is aware of a limitation of the chosen method, that is the impossibility of making generalizations about the usefulness of the proposed framework, from this research's only conclusions. It is clear that her individual activity of defining and testing a SISP framework will not be enough for generalizing conclusions about the explanatory --or lack of-- power from the proposed framework. Only on the basis of accumulated experiences using such a framework may one be able to test its explanatory force.

Even in the -quite infrequent - case that many people become attracted to a new framework as a result of its usefulness for explaining the situations observed, if, over time, people don't communicate the usefulness of such a framework, then there would be lower possibilities for it to become eventually inserted into current scientific culture and or organisational practices.

It is also true that in such a case, and only in such a case, may one affirm that one has properly tested or validated a conceptual framework. One may even expect it to keep this privileged position until somebody discovers a new framework that proves -- through a similar process -- to be stronger than the previous one for explaining the observed type of phenomena.

This way of reasoning makes the researcher feel that this research scope has to be limited to the development of the SISP Framework as the structure for analysing the real situations studied and to present an evaluation about the strengths and weaknesses of the Framework for explaining previously obscure situations experienced. Further methodological development and developing of proper training tools to use it would be required before going to test its explanatory power or usefulness for guiding a SISP process.

3.3. THE STRUCTURE OF THE REMAINING OF THE THESIS

This section presents the research development for the remaining of the thesis, as shown by Figure 3-3. There follows a description of each one of the remaining stages of development of this research.

3.3.1. Presenting the Theoretical Framework chosen to support design of "*the SISP Framework*"

On the search for some answers to the questions left open from the experiences lived, the researcher presents in this chapter, her view about the convenience for choosing a sound theoretical framework about social organisations and efficient management to support development of "*the SISP Framework*".

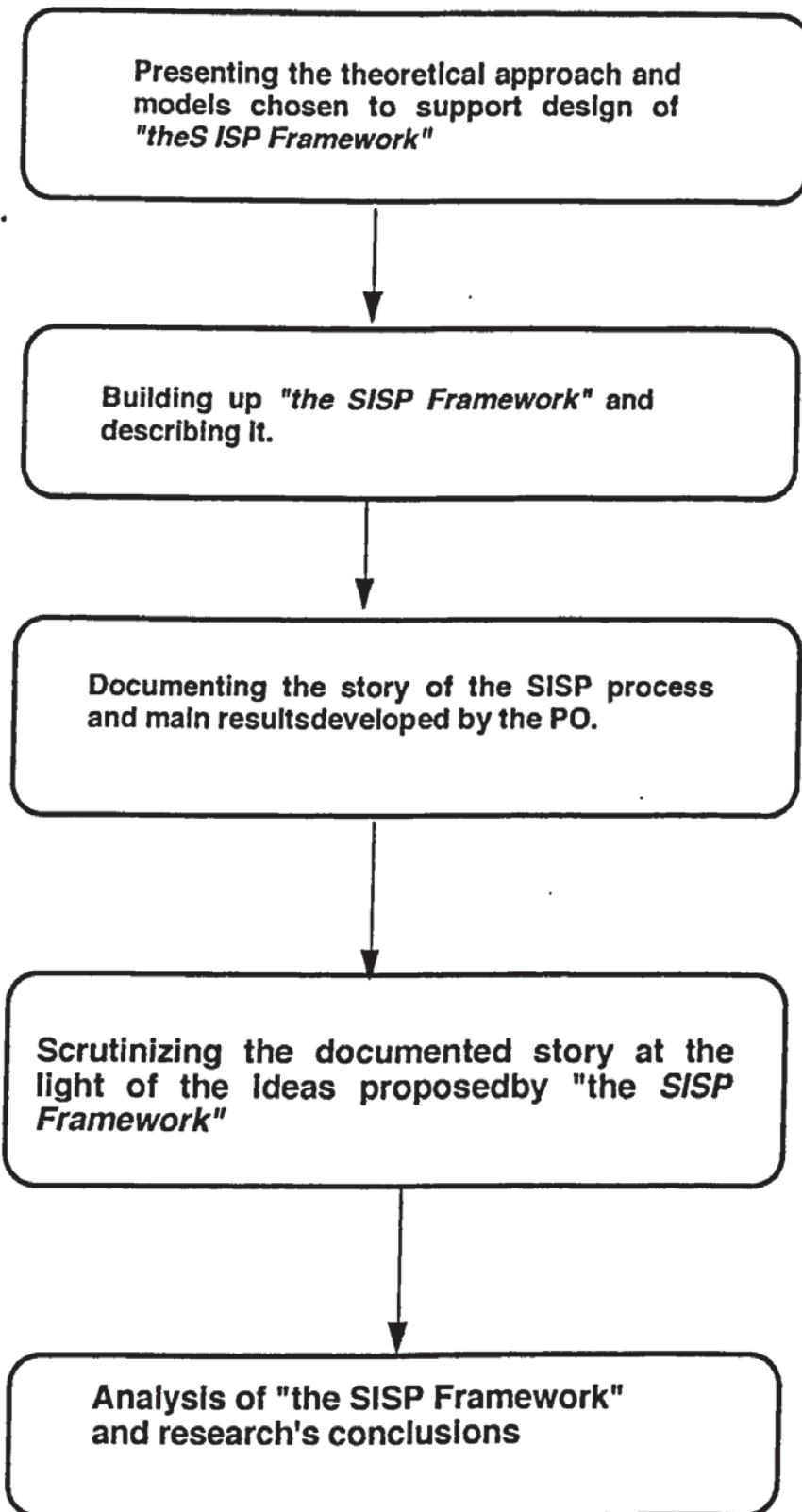
It argues the reasons why she chooses the managerial cybernetic approach to systems thinking as the approach supporting the development of "*the SISP Framework*". It also presents the chosen models of a social organisation (the VSM), the model of efficient management (Cybersyn) and the model of a management support system (Cyberfilter) to be used for supporting development of "*the SISP Framework*".

The hypothesis is that this chosen language and models serve as the required sound theoretical models supporting development of "*the SISP Framework*". The chapter ends by summarizing the criteria they offer to design the desired framework.

3.3.2. Building up "*the SISP Framework*" and describing it.

This chapter introduces a managerial cybernetic framework for developing SISP processes, that the researcher considers will overcome some of the gaps found in current SISP frameworks. On the basis of outlined criteria for designing this framework, the researcher identifies first the required stages of the framework.

Figure 3-3. Structure of the remaining of the thesis



Then, the researcher chooses a coherent set of methodological tools offered from other researchers from this and from the soft systems approach, and links them all to build up "*the SISP framework*".

It then describe in detail each one of the recommended stages for following up a SISP process, and it also recommends and describes a set of selected tools for developing each stage. At the end of this chapter there are some recommendations for using the SISP Framework for guiding a SISP process at a more practical situation.

3.3.3. Documenting the story of the SISP process and main results developed by the PO.

Chapter Six documents the story of the SISP process lived at the Colombian President's Office, from 1990-1992, that is the story this research pretend to analyze, at next chapter, by using "*the SISP Framework*." It first describes what was the political context at the moment, the structure of the Colombian Public Sector and the President's Office, its strategic posture and IS current support.

Then it relates the way the SIS portfolio was defined by a consulting firm, which stages did it develop, the problems they had and the recommendations they made. It also describes one of the SIS recommended at the portfolio and fully developed by the end of 1992, "*the index system*" that pretended to be a management support system to support decisions related with defining or re-viewing the national socio-economic development policy.

3.3.4. Scrutinizing the documented story at the light of the ideas proposed by "*the SISP Framework*"

Chapter Seven uses first "*the SISP Framework*" as the analysis structure to review the story presented before. It does review what was done at the practical situation, compares it with what the framework would recommend us to do in such situation, and highlights those aspects that this exercise enlighten.

It also analyzes the story of "*the index system*" development, at the light of ideas and models suggested by the chosen theoretical framework. In particular, it uses ideas from VSM to analyze the structural conditions for developing plans and for assessing performance that Colombian public sector organizations were using at that time. Also, it uses the cybernetic idea of a management support system to assess the proposed design of "*the index system*".

The chapter ends up by summarizing the main facts that previous analyses revealed, that were not clear enough for the people living the described situations, if reviewed using other analysis framework, and that the past analyses helped to made clearer.

3.3.5. Research's conclusions

This final chapter is a self-assessment of the whole research process. It does review the research's purpose, its development stages and the results achieved, trying to find out how much of the problems detected at the starting point have it properly solved.

It presents a detailed analysis about the usefulness of the suggested SISP Framework as the analysis structure used to review the process followed at the PO between 1990-1992, as well as the implementation of one of the most strategic IS projects developed. .

It also reviews the usefulness of the design criteria offered by the Managerial Cybernetics approach for supporting development of the SISP Framework. It revises retrospectively the suggestions from alternative approaches also providing guidance to SISP processes and it presents what the researcher considers that still remains to be done in the future in order to continue this research opened path.

Finally it displays what the whole research has shown as relevant things to take into account, for managers, IS managers and IS researchers.

4. CRITERIA FOR DESIGNING THE MANAGERIAL CYBERNETIC MODEL OF STRATEGIC INFORMATION SYSTEMS PLANNING

The experiences lived at the PO when developing the SIS portfolio and some SIS left the researchers with many questions opened about the nature of SIS and their impact on organisational effectiveness.

The review of the views from researchers in SISP and in organisational theory left the researcher with the idea that in order to develop a new SISP framework to better explain the situations lived, it is important to choose a sound theoretical framework and language to explain the idea of efficient management.

This chapter presents the researcher's chosen models to explain the idea of organisational effectiveness and effective management. It also argues the reasons for choosing the Managerial Cybernetic approach as the one supporting development of the intended framework.

Then, it presents the purpose of using the "*Viable System Model*" of a social organisation, "*Cybersyn*" model of efficient management and "*Cyberfilter*" model of a management support system as the set of sound theoretical models to support development of "*the SISP Framework*." It also explains why to choose these models for guiding development of this framework.

Finally, it describes the main ideas each one these models offer for modeling organisations, developing skills for strategic management and developing management support systems for supporting management. On the basis of this model of efficient management, the researcher then presents what she considers that a properly set framework for developing a SISP process should have, according to the criteria provided from managerial cybernetics.

4.1. THE REASONS FOR CHOOSING A SOUND THEORETICAL MODEL OF EFFICIENT MANAGEMENT TO SUPPORT DEVELOPMENT OF THE SISP FRAMEWORK

The problems found in SISP practice and the research needs uncovered from the literature reviewed, made clearer to the researcher the importance of developing a suitable framework for SISP fulfilling certain goals, that past chapter outlined.

The researcher considers that Managerial Cybernetics offers the broadest framework for modeling organisations and for debating issues of strategic development and organisational performance and that it offers coherent ideas about each one of these criteria for designing "*the SISP framework*", as next comments make clearer.

It was clear from the review that current approaches to SISP do not properly address the relevance that the operational domain -- in which the content-meaning formation takes place -- might have in the results of the IS plan.

The managerial cybernetics perspective, on the other hand, says that effective use of information systems in organizations requires having criteria to improve management processes. It suggests that we should design both the content and the context of any planning process in order to make it more effective and coherent with operational constraints.

Traditional approaches to SISP normally relate the content of the IS plan to a portfolio of applications and resources for implementation. The socio-technical approach enriches this picture arguing that the IS plan's discussion should also include other organizational-based issues, such as strategy, culture, structure, design of the IS function, etc.

Unfortunately, none of them offers guides for developing the contextual aspects of the SISP process; and even if cybernetics researchers offer such guides, they have not yet produced a detailed framework for guiding the SISP process, but only a set of criteria for guiding it.

Even so, the researcher believes that a cybernetic-based framework for

guiding the SISP process would be stronger than others, because it will help analysts and organizational members developing the SISP process, to take into account the organizational context for implementing the strategy and not only the perceptions that managers have about the referred strategy.

The researcher considers that the cybernetic approach does seriously consider the relationship between organizational context and strategy formulation, named by other researchers <Waema & Walsall, 90> and the need to guarantee "*good inter-organizational communications (to achieve cohesive implementation of the strategy)*". <McGee & Howard, 90>

Moreover, the framework presented by managerial cybernetics explains the links between organizational strategy, structure and information systems and develops a system of management aimed at overcoming some of the perceived managerial shortcomings in any real situation. <Espejo, 93b>

Finally, it offers criteria for designing a MSS for linking organizational strategy formulation and the implementation of strategic projects that each level of management requires.

Cybersyn enabled also a clearer distinction between planning, doing and evaluating performance. Other SISP frameworks assumed that people will develop the plans as expected and will have the proper conditions for developing them as expected.

It also develops the idea of having quality information and conversations about monitoring performance as the basis for relating strategic development projects to current organisational improvements or problems. This idea is not even touched by other approaches.

In order to use these ideas for guiding development of an SISP process it seems necessary to properly guide a cultural change process among managers and workers. This change process will aim at creating consciousness on workers and managers on the advantages of self-assessment, the convenience of balancing their structural arrangements with criteria of effectiveness, and the need for debating which areas require development and SIS support, supporting such debates with the

structured information provided by an index system as the one suggested.

In spite of these promising characteristics of the managerial cybernetic framework, the literature review showed the lack of a complete description of any SISP framework for this approach. It showed only some ideas suggested by Schuhmann when relating the experience that Espejo led in developing the SISP process at the Film Division at Hoechst AG, in Germany.

On the basis of previous arguments, it seems to the researcher that the SISP researchers community may benefit from having a fully developed framework of SISP based on cybernetic ideas.

The researcher acknowledges some risks in using this framework for explaining real-life situations. While it presents a strong conceptual foundation of VSM ideas and applications, understanding them still requires of many years of studies (at least those required for doctoral studies).

Even if there is a lot of sound theoretical development offered by managerial cybernetics, unfortunately, as Anderton points out, many people attracted to these ideas find that they are very difficult to grasp and finally renounce to any attempt to understand them properly. <Anderton, 89>

The fact that the practical experiences found in the literature are not yet detailed enough does not make the learning process easier for VSM followers. The lack of practical examples of successful experiences using these ideas makes it less likely that people risk trying to try them in practical situations.

Nevertheless, having had the opportunity to study these ideas in depth, the researcher considers it is worth pursuing the theory to see how it helps to explore practical situations. For this and the other reasons previously mentioned, she has defined it as the conceptual framework suggested for defining the proposed SISP framework.

4.2. DESCRIPTION OF "CYBERSYN" MODEL OF EFFECTIVE MANAGEMENT

4.2.1. Background on development of the Managerial Cybernetics Model of Efficient Management

On the basis of the criteria of effectiveness offered by VSM, Beer and his followers have developed the idea of Cybersyn as a model of effective management. <Beer, 81>

Over the last twenty years, Espejo has developed Cybersyn's idea further. At the methodological level, he has included the idea of Critical Success Factors, proposed by Rockart, that was not available before. He also has explained more clearly the relationship between strategy, structure and information management. <Espejo, 91>

Syncho Ltd, from England, is an international consulting firm on managerial cybernetics, chaired by Stafford Beer and managed by Raul Espejo. It has developed a software package that supports Cybersyn, called Cyberfilter. As Syncho's manager and as a consultant, Espejo has applied and further developed Beer's ideas in many practical situations.

This section introduces main ideas of Cybersyn and describes Cyberfilter, as their suggested MSS for supporting the managers' role. The researcher considers they constitute a consistent model of effective management and that they offer a proper language for designing a framework for developing an SISP process.

She agrees with other researchers from managerial cybernetics who argue that in order to support effective management it is important to improve management processes, and that VSM provides the required language for debating and developing such improvements.

Cybersyn's purpose is to offer managers criteria for improving the management processes, in terms of their relationship to the organization as a whole. In other words, it offers managers criteria for designing the mechanisms they require for effective management of complexity. In particular it regards with designing appropriate structural conditions for

defining and measuring strategy and policies, by relating them to organizational results and environmental changes.

Having into account the researcher's definition of SISs as systems to support organizational development in strategic areas, the following sections describe Cybersyn as a new paradigm that offers structural criteria for defining SIS in a SISP process.

4.2.2. Describing Cybersyn model of effective management

One of Cybersyn's hypotheses is that no matter how good an executive information systems is from a technical viewpoint, its capacity to foster managerial effectiveness depends largely on the proper design of the management processes it pretends to support. Same argument apply to many executive information systems pretending to support organizational development.

The main aspects which Cybersyn suggests that managers should properly design, in order to seek improvements in organizational effectiveness are:

- Defining Structural Adjustments for Fostering Organisational Development
- Finding out proper commitments about organization and processes purpose, agreed strategic developments and resources for each organizational level.
- The development of a standard system of measurements to measure organisational performance, to detect instability in the relationship between the organisation and its environment and to improve workers' learning skills.

The following sections comment on each one of these aspects suggested by Cybersyn.

4.2.2.1. Defining Structural Adjustments for Fostering Organisational Development

As Appendix # 1 describes, VSM recommends to redesign organizations

as recursive organizations, where there are partially autonomous sub-organizations at each recursive level, each one having the required mechanisms for survival. VSM also describes a structural arrangement to discuss strategy and policy issues at all structural levels, called the "*Mechanism of Adaptation*."

Researchers from Managerial Cybernetics argue that by comprehending and properly designing this mechanism we may foster the organization's cohesiveness and improve its capacity to adapt to a changing environment.

According to VSM criteria, in order to increase the chances of an effective policy process, control and intelligence should communicate with each other, each one submitting their views to the checks and balances of the other, before they inform the policy function. In order to do it properly, it suggests to properly design communication channels among the functions of intelligence, control and policy at all structural levels, (i.e., to properly designing the so-called "*adaptation mechanism*").

Cybersyn recognizes the intensely political nature of such debates, where each manager's strategic projects have to compete with those proposed by other managers at the same recursive level, each manager with his own views and interests in supporting certain strategic projects. Instead of intervening in the political debate, it suggests creating the right conditions for guaranteeing more effective debates.

This model of effective management has been used by Espejo for supporting development of some methodological tools which use VSM as the model for representing the organizational structure, and as the language for debating issues of organizational effectiveness. For instance, his "*Method to Study Organizations*" provides methodological guidelines for using VSM to guide an organizational diagnosis aiming at facilitating managers' own discussions about their own operational constraints for strategically developing the organisation as expected. <Espejo, 88>, <Espejo, 89c>

According to the author, it would aim managers to uncover, to debate, and to make feasible the organizational adjustments required for effective implementation of organizational strategy.

The following chapter describes such a method, as one of the main methodological tools to use as the basis for defining the SIS plan. The researcher considers that by starting the SISP process with the discussion of required adjustments to management processes and communication channels, one might have a stronger foundation to analyze the perceived strategic processes, and to define their required SIS support.

4.2.2.2. Finding out proper commitments about organization and processes' purposes, agreed strategic development areas and resources for each organizational level.

Traditional theorists on strategic planning have focused almost exclusively on designing frameworks and tools for debating content-based aspects of strategic plans and programmes. There are fewer researchers addressing the study of context based aspects of planning. Researchers from Managerial Cybernetics emphasize the importance of designing also the context for debating the planning issues.

Last section outlined Cybersyn's criteria for designing the adaptation mechanism, at each structural level, to improve the likeliness of defining good policies and of improving organizational effectiveness. It emphasized the importance of debating not only the likely development paths for the organization -- as suggested by traditional planning theories -- but also of debating the operational constraints for successful implementation of the corporate strategy.

At the methodological level, Espejo suggests to follow Rockart's ideas for defining critical success areas and critical success factors, as the tool for guiding debate on current plans and programmes. The managers' defined CSFs would then serve as the criteria for assessing the desired organization and for assessing the required structural adjustments for developing the organization as desired.

The author also suggests to promote debates among managers about their observed operational problems, their views on each one of the strategic processes and their requirements to properly implement such processes. The researcher considers that the agreements reached from these discussions, will strengthen their criteria for later debate of each one

requirements of IS support for developing their strategic processes. The methodological framework described at next chapter deepens into this issue.

4.2.2.3. Development of a standard system of measurements to measure organisational performance, to detect instability in the relationship between the organisation and its environment and to improve workers' learning skills.

Experience shows that the policy and strategy debates are sometimes not effective enough, even if managers have the required information for supporting policy decisions. Researchers from managerial cybernetics say that it may happen due to inappropriate design of the communication mechanisms underlying these type of debates.

They say that, when preparing debates on policy or strategy issues, it is necessary to design the communications tools (i.e., channels, filters, amplifiers, information flows and information tools) required to attenuate or amplify the scope of issues to be debated.

It resulted clear when summarizing the review from researchers on Executive Information Systems, the importance that good quality information about policies and results has for supporting strategic management (i.e., the importance of attenuators, in cybernetic language). What Cybersyn model makes clearer is that Concerning the issue of SIS, VSM suggests that,

"If there is no balance between the complexity of each function and/or no adequate channels of communication, then no executive information system would overcome the fact that policy makers are more likely to define weak policies."
<Espejo, 91>

The following sections also describe in further detail the managerial Cybernetics criteria for designing a MSS to support strategic management.

The researcher considers that by using such a system as a facilitator for the debates about organizational effectiveness, there are better possibilities

of having effective strategic management processes. In particular, she considers that the index data improves managers criteria when determining their needs for supporting strategic processes with IS.

As a consequence, the researcher would suggest that an important condition for developing a SISP and or a strategic planning culture and a self- evaluation culture in organizations, would be to implement a proper measurement system as the one described later.

4.3. THE CYBERNETICS' VIEW OF A MANAGEMENT SUPPORT SYSTEM

Previous comments have stressed the importance of developing IS to support strategic management and, particularly, the discussions on required level of resources' development.

From the cybernetic viewpoint, a management support system is a tool for helping the organization to coordinate debates about organizational effectiveness in developing itself in the direction suggested by the corporate strategy. This section details this model of a MSS.

4.3.1. The Suggested System of Measurements

Cyberfilter is the name of the cybernetic suggested MSS for supporting strategic management. It is based on Cybersyn's system of measurement based on the ideas of actuality, capability and potentiality, introduced by Beer. <Beer, 79>

A critique by Beer of traditional measurement systems asserts that they are based on the analysis of historical data and are therefore useful for forecasting short term behaviors, but do not take into account criteria about the organization's future.

He suggests the design of a new measurement system which permits managers to include their views on the organizations' future as well as to analyze its historical performance. Moreover, his suggested system would permit them to measure not only financial results but also the

organization's products or services.

Such a system of measurement would require from each manager the definition of indices to monitor the variables he or she considers essential for developing the operations he or she is responsible for. For each index, managers should measure the following values:

- *Actuality*: the current value of the measured variable. It serves to measure an event as soon as it happens. This value shows the current performance of an index, without changes to the initial plan and without improvements in the available resources.
- *Capability*: the best value that the variable might take, accepting the present level of available resources and the current limitations. It may be calculated either by means of a production study, or by choosing the best historical value met by the variable. The value of capability might eventually change. In order to measure its value, managers require to have adequate control mechanisms which helps them to know about the available resources, as well as to monitor their allocation and current use.
- *Potentiality*: the value that the variable should take if the organization eliminates its limitations and develops its resources. It is the best value that the organization might achieve, according to historical records, with the least restrictions and the best level of resources. Potentiality measures the organization's committed resources for its own long-term development, so it provides a direction in which to develop organizational resources.

Figure 4-3-1 shows the relationship between each one of the mentioned indices. As shown in the Figure, the index of achievement is the ratio between actuality and capability. Latency is the ratio between capacity and potentiality. And performance is the product of the indices of actuality and potentiality.

The value of achievement refers to current organizational results. Latency refers to realistic organizational commitments about required developments. Performance measures a balance between them. In this issue, Espejo, says that

Figure 4-3-1
Indices' Levels



Taken from <Espejo, 91>

"If the definition of potentialities and the measurement of capabilities and actualities are made at all autonomous levels in the organization, then they constitute a comprehensive system of measurement." <Espejo, 91>

According to Cybersyn, if the organization can commit enough resources for its future development, guarantee effective structural conditions for making optimum usage of such resources, and effectively implement its own plans while leaving the organization's clients increasingly satisfied, then and only then, we can say it is an effective organization.

Using the results of the MSS, managers can observe their own measures of performance and analyze the reasons for failure. The computer system's purpose is to keep records of index values and to analyze their performance from a historical and statistical perspective.

According to Espejo, the most common weakness of current executive information systems is that they emphasize the design, ergonomic characteristics and flexibility in the reporting while not worrying enough about their alignment with effective management processes. Their emphasis in drilling down into detailed data ignores the need for autonomy at all levels and it bypasses the necessary conversational processes between structural levels. <Espejo, 91>

In order to avoid this to happen, Cybersyn also suggests criteria for adjusting the mechanism of adaptation as suggested by VSM, so that there will be a better chance of debating failures at the right levels, and consequently, a greater possibility of achieving the required resources for implementing the changes needed to improve organizational effectiveness.

4.3.2. What To Measure According To Cybersyn's Criteria

Beer's opinion is that, in order to develop the organization's potential managers should design the operational conditions for developing strategic areas. His proposed system of measurement aims to serve managers from each structural level, to assess its relationship to both external and internal environments. In this way each manager could measure his or her skills for using the organization's resources and for

achieving his or her goals, as agreed with the managers from other organisational levels.

Cybersyn recommends that the manager from each autonomous activity define their critical success areas, as well as some variables that would indicate the state of development of such areas, at any time. These variables or indices should refer to both their relationship to the environment and to the organization's operations.

How to choose an index is an important aspect in the implementation of Cybersyn. The researcher agrees with Espejo's suggestion of defining managers' critical success factors (CSFs) and related indices for this purpose.

Rockart suggests to define the success factors which each manager consider critical to pay attention to, if the sub-organization (s)he is in control of is to remain viable. He even suggests managers to define some related variables or indices to measure the most likely changes in the performance of the critical organizational areas affected by environmental changes.

He defines CSFs as a limited number of areas that will ensure (if they produce satisfactory results) a good organizational performance in the organization's competitive field. They are key areas where *"things should go right"* if the business is to develop itself. <Rockart, 89>

As Espejo would say,

"In order to define the activities which should be autonomous, the organization should answer the following question: which are the activities in which the organization must excel - be world champions - if it is to remain viable as a whole.?"

The answer to this question depends on the organization's vision, mission and perceived strategy. For those activities given by the answer to this question, it is not enough to work out a competitive edge for the organization today, but rather it is also necessary to endow it with a viable organizational structure." <Espejo, 91>

In other words CSFs are the areas of the business or the environment that the manager sees as the ones (s)he must constantly monitor to guarantee the organization's survival, or to guarantee that current operations are pushing the organization closer to the path traced by the agreed

organizational strategy.

Beer also suggests using indices to measure each managers' strategic variables. An index is a relationship between quantitative or qualitative variables that aids people in observing a situation and the trends for changing performance in the observed object, in comparison with some pre-defined goals or expected performance.

When defining indices for measuring the external criterion of stability (i.e. the one measuring the operations versus environment relationship), operational managers should define which essential variables in the relationship pertaining to their particular environment they should be aware of, in order to control this relationship.

In order to define the indices, each autonomous activity can be considered as a process of transformation, from an original situation where there is a community asking for a product or service, to a situation where the community's requirement is satisfied.

From this viewpoint, what is more important to measure is the quality of the results of the primary (autonomous) activity, from the viewpoint of the user's community. The expected level and quality of products or services will be the best measure or index.

However, it is also valid to measure the inputs of intermediate production processes, if they are a good index of the final quality of products or services, when the production process takes a long time or is too complex. In this case, the index will attempt to measure the process' effectiveness in terms of the inputs used or in terms of the process itself.

In any case, the variables to be measured are those which managers perceive as the essential ones they should control, in order to manage a particular task. These essential variables are the driving forces for developing information systems. An important criterion for defining indices is that their meaning must be clear to the executives, and that it lets them to act pro-actively, without waiting for a later analysis that would delay their decisions and actions.

Managers may be able to define their own indices of performance on the

basis of the operational constraints they currently face, but they must also take into account the organization's commitment to the development of the required resources in the middle and long term.

4.3.3. On the Managers' responsibility for implementation of the MSS

Cybersyn recommends managers to design the mechanisms they would employ for collecting opportune and sufficiently reliable data with which to keep the index values updated. The implementation of Cybersyn would then require the definition of procedures for obtaining the data needed to calculate, on a permanent basis, the current value of each index, while keeping track of its time series.

In order to correctly achieve this, managers should make sure there is somebody responsible for collecting the data required and for updating index values and guaranteeing the technical functioning of an information system which manages the index data. For each index, people should be assigned to collect the data and others (or the same ones) should update the index system.

The organisation might need to develop a computer-based information system to support data management, if the complexity of their own indices data processing makes it worthwhile doing it. In such a case, once a IS supporting data analysis has been developed and implemented, managers should send their current data to such a system.

There must be at least a person responsible for managing and operating the system so that it processes the indices data and produces reports about abnormal operational situations requiring management's attention. The information system must be able to discover such situations by making an statistical analysis of the historical performance of the indices.

This type of analysis should be done by comparing the current trend in the performance of each index with the index's own historical trend. The system may thus be able to forecast unexpected performance even before it happens, and to timely alert managers so that they can prevent a crisis from occurring.

Cybersyn's also recommends the design and implementation of appropriate communications mechanisms for debating these kinds of problems as soon as the system announces them. Moreover, if the system has forecasting capacity, it becomes an early warning system, and the debates mentioned before would take place in order to prevent crises rather than manage them once they occurred.

4.3.4. Technical Characteristics Of Cyberfilter

The aim for developing a cybernetic-based executive information systems is to allow managers to record periodic measurements about the performance of defined indices and to act pro-actively on the basis of information provided by the system.

A basic criteria Cyberfilter provides for designing the MSS is that it should be able to produce early warning signals. In order to do this the system should analyze the historical performance of the time series from each index trying to detect significant changes in its behavior and to forecast short-term performance.

Cyberfilter also suggests that the system ought to report unexpected changes in index performance to each level of responsibility. For this purpose, the system should be able to test each current value and to establish if it signifies a change in performance. Each time the programme detects an incipient change in the performance of an index, it should generate an alert to the responsible manager.

An exception report should exhibit data from all those indices that are currently showing unexpected performance, or aggregated indices which are behaving in an abnormal way. If installed in a networking environment, the system must also produce, electronically, an exception report to upper managerial levels in those cases when managers have not solved the alerts timely.

Cybersyn recommends to managers to be ready to take action once (s)he receives an exception report that includes an alert signal regarding the variables under his or her responsibility. In other words, in order to

avoid a crisis occurring, managers should analyze the causes behind an abnormal situation and should act timely.

With the help of this system, managers should be able to assess their own effectiveness in implementing organizational strategy, make the necessary changes, and forecast inappropriate performance in activities under his or her responsibility.

In summary, a cybernetic MSS should offer managers information with the following characteristics:

- *Aggregated*, at the manager's level of responsibility. Each managerial level should have the autonomy to supervise its own index performance. Only for the purpose of following up an unsolved diagnostic problem should managers from one level review information belonging to managers from another level.
- *Selected*: focused on indices that the manager considers relevant to control performance.
- *Filtered*: the system should report only relevant changes or discrepancies. It should produce reports on the basis of the detection of incipient instability in an index's performance. It should also produce warning signals when it detects important deviations between the values of actualities and planned improvements towards capability.
- *Timely*: If possible, the system should produce real time information in order to guarantee that the following action will be effective. <Espejo, 89>

4.3.5. Structural Criteria For Defining Indices

Figure 4-3-5 shows the structural design required for effective implementation of Cybersyn's ideas. According to the Figure, the policy function does not have to know details of the manager - operations relationship at each level, but it has to care about the effectiveness of their results, from the viewpoint of the organization's strategy. Similarly,

managers do not need to know every detail about the operations - environment relationship, but they should only monitor a selected group of variables related to the critical success areas.

Operational managers have to define the criteria of performance (C2) between operations and the environment, while the policy function (that may be responsibility of senior managers) defines the same criteria of performance between managers and operations (C1). Both of them ought to define the measurements M1 and M2.

These criteria (C1 and C2) serve as the basis for defining potentiality. This value is only meaningful as a result of discussions about possibilities that should occur among managers from each structural level. From this viewpoint, an index system is a tool to be used for fostering the right level of commitment among all managers.

Cybersyn suggests that the process of definition and analysis of indices should take place in a participative environment, in which the group uses the experience of those with operating responsibilities for defining their CSFs and indices. It supports the idea that they are the ones who perceive the complexity of the environment, the complexity of the tasks, and their own limitations in carrying them out, and the user's satisfaction or dissatisfaction with the products or services they are offering.

It is for this reason that this model recommends that employees from each autonomous recursive level define their own critical success factors, as well as the indices that they want to monitor to compare expected versus current results. They are also the ones with criteria to define the SIS they require to support the development of strategic processes.

In order to support each level's autonomy, while maintaining organizational cohesiveness, Cybersyn suggests to balance this given freedom to each manager in the definition of CSFs and SISs, through the design an implementation of a negotiating scheme for agreeing on index definitions, current and historical values and alarm thresholds from each index, with upper managerial levels.

This self-regulating scheme would permit operational managers to fulfill their own need of being permanently aware of the performance of their

**Figure 4-3-5. Structural
Interpretation of Indices**



Taken from <Espejo, 91>

essential indices. It is also more likely for them to be committed to the resulting plans and projects, if they themselves have defined their indices and have negotiated their values of capability and potentiality.

4.3.6. Cybersyn as a new Paradigm of Effective Management

The authors present Cybersyn as a new paradigm of effective management. This section summarizes the idea of how managers may use the information from the MSS and the designed system of conversations to develop strategic management.

In order to develop a short-term action plan, each manager should have an idea -- as precise as possible -- about the amount and type of resources required to implement strategic activities. She or he should then be able to compare this estimate with his or her used resources as well as to learn from the comparison.

In other words, the manager needs to periodically compare current versus expected levels of performance (or what Cybersyn calls the index of achievement that defines as the relation between the actuality and the capability values). By studying the historical behavior of the value of achievement of the critical variables, they will be able to discover desirable improvements in the situation measured by the variable. Such improvements may be the basis for designing medium-term plans.

The suggested MSS should thus be responsible for processing the required data for making this sort of analysis as well as for alerting managers of likely abnormal behaviors on the control variables it measures. The manager should get from the system alerting messages about situations that may anticipate undesirable behaviors in the monitored variables and (s)he should coordinate the analysis of the situation, in order to generate the required administrative actions to correct the abnormal situation or to prevent it from becoming more problematic.

It is in this sense that the system offers information to support the strategic planning and the performance evaluation's activities. Normally, in order to solve a critical situation managers have to invest some resources. In case (s)he needs to improve resources (s)he must negotiate

with higher management levels.

This model of effective management also suggests that when the system produces such an "*early warning signal*", it is important to guarantee an opportune and successful action from the responsible manager. For this reason Cybersyn suggests the definition of a communications mechanism with an adequate channel capacity, to force the relevant participants to debate timely the best way out of the problematic situation that has been revealed by an early warning signal.

If no alarm signals are produced by the system, it means that the situation is normal and the manager is controlling it. The manager should define for himself the threshold at which the system triggers an alarm.

The manager should learn to permanently adjust this threshold according to environmental conditions and according to his or her learning skills. In normal situations each manager is the person who is responsible for maintaining control of each index's performance.

By observing and analyzing the trend shown by the actuality value, the manager might develop short-term planning processes, given current limitations, but make better provisions for the medium or long term.

Strategic planning, in the medium term, depends on the estimated value of achievement. Each manager needs to continuously compare his or her planned achievement value versus the current one. Also at this level the index system should produce an exception report to alert the manager about unexpected performances.

The latency index measures the organizational commitment with long term developments (normative planning). It means that this index might serve as a support for developing the organization's strategic plans in the long term. On the basis of the analysis of this index, each manager can negotiate the resources with which to develop the long-term capacity of the organization, eliminating current restrictions.

The manager must negotiate resources in order to develop the organization's long-term capability. This can be seen to be occurring when capability and potentiality values approach each other. Plans are

developed by locating new resources as new investment projects, new R&D plans, new product design, etc.

The managers responsible for the policy function should define performance criteria to measure the results of interactions between management (systems five, four and three) and organizational operations (systems three, two, one). It defines potentialities, which must be consistent with the organization's identity and mission. At the operational level, all changes in performance indices should be measured and reported to the next higher recursive level of autonomous activities.

Cybersyn's main hypothesis is that, as long as the control function makes a realistic assessment of the organization's capabilities and is able to measure actualities in real time, the measurement system will be sufficient to support effective management. It suggests this model of management as a new paradigm of effective management.

4.4. THE CRITERIA PROVIDED FROM MANAGERIAL CYBERNETICS FOR DESIGNING A COHERENT SISP FRAMEWORK

This section presents an outline of the main features that the researcher considers convenient to improve from current SISP frameworks, according to her own experience in using them and also according to recommendations from managerial cybernetics researchers.

In her view, a new *SISP* framework that aims at overcoming some of the perceived shortages that she and other SISP researchers have addressed, should have the following characteristics.

4.4.1. It should not de couple the activities of planning and doing.

Last chapter discussed that most of the literature on strategic planning concentrates on the idea that organisations must properly define the best possible strategies (organisational and technological) in order to become leaders in their markets and remain competitive.<Porter, 80>

It also mentioned that systemic thinkers are people who develop a holistic view of nature. Porter, as a systemic thinker offers us a view of strategic thought that lead us to better understand the behaviors of different enterprises competing in a competitive environment. In this respect, he says that,

" ... Understanding competitive advantage requires a holistic view of the firm which, while cutting across the many disciplines and activities within the firm ... combines them by examining all of its sources in an integral manner." <Porter, 92>

Nevertheless, most theorists and practitioners have traditionally viewed strategic planning as a rational exercise, instead of seeing it as a social exercise for achieving a commitment to the effective implementation of an action strategy, as suggested by some contemporary systemic thinkers. Even Porter's suggested models and tools do not offer criteria for guiding effectively the conversations about planning and doing or the conversations for learning from the experiences.

Also, most planning schemes have assumed that the rest of the world won't change during the implementation stage. These and other reasons led some researchers to suggest that we have too often de coupled the conversations about formulation of plans from those for comparing the results obtained with the expected ones.

These researchers suggest that de coupling these conversations may create problems during implementation. <Mintzberg, 94> The researcher considers that by de coupling them there will be less opportunities for closing the social learning loops effectively and for generating organisational adaptive behavior.

On the other side, there is a group of systemic researchers who have provided a clearer description of the nature of social learning activities, by describing the importance of jointly developing a shared understanding about the nature of the situations they have to deal with while developing social actions. <Checkland, 81> Some of them have also contributed to understanding the social learning process associated with strategic planning. activities. <Doyle, 91>

The researcher considers that a new framework for explaining the SISP

process in social organisations should take into account these systemic viewpoints about the nature of the planning conversations.

4.4.2. It should promote development of conversations about required structural arrangements to create proper conditions for strategic development of the organisation

From reviewing the literature on SISP research, we find that most of the frameworks studied were either fragmented -- only describing some aspects of this type of planning activities -- or they do not have a coherent and sound theoretical framework . Most of them concentrate on providing tools for guiding the content definition process of strategic planning and offer fewer criteria for assessing implementation results.

Even if there are systemic thinkers among the community of SISP researchers, there are few systemic frameworks for guiding the development of an SISP process. In particular, there is a lack of conceptual frameworks capable of supporting the definition of strategic information systems, and for relating it to the organisational context in which the implementation of technology occurs. <Waema & Walsham, 90>

According to cybernetics criteria, if we want to use information systems for improving organisational effectiveness, it is not enough to work out the strategic information systems or services required by the organisation, but it is also important to make the required structural arrangements to guarantee the effective implementation of strategic projects.

On the other side, Managerial cybernetics' researchers suggest that by not understanding properly the relationship between developing plans and creating proper conditions for such developments, organisations may limit their capacity for effective learning and their possibilities of adaptation to a changing environment. It suggests to people to timely develop the required conversations for creating proper structural and technological conditions for guaranteeing successful implementation of the strategic projects. <Beer, 79>

The researcher considers that these ideas add to our current

understanding of the relationships between organisational strategy, information systems and organisational structure, and that they might as a result contribute significantly to explain the process of SISP. By using them, she concludes that a new SISP framework should promote development of conversations about required structural arrangements to create proper conditions for strategic development of the organisation.

4.4.3. It should provide criteria for designing the context of the planning conversations

Current planning practices suffer from frequent disappointment from people participating in the planning process, when the results they achieve from their doing are too distant from their expected results, as agreed at the planning process. It has led some researchers to suggest that social groups should improve their feedback mechanisms to increase their learning speed.

Even if most enterprises develop some kind of feedback mechanisms, naturally, sometimes these mechanisms are not effective enough. Some researchers have reported the lack of understanding of the contextual aspects influencing the effectiveness of conversations about planning and doing in social organisations. In particular, some SISP researchers have suggested the need for newer SISP frameworks that properly address both the content and the context aspects of planning.

Agreeing with this argument, the researcher considers that a new SISP framework should be able to help managers and analysts to more effectively close their own learning loops, when planning and developing SIS. She considers that a new SISP framework should offer criteria for designing an effective context for developing these types of conversations and not only criteria for improving the quality of the debates (i.e., by focusing only in the content aspects of the conversations) about feasible and desirable strategic projects, investment resources and so on.

She thinks that by guaranteeing such a properly designed context for developing these types of conversations it is more likely that the agreements reached from the strategic debates result in cohesive social actions. It is also more likely to expect that people participating in this

sort of debates will develop criteria for determining the most important areas and processes requiring technological support. Therefore, it is desirable from a new SISP framework to properly design the context of the strategic planning conversations.

4.4.4. It should offer criteria for designing tools to promote effective learning

One of the problems of effective learning, described by the experts, happens when the observer or a situation it is interacting with, have no way of tracking the results of its own interaction with the environment. In technical language, we would say that the observer has not properly close the required feedback loops and as a consequence, its learning process will be slower -- and may be even more painful. --

People from a social group naturally develop conversations about the current situation they share, its problems and opportunities, and consequently, negotiate or determine the most desirable and feasible opportunities for developing the social organisation. In managerial jargon, these types of conversations result normally in agreements about investment resources and strategic development areas.

However, at the light of this argument, current strategic planning practices do not recognize clearly enough the need for closing the learning loops in the experiences of planning- doing, in order, not only to improve their learning speed, but also to make them aware of their own learning, process, that is to say, to learn to learn.

Managerial cybernetics offers a clearer description of the nature of social learning and provides tools for improving the speed and the social climate when jointly learning from common experiences. It offers criteria for designing an effective measurement system that gives us information about implementation results, and help us to use them for guiding debates on strategy (re)formulation. <Espinosa, 94>

The researcher considers that a new SISP framework should promote development of these type of criteria, to improve the learning skills of a social group developing the strategic planning projects or the people

analysing the strategic planning or SISP types of processes.

4.4.5. It should provide criteria for ascertain the need for technological support for each particular process in the value chain

There is some research evidence on the strategic impact of IT developments on the successful operation and growth of organisations from different industrial sectors. <Keen, 91> Such evidence has pricked the imagination of some people who predicted that we need to consider IT as a key factor in improving the organisation's competitive position in the market and that the SISP activity is a strategic activity for the corporation. It has also motivated research interest on the issue.<Earl, 88b>

Former researchers on SISP observed that most organisations needed to follow an entire learning cycle in order to incorporate the new information technologies into their working practices. They suggested that most organisations learned to plan the relevant activities related to developing and using information systems, in order to rationalize expenditure and the number of different technologies and data processing formats and methods used. <Nolan, 79>

There is evidence of other types of organisational changes resulting from IT use: For instance, Ciborra has observed and studied changes in the communications patterns among organisational members resulting from the use of IT. He argues that to develop an information system means, to a large extent, a change and restructuring of the institutional bonds and background conditions with which people relate to each other. <Ciborra, 89>

Other researchers even support the view that the use of the newest IT tools may foster decentralization of the organisational structure, therefore making IS the core of efficient and adaptable organisations. <Salmona, 89>

It is also clear to observers that IT technology changes the relationship between each person and his/her tasks and that the relationship between the organisation and its clients changes, as well as that between

organisations and its clients, suppliers, and even among competitors. For instance, IT has made it possible for some competitors to form strategic alliances (e.g. by sharing the development of an EDI process with their client), thus changing the structure of their markets. The success achieved by this type of strategic alliance, has shown the importance of also analysing phenomena of collaboration, while previous researchers on strategic issues concentrated on analysing the phenomena of competition. <Keen, 91>

Despite this and other evidence of the strategic impact of IT in enterprises and markets, other authors feel that the relationship between achieving a competitive advantage and defining and implementing leading edge technology is not yet clear enough and that we have not yet found a proper way to measure the impact that IS has on an organisation's effectiveness. <Galliers, 88>

Meanwhile, most companies increase year by year their percentage of investments in information technology and for that very reason, they worry more about the usefulness and appropriateness of the investments made. This situation has forced them to develop their learning skills in planning and developing strategic information systems.

Following Porter's ideas of the "value chain" <Porter, 92> the researcher considers that a new SISP framework should offer criteria for ascertaining the need for technological support for a particular process in the value chain.

This chapter has argued that Cybersyn offers a coherent model of effective management that gives clearer criteria for designing "*the SISP framework*." It has also argued that by developing "*the SISP framework*" at the light of these criteria, its users should be able to overcoming some of the perceived shortages that other SISP frameworks have. Next chapter will present the managerial cybernetic based framework for developing a SISP process, designed at the light of the criteria outlined here.

5. STRATEGIC INFORMATION SYSTEMS PLANNING PROCESSES: A CYBERNETIC VIEW

5.1. THE PROCESS OF BUILDING UP *"THE STRATEGIC INFORMATION SYSTEMS PLANNING FRAMEWORK"*

This section describes the logic used by the researcher for designing a new *"SISP Framework"* able to serve as a sound, consistent analysis structure for the situations motivating this research's interest, that is, the SISP process lived at the PO, during 1990-1992.

It first describes the main learning from such experience and the criteria they suggest for designing the analysis structure and then it summarizes the main recommendations from other SISP researchers. It reviews these points, at the light of the criteria offered from managerial cybernetics' ideas and consequently describes the researcher's own proposal for setting up the new framework.

Then it details the researcher's recommended methods and tools for following each one the stages suggested at *"the SISP Framework"*. The second part of this chapter, from Sections 5.2. to 5.8., describe each suggested step and sub-step in the framework. Final sections offers some practical recommendations for developing them and a summary of the framework, illustrating which aspects are useful for looking retrospectively at the Colombian case that next chapter will present .

5.1.1. Criteria for designing a new analysis framework, from the experiences lived by the researcher

The researcher lived an experience as the manager of the SI&S and the supervisor of a contract for developing the SISP process of the PO, during 1990-1991. She also lived the experience of creating, contracting

and monitoring development of other contracts for developing some of the suggested SIS from the SIS portfolio determined.

Main problems found in the process of formulation of the SIS portfolio were the lack of commitment from other senior and junior managers from the PO in the debates about CSFs and required SIS support, lack of understanding of the organisational processes in use from the consultants, and lack of alignment between the designed SIS portfolio and the main structural and management problems that the organisation presented at that time.

In the process of developing the SIS studied (*"the index system"*), main difficulties came from lack of administrative support for effectively developing the SIS proposed and also from the lack of commitment from the CPS organisations to the project that pretended to monitor their effectiveness in developing socio economic development programmes.

Moreover, there were serious communications problems among CPS organisations, the PO and the NPD that also made more difficult successful development of the project. The researcher is also aware of other technical limitations that the designed system had in terms of the system of measurement it used, the sources for getting the data and other details.

This summary makes her to think that the following are the main recommendations she will put to the designer of a new SISP Framework so that it is able to through new lights into retrospective analysis of these situations:

- It should offer tools to align the suggested SIS portfolio to the organisational tasks currently developed;
- it should let the analyst to properly study structural problems limiting organisational effectiveness and to have them into account when defining the SIS portfolio;
- it should offer criteria to review the context where the planning activities take place and to suggest improvements for setting up a proper context;
- it should offer tools to analyze communication problems among organisational actors.

- it should offer criteria to align descriptions on current organisational processes, considered strategic for organisational development, to their required SIS support.

5.1.2. What the study of other SISP Frameworks showed as required research new efforts

In the opinion of the researcher, the main research efforts for improving the approaches to SISP studied in the literature review, are the following:

- Clear need of new frameworks properly dealing with both content and context aspects of the SISP process.
- Lack of conceptual frameworks for researching organizational structure problems.
- Most of the available frameworks do not properly address the study of communication problems.
- The most widely known SISP approaches over - emphasize the activities of identifying the required SIS and defining the required resources for the implementation of SIS.
- There is not a fully developed framework for SISP, supported by a coherent conceptual approach which explains coherently what is the SISP process, from the beginning to the end, what are the suggested stages and recommended tools for each one.

As a consequence, much detailed analysis and reasoning has to follow, after following from most approaches' recommended stages to SISP, both, in discovering strategic SIS and in modifying current management approaches to be more strategic.

These ideas makes clear the convenience of attempting to develop a new SISP Framework trying to overcome most of these shortages from current frameworks.

5.1.3. Criteria offered by the theoretical approach chosen for the design of *"the SISP Framework"*

Once clarified the need to develop a new framework to overcome these perceived limitations from current frameworks, the researcher explains

here the need to support such development on a sound theoretical language expressing cohesively the ideas of social organisations, social learning and organisational effectiveness, as Managerial Cybernetics does, in her view.

The review of main theoretical developments from this approach resulted in the determination of criteria to build up "*the SISP Framework*", that may be summarized as follows:

- It should not de couple the activities of planning and doing.
- It should promote development of conversations about required structural arrangements to create proper conditions for strategic development of the organisation
- It should offer criteria for designing tools to promote effective learning
- It should provide criteria for ascertain the need for technological support for each particular process in the value chain
- It should provide criteria for designing the context of the required conversations during a SISP process.

Next section describes the researcher's interpretation of this criteria, for defining the desirable stages for the new SISP Framework, coherent with this theoretical posture.

5.1.4. The researcher's proposal for building up "*the SISP Framework*"

Past considerations make the researcher to define the SISP process as a process for designing the required SIS to support the most critical development areas of the organisation, according to its expected development strategy and to its current operational constraints and agreed adjustments.

In order to develop a SISP process, according to the theoretical framework presented in past chapter, and to past definition of the process, the researcher considers important to, at least, go through the following stages for developing it.

- A stage for properly discussing the most critical success areas of the organisation, as well as the most critical factors determining successful development of each one.
- A stage for promoting agreements about the required structural arrangements as well as the required resources and actions for developing the relationship from critical success areas.
- A stage for analyzing (technical and managerial) appropriateness of current IS support to each one of the critical success areas.
- A stage for determining each critical success area's own need for SIS support.
- A stage for agreeing on the most feasible and desirable SIS developments required, according to current priorities, resources and strategic criteria (defining the SIS portfolio).
- A stage for detailing, for detailing the required resources, timetables and goals from each one of the designed SIS and for negotiating the required resources for its development.

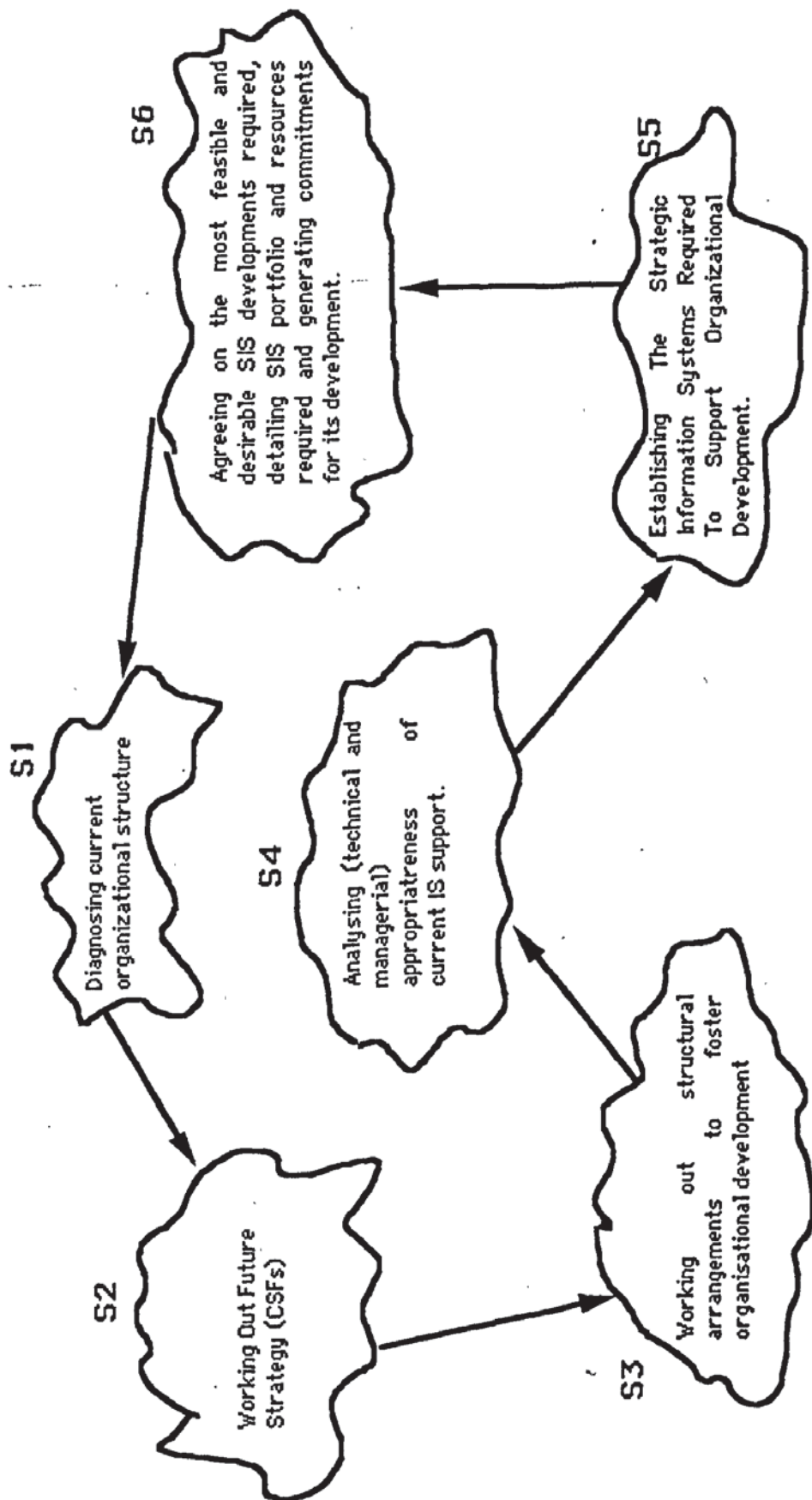
Figure 5-1-4 presents "*the SISP Framework*" that the researcher proposes here. She designed it, by discussing each one of the required stages as well as the better way for linking them all together, with her supervisor, R. Espejo, until May 1994, where the thesis was first submitted to the examiners. Last version of this framework has improved the coherence and details of the presentation but has not changed the stages or the order agreed with Espejo.

There follows a brief description of the activities that require development, at each one of the suggested stages of the SISP Framework.

5.1.4.1. Organisational Diagnosis (Diagnosing the current structural constraints on effective learning from the social groups developing the different categories of tasks.)

"*The SISP Framework*" recommends first to define the organizational area of interest for the study. In order to do this, it is important to define the area of business processes which play the most outstanding role in the implementation of the perceived strategy. It is called "*the system in focus*".

Fig. 5-1-4. THE PROPOSED SISP FRAMEWORK



For this area, this stage suggests us to develop a diagnostic review of the operational constraints that people in charge of current tasks have for developing them efficiently. The diagnostic focus is on the relationships between areas in charge of the productive processes (within the boundaries of the system in focus) and servicing areas providing administrative or technical support.

The diagnostic result is the outline of critical structural adjustments required, in order to create proper conditions for developing these areas strategically, as desired.

5.1.4.2. Working Out The CSA And CSF. (Discussing the most critical success areas of the organisation, as well as the most critical factors determining successful development of each one).

At this stage, the SISP Framework proposes that analysts facilitate discussions among managers and worker representatives, about each one's interpretation of the organisational development strategy, in terms of the most critical areas that it suggest to manage very effectively in order to succeed in developing the organisation as desired.

Cybersyn offers structural criteria for designing these kind of conversations. The result of these conversations are agreements and commitments among participants from each area, about the most strategic tasks requiring attention as well as about the most critical factors (CSFs) that each area should monitor in order to learn effectively while developing each area.

The researcher considers that previous agreements about required structural arrangements will improve managers and analysts' criteria for debating the CSAs and the CSFs.

5.1.4.3. Creating conditions for effective organisational development (Analyzing the required structural arrangements as well as agreeing the required resources and actions for developing them).

In the light of the defined CSAs and CSFs, managers and/or workers'

representatives from all areas within the system in focus should agree about the most desirable and feasible to implement from all the suggested adjustments required to create the structural conditions for success.

The result of these debates should be the definition of those structural aspects for which the organization agrees to commit the required resources and the required human efforts. They may be either improvements to the operational schemes of current business processes, or the design of new products, services or productive processes, recommendations for improving current procedures, etc.

5.1.4.4. Analyzing (technical and managerial) appropriateness of current IS support.

The Framework then recommends evaluating current IS support for existing processes (within the system in focus), from the technical and from the managerial perspectives. The analysis tools should provide an appropriate technique for modeling the complexity of each task under analysis, and for debating the appropriateness of current IS support it has, both from the managerial and from the technical viewpoint.

The result of this analysis is the outline of required improvements to current IT platform and IS applications available that each task's representatives suggest to develop.

5.1.4.5. Establishing The Strategic Information Systems Required To Support Organizational Development. (Determining each critical success area's own need for SIS support).

At this stage, the analysts coordinate the task's modeling from each critical success area. The framework suggests soft systems oriented tools to guide this type of analysis, which result is the definition of the new requirements of SIS that each area consider important to develop according to current priorities, resources and strategic criteria (i.e., the definition of this aspect of the SIS portfolio).

5.1.4.6. Agreeing on the most feasible and desirable SIS developments required and generating commitments for its development

By comparing the current provision for IS support with the support required, one can define the improvements to be made, either by developing current IS resources or by building up new ones.

The conclusions drawn from this analysis provide the basis for defining the IS portfolio and for determining the resources needed for its implementation. They refer to determining the required human and financial resources, IT tools, the term in which results are expected (long, medium, short), estimated starting date and estimated investment required

The final steps suggested by this SISP framework for defining the SIS portfolio are the adjustments which need to be made to IT architecture and to the IS management's role.

Sections 5-2 to 5-8 present each step's activities as well as recommended methodological tools and suggestions for developing it in a real situation.

Finally, according to cybernetic criteria, in order to develop a SISP process, it seems to be also important to set up a proper context for debating strategic development issues of the organisation, relating them to current operational constraints, measuring results of the organisation and relating them to the expected results and determining the required SIS support to improve effectiveness of the most critical areas. The researcher considers that VSM offers criteria for properly designing this context of strategic conversations, as explained later.

5.1.5. Recommended tools for developing the required activities at each stage.

Figure 5-1-5 presents a detailed description of all the suggested steps and sub-steps of the SISP framework. Next section introduces the main methods and tools suggested to develop each stage. Sections 5-2 to 5-8 present in detail each step's activities.

5.1.5.1. Suggested tools for the Diagnostic and Strategic Stages (A., B. and C.)

The previous section made it clear that the researcher considers it important to back up discussions about required technological support with previous agreements concerning the adjustments which should be made to management processes.

For this reason, the first methodological recommendation of this "*SISP framework*" relates to the coordination of such discussions concerning the effectiveness of current management processes. The recommendation refers to the use of Espejo's "*Method to Study Organizations*".

This method uses the VSM as a model for effective organization and serves as the basis for guiding organizational diagnostics. It helps to review the structural adjustments which the organization requires in order to develop itself in the direction indicated by the its strategic vision. As the author makes clear, the method suggests using soft systems tools for guiding the required discussions at different stages of the diagnosis. <Espejo, 88, 89a, 89b, 89c, 89d>

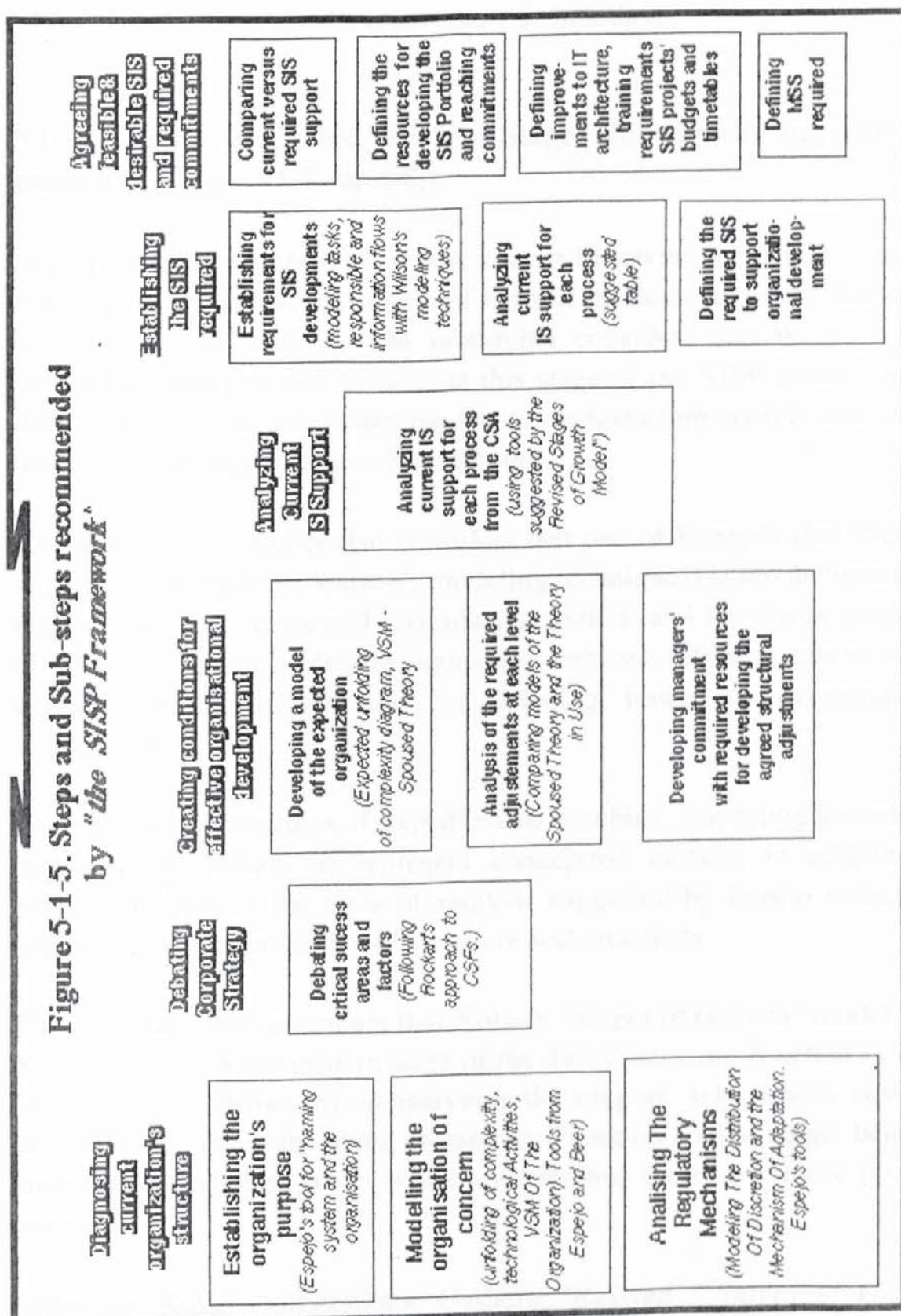
For instance, the first stage which the method recommends as the starting point for organizational diagnostics is that of "*naming the organization of concern*".

This step suggests that representatives from each organizational area involved in the project discuss their perceptions of the current organization and agree on a common perception of it. Such an agreed organization (the areas of concern within this particular view of the organization) constitutes the "*system in focus*."

As Espejo has stated elsewhere, it is also important to model the relationship between the organization and the environment and to monitor this relationship, and Espejo has recommended modeling the organization-versus-environment relationship by using Rockart's CSF approach. <Espejo, 89a>

In order to clarify the relationship between strategy and structure, this SISP framework suggests relating the CSFs to the particular tasks that the

Figure 5-1-5. Steps and Sub-steps recommended by "the SISP Framework"



managers have to regulate. The researcher suggests that, in order to do this, analysts may use both Rockart's approach and Espejo's Method to Study Organizations, and explains how to link them.

5.1.5.2. Tools suggested by the Stages for developing the SIS portfolio (Stages D, E. and F.)

Wilson is one of Checkland's best known followers, and the researcher highly appreciates the usefulness of his soft methods and tools for many kinds of systems analysis. The researcher considers that Wilson's tools would help analysts and workers at this stage of the SISP process in the development of the conceptual models of the tasks they wish to analyze, in terms of their required IS or SIS support.

However, the researcher also considers that one of Espejo's contributions to previous work (e.g., Wilson's modeling techniques) is the distinction he makes between primary and secondary activities, and the use he proposes of VSM as a language for distinguishing between different categories of organizational functions and for debating issues of organizational effectiveness.

The researcher considers it expedient to combine modeling techniques suggested by Wilson to represent conceptual models, in addition to employing some of the tools of analysis suggested by Espejo to test the usefulness of such models with actors in real situations.

The researcher also considers that Nolan's "*Stages of Growth*" model may well help identify the growth stage of the data processing function in each business unit. It focuses on analyzing the support which each business unit receives from the data processing function (this stage being a business unit oriented stage, while the previous stages are more process oriented).

Following Nolan's suggestions, Galliers' "*Revised Stages of Growth Model*" underscores the convenience of analyzing, at the level of each organizational unit, the current coverage of IS support and its technical and business value at this stage of the SISP process. <Galliers, 91>.

His model also reviews other aspects of the system's management function for this unit, and provides criteria for determining adjustments to the system's role in order to foster the unit's learning regarding the use of information technology.

5.1.6. Criteria for designing a proper context for developing the SISP process

According to the theoretical criteria, "*the SISP Framework*" should promote development of conversations about required structural arrangements to create proper conditions for strategic development of the organisation. It should also provide criteria for designing the context of the planning conversations, as well as to offer criteria for designing tools to promote effective learning .

The researcher considers that by using Cybersyn as its model of effective management and by using its suggested design of a MSS (Cyberfilter), the SISP Framework will provide criteria for proper design of the suggested context for developing the SISP process.

Cybersyn as a model of effective management, underscores the importance for managers to be reliably and timely informed of operational results, debate the most feasible and most desirable action development path, and improve the operational conditions in which to coherently develop the organization.

In other words, the researcher considers that Cybersyn provides criteria for designing the context in which conversations on strategic issues should occur, and Cyberfilter provides criteria for designing the required information system to support effective discussions about strategic process management.

In addition, this SISP framework recommends Cybersyn as the conceptual framework for training managers and analysts when starting an SISP process, an organizational diagnostics process, or a process for developing a management support system. It suggests Cybersyn as the required common language for debating problems of organizational effectiveness and Cyberfilter as the information system supporting debates

on organizational effectiveness.

The topic of the following sections is to present the way the researcher considers the SISP process should be followed, as well as to further detail the recommended methodological tools for each step and sub step.

5.2. FIRST STAGE: ORGANISATIONAL DIAGNOSIS

As mentioned earlier, "*the SISP Framework*" suggests we begin a SISP process with a diagnosis of current organizational structure. The first stage aims to diagnosing the organisational constraints that current organisational structure imposes on effective learning to the social groups developing the different categories of tasks.

The "*Method to Study Organizations*" is a description of the main activities to follow if one wishes to use VSM as a language for guiding an organization's process of change. The following sections summarize it. For the remainder of this paper we shall refer to it as "*the diagnostic method*." <Espejo, 88b>

The "*diagnostic method*" suggests techniques which can be used either in diagnostic or design modes. In the diagnostic mode, they refer to reviewing the existing organizational structure, and to determining operational or structural improvements aimed at increasing the possibility of successful organizational development, under current constraints.

In the design mode, the techniques serve to define those business processes which do not currently exist, or which exist but require a complete change in design. "*The diagnostic method*" recommends developing both types of descriptions.

The purpose of the first activity suggested by the method is to develop a description of the current organization's model of itself, that is to say its "*theory in use*". The second activity is to repeat the exercise, but this time, coordinate debate among managers and experts and model the organization's "*espoused theory*", according to corporate strategy.

The final activity suggested by the diagnostic method is to compare the results of the previously recommended diagnostics and design, in order to define recommendations for structural arrangements. This step is coordinated by analysts. Since these modeling techniques have been described by Espejo in detail elsewhere, the researcher includes only her own interpretation of them.

5.2.1. Establishing The Organization's Purpose

The aim of this initial sub-step suggested by "*the diagnostic method*" is for the relevant managers to debate the organization's perceived purpose. Espejo emphasizes the multi-systemic nature of human activity systems and strongly recommends reaching an agreed definition of the organization to be studied.

Because of the multi-systemic nature of organizations, they can only be modeled from a particular viewpoint. Each angle of observation of the organization requires making the viewpoint or the observation's filter clear, as well as locating viewpoints which contribute better criteria for the observation of the organization.

In order to study a organization, Espejo recommends that analysts coordinate debate among experts and managers from the organization about their perceived organizational purpose. He suggests using the soft system's technique of "*root definitions*" to describe each primary activity.

They should also define the organization's area of interest for the diagnosis, that is to say, the "*system in focus*", according to the organization's purpose as perceived and agreed by them. The "*system in focus*" comprises that set of organizational units in charge of business processes which develop activities that have a strategic nature, at the light of current organizational strategy.

5.2.2. Modeling Structural Levels

According to the author, a vital aspect in using VSM for diagnostic

purposes is to establish the structural levels which contribute to the implementation of the organization's tasks, or, in Beer's words, "*to define the levels of recursion of the system in focus.*" He recommends carrying this out either in diagnostic or design modes employing the following recommendations. <Beer, 85>

Firstly, analysts should represent the levels of complexity which managers recognize when carrying out the transformation implied in the named system. Analysts should identify basic properties at each level of management and at each level of production. For developing this type of modeling, Espejo suggests using an "*unfolding of complexity*" diagram as the one outlined in Figure 5-2-2. <Espejo, 88, 89a, 89c>

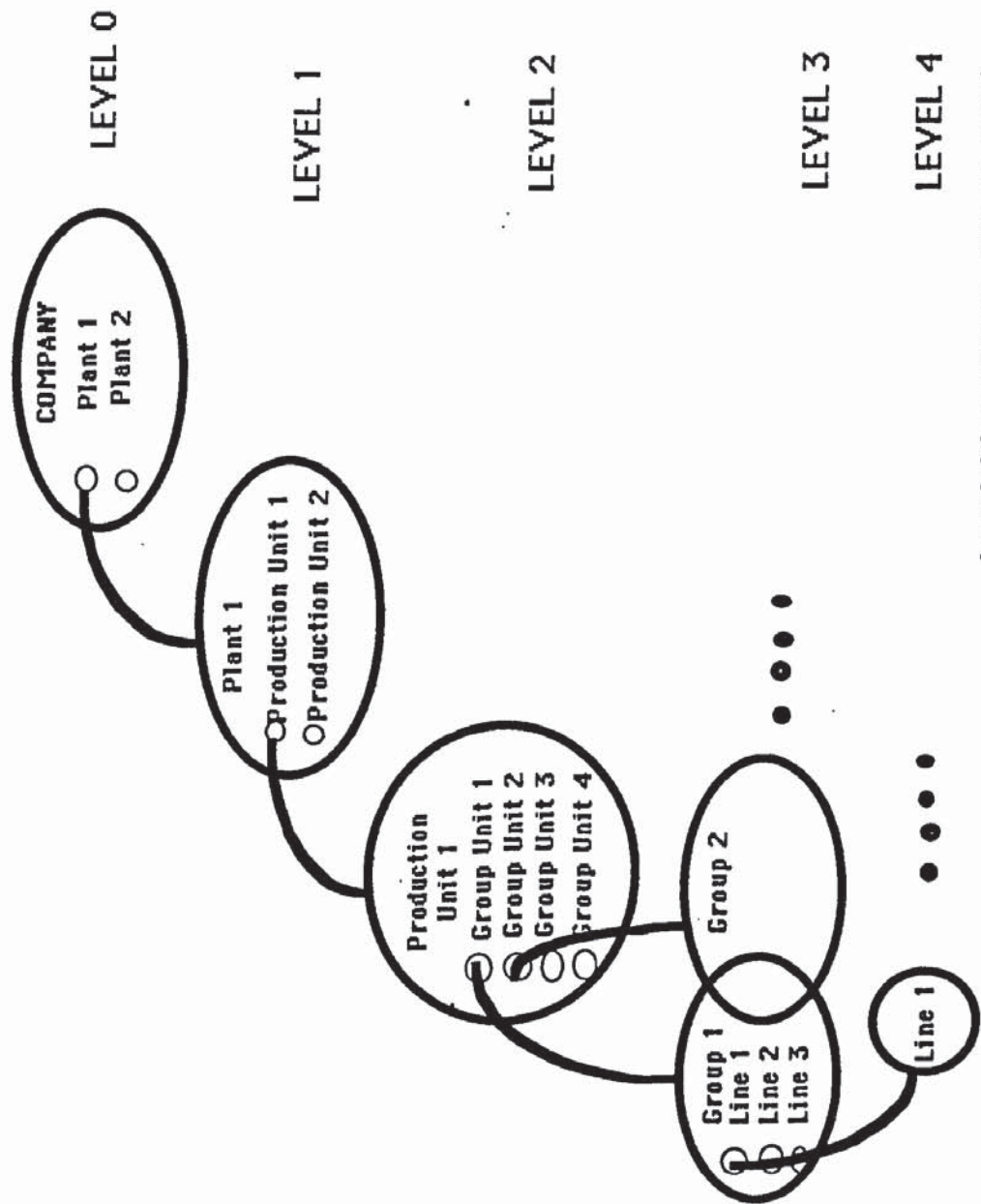
Even if at first glance it looks like the "*hierarchy of conceptual models*" suggested by Wilson and other researchers, the activities represented here are not entirely the sort of activities which Wilson describes. Espejo distinguishes, rather, between two different categories of organizational activities -- primary and regulatory activities -- and recommends portraying only what he calls primary activities, as shown in the diagram.

He describes primary activities as those developing the organization's purpose, that is to say, those producing the organization's principal products or services, or those coordinating their production from lower operational or geographical levels. Following Beer's suggestions, he distinguishes them from secondary or regulatory activities which are those providing support, coordination or control services to principal operational activities, at each level of complexity.

5.2.3. Modeling Technological Activities

"*Technological activities*" are those required to produce expected organizational results. They are the answers which the organization has obtained when defining "*how to do*" each primary activity. In the diagnostic mode of study, the logic used for defining technological activities is that represented by current organizational practices. The organization's limits are set by the way the organization is currently developing its technological activities.

Figure 5-2-2. UNFOLDING OF COMPLEXITY DIAGRAM



Amended from Esposito, 98b, pp. 332-1

For this step, the "*diagnostic method*" recommends the modeling technique outlined in Figure 5-2-3. It serves to describe the main sub-transformations as well as the communication channels which transport resources, money, materials and information.

While such a modeling technique seems to be very useful for modeling manufacturing processes, the researcher's experience leads her to look for softer tools for modeling technological activities, in particular when modeling activities for service businesses. She considers that Wilson's "*conceptual modeling*" technique could be very useful at this stage. Section 5-6-1 provides further suggestions about this.

The researcher considers that in order to follow this technique's suggestions, analysts should investigate the nature of each technological activity in order to properly coordinate subsequent debates between managers and experts from each organizational level. Analysts should then facilitate discussions for properly *naming* each technological activity, at every level of recursion and within the system in focus. By the end of the exercise, analysts would be in a position to develop a conceptual model of the activities of the system in focus.

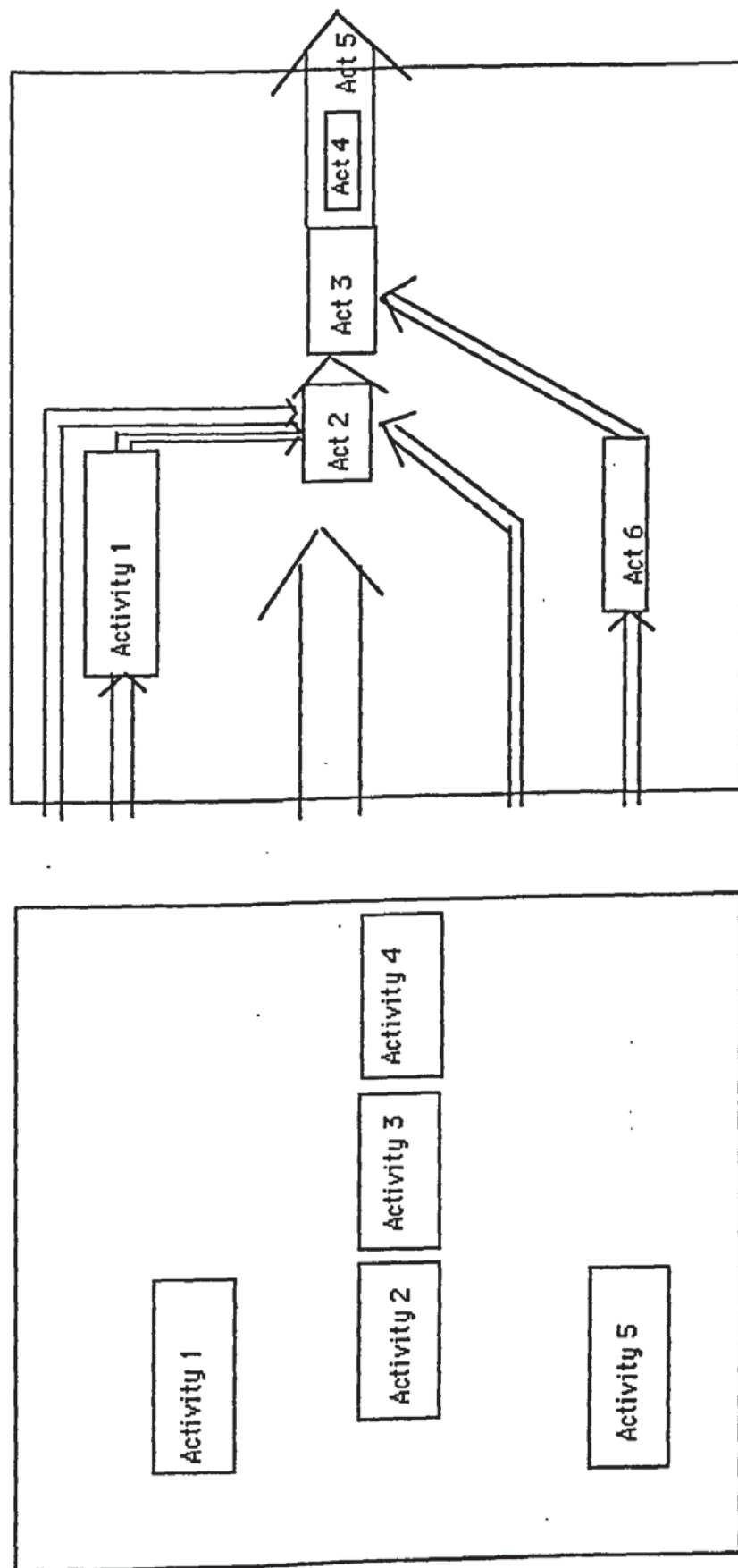
According to "*the diagnostic method*", this kind of analysis is feasible not only in terms of what the relevant actors claim the organization is doing, but also with regard to the analysts' perception of the way the organization actually works. <Espejo, 88>

5.2.4. Modeling The VSM Of The Organization Of Concern.

At this stage the researcher recommends to model a VSM for each set of nodes representing a "*tree*" in the unfolding of complexity diagram. A family of nodes is the set of "*branches*" (uppermost node) and "*leaves*" (nodes unfolding the tree's complexity). Because VSM and its applications have been extensively written about, the researcher will not describe Espejo or Beer's recommendations for developing a VSM here. Appendix # 2 introduces the issue for interested readers.

The researcher's recommendation is, then, to produce a VSM of the named family of primary activities as the basis for debating problems of

**Figure 5-2-3. Different representation for
the technological activities**



communication in the structural channels. Espejo also distinguishes between the VSM of organizational models developed in the diagnostic mode -- the "*VSM-Theory in Use*", and the VSM developed in the design mode -- the "*VSM-Espoused Theory*". Section 5-3 provides criteria for developing the second type of VSM. The following section refers to diagnostic points to be carried out with respect to the "*VSM-Theory in Use*" developed by the analysts.

5.2.5. Modeling The Regulatory Mechanisms

By using VSM criteria at the level of each pair of consecutive recursive levels, we can analyze the effectiveness of current organizational structure in terms of the communication channels which link each pair of structural arrangements (e.g., environment and operations, operations and the operation's manager, etc.). In particular, Espejo recommends observing the mechanism of monitoring control and the mechanism of adaptation, for each recursive level in any structural arrangement.

The Mechanism for Monitoring Control refers to the use of each of the available communication channels among senior and operational managers. Its analysis considers the appropriateness of the capacity of each channel (corporate regulation, negotiation of resources, accountability, coordination and monitoring) for properly carrying the messages it is designed to channel.

The Mechanism for Adaptation refers to the interactions between control, intelligence and policy functions with respect to each of the issues perceived as strategic ones, in the light of the organization's current strategic vision. The recommended analysis concerns the quality of the conversations about strategic issues and the structural conditions supporting them.

5.2.5.1. Modeling The Distribution Of Discretion In The Organization Of Concern

Espejo recommends analyzing two types of mechanisms in VSM. The first one is the "*Monitoring Control Mechanism*". He describes the mechanism as the communication channels it provides to each operational manager,

through which services can be requested or servicing requirements responded to.

At this stage, "*the diagnostic method*" suggests we observe the way the distribution of discretion occurs in the organization. In order to analyze the relationship between structural levels and the regulatory mechanisms in use, the author suggests we employ the "***Table of Recursion/function***" as outlined by Figure 5-2-5.

The *Table of Recursion/function* is a tool to aid analysts in using VSM criteria of effectiveness as the basis for assessing the relationship between primary and regulatory activities. It aims to facilitate the debate of highly political issues such as that concerning the discretion/autonomy of each manager. This table is to be filled in with each manager's perceptions about his own discretion for deciding whether or not to request resources, technological support or managerial support. In order to use the table, analysts should first develop the VSM of the named organization.

The researcher's experience has shown that managers can be left with the responsibility of filling in the table, provided some technical support from the analysts is given. By the end of the process, the table should summarize the manager's viewpoint of his own autonomy in terms of making decisions concerning required resources, managerial or political support, and technological support.

The researcher's experience in using this table in a real situation also showed the usefulness of distinguishing four types of situations which occur in the real world (see the symbols at the bottom of Figure 5-2-5).

"•" in the case that managers feel they have the level of discretion they need. In other words, when they feel that the available communications channels with the servicing activity (identified by the column label) have adequate channel capacity.

"!" the level of discretion is not enough and it causes trouble or delays in operations (in these cases, the researcher recommends explaining the situation on a separate sheet of paper, and relating the explanation to the symbol by using a reference number).

Figure 5-2-5. TABLE OF RECURSION/FUNCTION: AN OUTLINE

Function → Level of Recursion			Production			Buying&Contr			Maintenance			Finance		
			F1	F2	F3	F1	F2	F3				F1	F2	F3
Line 1			•	•										
Line 2				•										
Line 3				•										
Group 1			•	•		•		•				•	•	•
Line n			•	•										
Line n+1				•										
Group 2			•	•		•		•				•	•	•
Line m			•	•										
Line m+1				•										
Group 3			•	•		•		•				•	•	•
Line p			•	•										
Line p+1				•										
Group 4			•	•		•		•				•	•	•
		Product Unit 1	•											
.....														
.....		Product Unit 2	•											
		Plant 1				•		•						
		Product Unit 1	•											
.....														
.....		Product Unit 2	•											
		Plant 2				•		•				•	•	•

"?" managers consider they are lacking discretion to define the sort of issues they negotiate with the servicing activity identified by this column label. The researcher considers it useful to explain, when convenient or necessary, the problems caused by this lack of discretion.

"*" in practice, there is sufficient discretion from managers (identified by the corresponding line heading), but this is not supported by any structural arrangement.

Once managers have filled the table, seen vertically it would show the most evident patterns of complaints about lack of discretion, as well as patterns of complaints about unnecessary levels of discretion. It would provide criteria for guiding subsequent debates on relationships viewed by most people as clearly problematic situations.

By building up a model of the organization using this technique, the analyst can observe the principal problem at each level of resolution. The technique is versatile, since as many levels of resolution as are desired can be represented (the constraint is imposed by the physical media for portraying it).

The diagnostic points obtained using this tool relate to the levels of centralization or decentralization in the organization as a whole and in each sub-organization. They also identify the principal problems in the structural arrangements employed in the organization.

The researcher considers that VSM is a functional language for use by analysts in debating this kind of structural problems. However her experience in applying it has indicated the difficulty found by most non-trained people to properly grasp the abstract level of modeling involved, as well as the philosophical context VSM relies on. Such experience has provided the basis on which many of the recommendations for using this framework have been made (see section 5-9).

5.2.5.2. Modeling The Mechanism Of Adaptation

In order to investigate the magnitude of a primary task's problems of

adaptation, analysts can investigate which are the current structural arrangements the task has generated for developing intelligence and policy functions. Once again, "*the diagnostic method*" suggests reviewing such arrangements employing VSM criteria of effectiveness. Appendix # 2 provides an overview of recommended cybernetic criteria for modeling the mechanism of adaptation.

Analysts may offer recommendations about the adjustments required to improve the variety of either regulatory or intelligence functions, in order to improve the balance between them. They can subsequently promote a debate of these recommendations between managers (see section 5-4 for more detail on such discussions).

Another recommended analysis of the adaptation mechanism involves assessing the quality of the communication channels through which system four (the intelligence function, in VSM language) communicates with the environment and the managers.

In addition, the appropriateness of the variety operators connecting together systems five (policy function), three (control) and four, is a subject of study at this point. If, for instance, the policy function has no appropriately developed variety attenuators for filtering the complexity coming from systems three or four, analysts should recommend at this stage the design of appropriate attenuators.

5.3. WORKING OUT THE ORGANISATIONAL STRATEGY (CSA AND CFS)

The aim of this stage for developing a SISP process is to discuss the most critical success areas of the organisation, as well as the most critical factors determining successful development of each one. This step is also suggested by "*the diagnostic method*" .

In order to design an effective context for developing these type of conversations, Espejo highlights the importance of promoting a balanced participation in the debates among managers and worker representatives from different levels. The debates aim to reach agreements between them about their views on CSAs and CSFs.

Espejo suggests to use Rockart's idea of "*Critical Success Factors*" (CSFs) for guiding discussions on organizational critical development areas. The researcher agrees with Espejo's suggestion, since she considers that such a tool may well attenuate the variety of the likely issues to be dealt with when debating organizational strategy.

CSFs are a limited number of areas that will ensure (if they produce satisfactory results) that the organization achieves a good level of performance in its competitive field. They are key areas where "*things should go right*" if the business is to develop itself. <Rockart, 89>

Rockart says that the definition of CSFs varies from one organization to the other (even if they belong to the same industry), depending on the organization's growth stage, its position in the market and its strategies.

In Rockart's view, the main aspects determining CSFs are the industry's structure, environmental factors (political, environmental or social changes affecting the organization) and some internal temporary factors (a unit group in a deep crisis, for example).

He distinguishes between two types of CSFs, called "*control*" and "*constructive*" CSFs. The aim of the control CSF is to support the management control function, while the constructive CSF serves as a communication device in the planning process.

The *constructive* CSF aids modeling the organization's future when it needs to adapt its structure to environmental changes. The *control* CSF is needed in order to observe critical aspects of operations controlled by managers.

In order to define CSFs, as suggested by "*the SISP framework*", managers should be encouraged to undertake the necessary debates so as to reach agreements about those environmental objects which have a critical incidence in the successes or failures of their sub-organization.

The researcher considers that analysts may again use the "*Table of Distribution of Discretion*" to guide the process of defining CSFs. Her experience indicates that by orienting discussions around the resulting

diagnostic points, analysts can focus conversations on the most critical problems of effectiveness (in defining the control CSFs, for example).

In addition, VSM models of the organization and particularly Espejo's suggested analysis of the adaptation mechanism could be useful for focusing discussions about constructive CSFs.

More information may well come from studying industry's CSFs, for the given business. The researcher considers that the result of this type of analysis can improve analysts' criteria for defining which are, at the structural level, the critical success areas which the organization must create or improve in order to develop itself in the intended direction.

5.4. CREATING CONDITIONS FOR EFFECTIVE ORGANISATIONAL DEVELOPMENT

This stage's aim is to analyze the required structural arrangements as well as the required resources and actions for developing them. It is intended to promote agreements about the most feasible and desirable adjustments to current organizational structure, required if the organization aims to develop itself in the expected direction.

The diagnostic method suggests that in order to coordinate these debates, analysts should help managers review the organization's perceived VSMs and its "*unfolding of complexity diagram*". In the light of the criteria provided by the CSFs, analysts can help managers agree on a model of the expected organization.

They can subsequently make an analysis of the structural arrangements required by comparing their expected model of the organization with that perceived by the managers. As the result of such a comparison, they can produce a list of recommendations for making the necessary organizational adjustments.

In addition, analysts can develop a "*Table of Recursion Function*" of the system in focus, according to the espoused theory of the organization. By comparing both tables, that of recursion function and the one representing the VSM - Theory in Use, analysts can summarize the principal

differences between both arrangements.

The result should be an overlay of *actual* against *desirable* distribution of discretion, in the diagnostic mode (or a blueprint of distribution of discretion in the design mode). On this basis, the analyst recommends adjustments to the discretion or autonomy given to each primary activity.

Once the suggested structural adjustments have been summarized, it is important to discuss them with the responsible managers in order to clarify which of the suggested changes are feasible and practicable and establish priorities for them, in addition to the time scope and resources required for the implementation of the changes.

As suggested earlier, managers' commitment to implement changes should be the basis employed by SISP analysts to study and design the necessary strategic information systems support. The following two steps of the "*SISP framework*" describe such a process.

5.5. ASSESING CURRENT INFORMATION SYSTEMS SUPPORT

This step in the SISP framework aims to establish the technical and managerial value of current IS support given to each task.

The researcher considers that the use of VSM as the background model of the organization can increase analysts' awareness about the communication devices, including information systems, needed to guarantee the effective implementation of tasks.

As indicated earlier, VSM provides a clearer language with which to relate ideas about processes, information needs, organizational structure and organizational learning. In the light of such ideas, the researcher re-interprets the meaning of this step in the SISP process in the following manner.

On completing the previous steps in the SISP process as suggested by this framework, the researcher believes that analysts would better understand each process and its relationship with other processes.

In other words, the researcher considers that the previous steps of the process, if developed as suggested, should provide analysts with a more ordered way of modeling organizational complexity.

If that is the case, analysts would have as a result a sufficiently clear representation of organizational structure (communication mechanisms) and both primary and technological activities.

They would also have agreed models of the regulatory mechanisms in use (e.g. the table of recursion function) and further information about the CSFs and agreed structural adjustments.

Therefore, one can expect that they would have a clearer picture of the organization than that obtained by following other SISP frameworks. The researcher considers that most of them would provide tools only for modeling the organization's formal structure.

The researcher also considers that the organization, while developing and negotiating structural arrangements, would gain experience and criteria to develop a more focused study of required IS support. As other soft systems methods also suggest, this framework recommends that, as far as possible, the resulting models involve the managers' views.

By following the criteria suggested by the CSFs and diagnostic points, it becomes easier to focus attention on the technological adjustments which need to be made in order to support the effectiveness of strategic processes and/or to foster technical development of the organization, according to environmental demand.

This step in the framework recommends, then, analyzing the necessary information systems support for each strategic process. In order to make this sort of analysis, a review of the "*Table of Recursion Function*" for the agreed organizational structure is suggested.

The main advantage of this tool over the tools presented by the other methods is, in the researcher's view, that it facilitates an orderly discussion with the users themselves about their perceived value of current IS support and to use their criteria as the basis on which to assess

current problems.

Analysts may use the Table so that, for each box in the matrix, they interview the manager responsible for this process regarding the technical and business value of his current information systems support.

The Table refers to IS support for the development of the task (a production support IS), management needs (management support systems and intelligence systems) and the relationship to servicing roles (transaction processing systems).

It is recommended that interviews with managers about their current IS support on each of these issues be designed. Traditional SISP methods suggest good techniques for this purpose. <Andrew et al, 91>, <Wilson, 84>

Moreover, in order to facilitate this kind of discussion, the researcher suggests using Wilson's technique called "*the Maltese Cross*". She considers it can help analysts assess current IS support versus required support, as the following section makes clearer.

At the conceptual level, the researcher considers that the categories of functions offered by VSM's language might also serve for classifying the different types of required IS support for each function.

Analysts might then distinguish between the different characteristics of the information systems required to support the development of policy and intelligence, coordination, control, monitoring and operational roles.

Once analysts obtain the views of representatives of the operational units about their current IS support, they can attempt a summary of the current IS support situation.

To assess the technical and managerial value of each IS, the researcher recommends following other researchers' well-known recommendations. She is particularly in favor of using Galliers & Sutherland's recommendations, as suggested in their "*Revised Stages of Growth*" level.

5.6. ESTABLISHING THE STRATEGIC INFORMATION SYSTEMS REQUIRED TO SUPPORT ORGANIZATIONAL DEVELOPMENT

5.6.1. Establishing Requirements For Strategic Information Systems. Development

At this step in the SISP process, the researcher recommends that analysts investigate which new IS support is indicated in order to more effectively support the development of each strategic process. The researcher also agrees with Galliers and Sutherland's recommendations to use Wilson's Maltese Cross at this point for defining new IS requirements. <Wilson, 84> <Galliers & Sutherland, 91>

As recommended by these researchers, analysts should help the responsible manager (from each process of the system in focus) to produce a basic definition of their assigned task. From these definitions, analysts can define an activity model showing all strategic sub-operations or sub-systems and use it to facilitate conversations with managers about the development of the desired task.

Once a conceptual model of each activity has been defined, analysts should then identify (as Wilson would suggest) the assigned roles and information flows (inputs, outputs and transformations) required for the implementation of each sub-activity. Figure 5-6-1 shows the diagrammatic convention suggested by Wilson for representing the models of hierarchical activities. <Wilson, 84>

Once this detailed model has been clarified in the light of the managers' own suggestions, analysts should then debate with them the IS support required to implement the designed activities and the interaction of roles. The model refers to the IT tools required to support productive activities, the development of IS to support management processes, or to the need for other communication devices to support effective conversations.

The next stage of the SISP process helps determine whether these requirements could be fulfilled with improvements to current IS structure, or whether there is a need to develop new ISs or acquire IT or

communication tools.

5.6.2. Defining Improvements To Current IT And Communications Architecture

The researcher considers that analysts should not only define a portfolio of SIS systems requiring development, but also investigate improvements required in current IT and communications network.

To achieve this, the researcher suggests that analysts first identify those cases where there are (or might be) communication problems between those responsible for implementing the primary activity. Diagnostic results may well serve this purpose at this stage.

For instance, analysts could review the capacity of the communication channels linking each pair of roles which have communication problems. A cybernetics technique could be employed here. Such a technique serves to analyze the capacity of the communication channels between two participants in a common task (e.g., between those producing the product or service and the suppliers or clients).

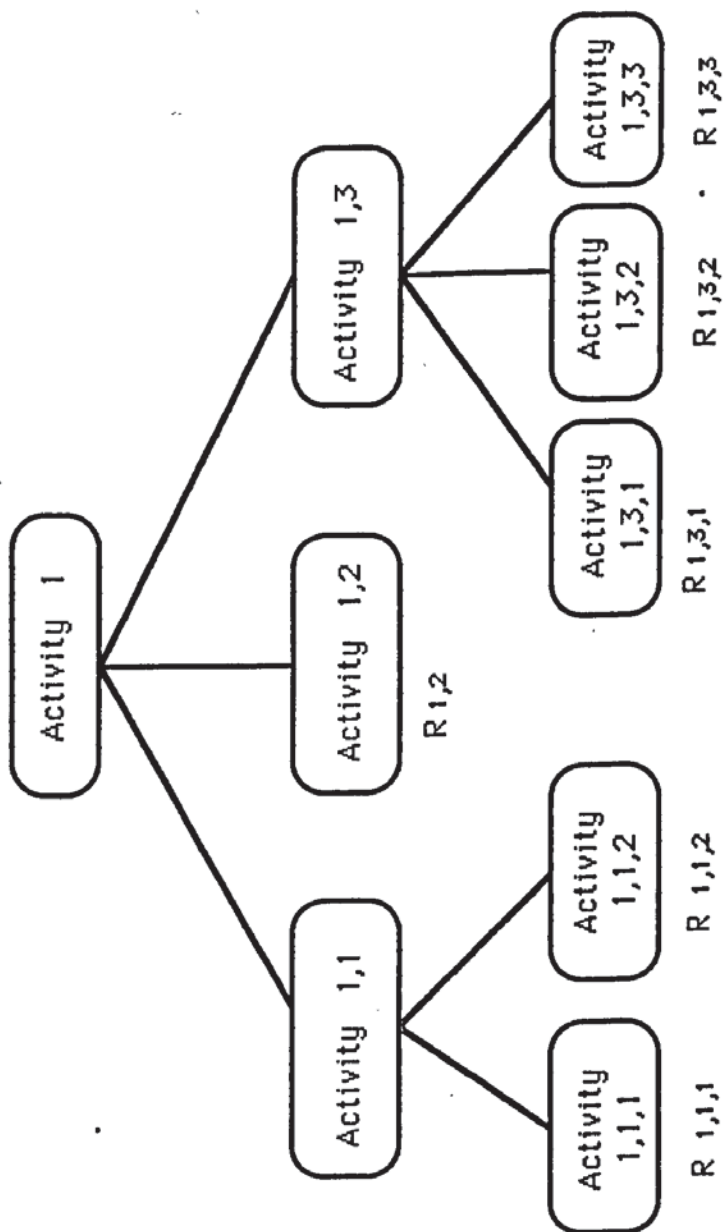
The analysis refers to the context of the interaction and not to its content. It reflects one viewpoint (the low variety of interaction, for example). Analysts should show which are the current amplifiers and attenuators in use, and what are the requirements for defining new operators or improving current ones (see Figure 5-6-2).

On the basis of this study, analysts can produce a summary of recommendations for re-designing the current set of variety operators whenever convenient. Variety operators include not only IS tools but many other kinds of communication tools (i.e., OA tools, networking facilities or other necessary conversational tools).

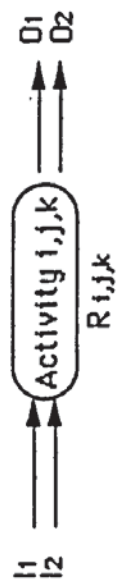
5.6.3. Defining The IS Support Required For Monitoring Organizational Development

Following cyberneticians' recommendations leads to the conclusion that

Figure 5-6-1. Activity Model



Conventions



I_i : Information Input "i"
 O_j : Information Output "j"
 $R_{i,j,k}$: Responsible for activity 1,j,k

Adapted from (Wilson, 84)

for complex organizations it is very important to design and implement a management support system (as described in Chapter 4) to monitor organizational development.

At this stage of the SISP process, the researcher suggests that analysts evaluate the necessity for such a system for the particular organization of concern. If there is agreement about the convenience of developing the system, market research for identifying appropriate software can be carried out, or the outlines for designing a tailor-made system be produced.

Whether or not such a system already exists, while the organization develops the suggested SISP process analysts should at this stage help managers define or revise their CSFs, as well as related indexes and goal levels. They can also define a set of recommendations for operating the system, while arrangements for the development of the MSS follow.

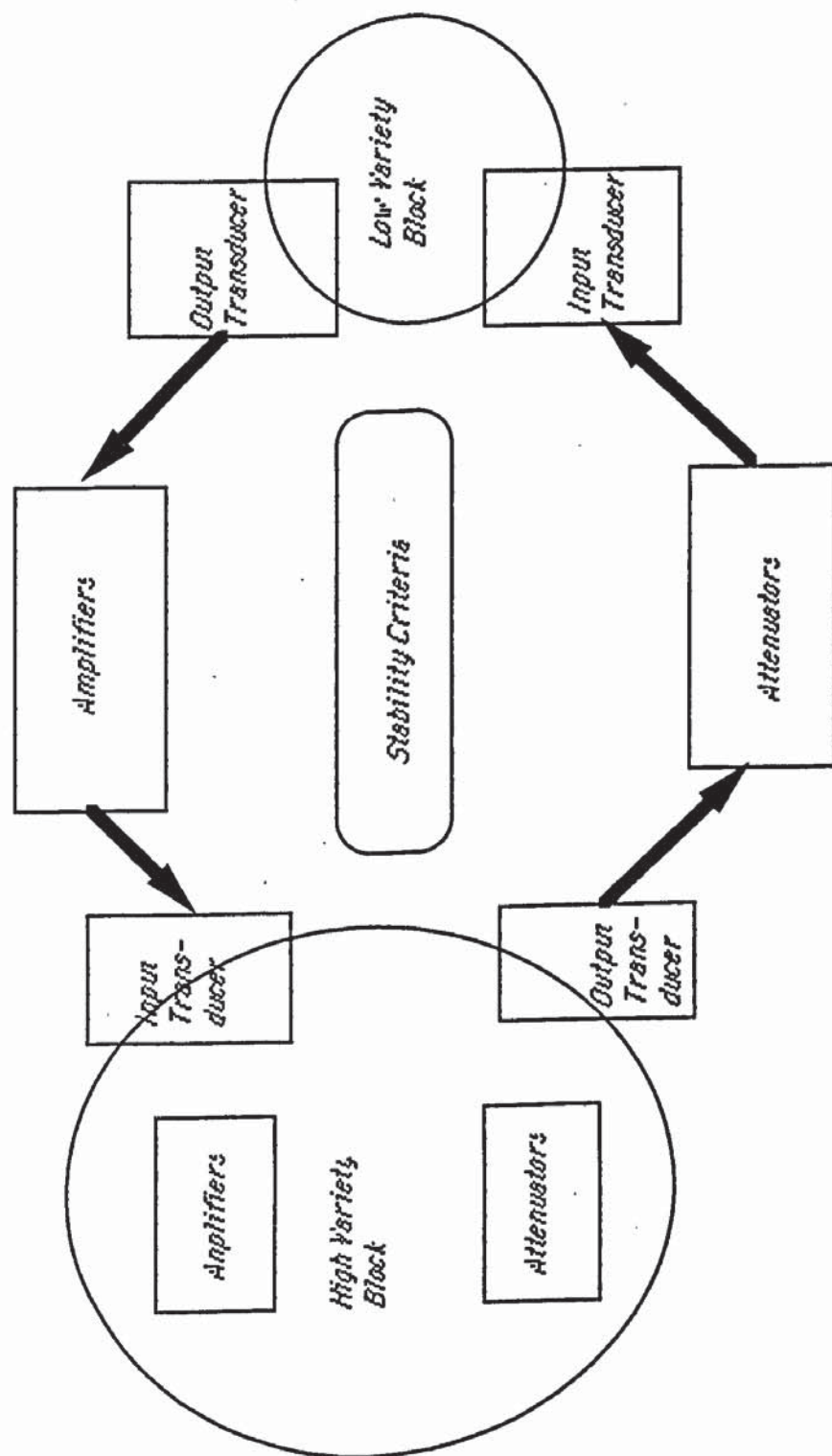
In any case, Cyberfilter can be used as a paradigm for designing a MSS following VSM criteria of effectiveness. Such a system, even if implemented manually at first, would permit managers to subsequently assess the effectiveness of their operational results in the light of the organization's perceived CSFs and indexes of performance.

Given the structural nature of such a system, the researcher considers that every SISP process should include a conciliatory step of design or diagnosis which permits recommending improvements. The suggested MSS would serve as a monitoring system for balancing the command channel's variety with the horizontal variety left unattended by managerial and operational levels. <Beer, 85>

The redesigned or improved MSS would then support management's effectiveness, as suggested by Cybersyn's model of effective management.

Finally, this sub-step of the SISP framework would be adequately completed with the definition of technical *and* financial requirements for developing or improving the MSS system.

Figure 5-6-2 Analysis of communication channels



Transformation.

Adapted From <Espejo, 88b>

5.7. AGREEING ON THE MOST FEASIBLE AND DESIRABLE SIS DEVELOPMENTS REQUIRED AND GENERATING COMMITMENTS FOR THEIR DEVELOPMENT

At the end of the study, analysts should compare current versus required SIS support, as well as compare current versus required IT or communications tools. The researcher once again agrees with Galliers and Sutherland's recommendation to use Wilson's "*Maltese Cross*" in order to facilitate the comparison.

Previous analysis for each process would develop analysts' criteria for making this sort of comparison, aimed at defining the most necessary IS, IT and communication tools support.

Following Wilson's suggestion, analysts should represent, for each organizational task, its current versus required IS support. Wilson also suggests that analysts define "*information categories*" identifying each activity.

Nevertheless, the researcher considers that due to the technical nature of defining data classes and relating them to information categories (as suggested by BSP), this latter activity might be left to the responsibility of the systems analysts developing new ISs.

5.7.1. Comparing current versus required SIS support

The researcher considers that at this stage it may be more useful for analysts to review the summary of diagnostic points about IS support in the light of the structural diagnostic points reached earlier. The overview of joint structural and technical problems at several stages of the Table of Recursion Function would signal the most critical problems requiring attention. It provides criteria for defining those information systems having a truly strategic nature.

In other words, analysts can reach important conclusions once they become aware of the relationship between poor communication

mechanisms and poor IS support, especially when the responsible manager of the task experiencing such problems is also responsible for developing it as a strategic task for promoting organizational development.

As a result of the comparison, analysts should finally produce a list of the most strategic improvements to, or design of, IS support for all tasks within the system in focus. This list would be the basis for building up the SIS portfolio. The following sections describe some other aspects that need to be defined in order to complete the SIS portfolio.

In order to produce the SIS portfolio, analysts should evaluate the strategic value of each suggested SIS project, its level of risk (depending on the technical skills available for the development of the project, etc.) and its required resources.

For each sub-system analysts should define the purpose of the project, the main activities required for its implementation, the risks involved in the development of the project, the organizational tasks supported, the CSFs supported by the development of the project, and the level of strategic impact (support, transition, strategic, vital). A technique which can aid in establishing the value and risk factors for each IS project is that recommended by Parker & Benson. <Parker & Benson, 88>

A first draft of the SIS portfolio can be produced by summarizing these results in a table. The table should indicate in each row the name given to a SIS, as well as the assessment of the task supported, development risk, CSFs supported, etc.

Once such a first draft of the SIS portfolio has been defined, it must be validated with managers' views. For this purpose, analysts have to produce a complete version of the IS portfolio and compile an executive summary to be discussed by the managers, in order to define the priorities they perceive for the development of the necessary SIS projects.

The final version of the SIS portfolio is that which has been agreed on by managers at this stage, after they have made criticisms or suggested modifications to it. Next sections detail more the required sub-steps.

5.7.2. Defining the resources required for developing the SIS Portfolio and reaching commitments for its effective development

This stage aims at agreeing on the most feasible and desirable SIS developments required and at generating commitments for its development.

Once the SIS portfolio has been defined and agreed on by managers, analysts can evaluate the human and financial resources needed to implement it, in addition to the following aspects of each sub-system in the IS portfolio: the required human and financial resources, IT tools, the term in which results are expected (long, medium, short), estimated starting date and estimated investment required.

Once these priorities have been set and the project's objectives and descriptions agreed upon, analysts should present them for debate so that interested managers seek agreements regarding the resources they want to commit in order to develop the planned SIS projects portfolio.

The final version of the SIS portfolio might include a description of each of the aspects analyzed for each sub-system (risks, CSFs supported, strategic impact, resources required, summary of the required budget, timetables, etc.). Final discussion of the projects portfolio should also explicitly describe the requirements for improvements in current IT architecture and communication tools, as suggested in the following section.

5.7.3. Designing The Required IT Architecture

The purpose of this sub-step is to define more precisely the improvements which need to be made to current IT architecture. In order to do this, analysts can review the IT requirements arising from the projects portfolio, and evaluate them in order to precisely design the necessary IT architecture.

An IT architecture can include a detailed description of the required communication mechanisms and IT tools, specifying who requires them in

each organizational sub-system or physical location, as well as the intended usage for each of the tools suggested. The description may refer to all the required individual and group communication tools, other kinds of conversational tools, electronic network facilities and other kinds of IT tools.

It is advisable to describe in detail, for each one of the required IT architecture's elements, such aspects as technical specifications, estimated average market cost and intended use.

5.7.4. Defining Training Requirements

When analysts find that more than developing or acquiring new IT tools, managers also require specific training in order to use them, they should describe the necessary training courses specifying for each course participants' outlines, justification for training, expected output from training, expected costs and so on.

5.7.5. Defining Budgets And Timetable

Analysts should summarize the costs of the required IS projects, IT tools and training requirements, according to the priorities assigned to each one and the expected starting and completion dates.

5.7.6. Working up recommendations for re-designing the IS management role

It was suggested earlier that the IS manager role should negotiate with senior managers, at each operational level, their commitment to the development of the SIS projects portfolio. The researcher considers that the development of this sort of debate, guided by the IS manager's role, increases the possibility of defining a SIS portfolio aligned with organizational strategy.

Cybernetic criteria of effectiveness also suggest that the organization should attempt to distribute as much as possible the system's resources

(physical, human, and financial resources for promoting the development of the IS function) in order to support local processes. This would provide more autonomy for each IS manager and greater possibilities of specialization.

Cybernetic criteria also stress the importance of defining the standards required to guarantee the harmonious development of the IS function at different levels in the enterprise, while maintaining the cohesion of the organization. This responsibility for defining standards includes the formulation of information technology policies. Such policies should aim at ensuring compatibility between different technological platforms.

Another aspect recommended by cybernetics criteria is the development of standard administrative procedures in order to create a cohesive management language between the different recursive levels. If such responsibility has not been explicitly defined, the researcher considers that it is important at this stage of the SISP process to define a responsible role for developing such responsibilities. In addition, in the case that this role is in charge of the IS function, this researcher would recommend adjusting the role so that it includes responsibility for coordinating activities for the design or revision of standard procedures.

Another aspect which needs attention from the IS manager is his participation in the procedure of *"redesigning business processes."* Cybernetics criteria have indicated that it is important for the organization to carry out, as an on-going activity, a review of the adjustments required by the organization according to its perceived mission.

In the case that this is carried out, it is also important to create the conditions for the IS manager to participate in (or even to coordinate if he encounters the required expertise within the organization) those permanent activities which model the organization.

5.8. SOME RECOMMENDATIONS FOR DEVELOPING AN SISP PROCESS AS SUGGESTED BY THIS FRAMEWORK

In order to properly develop the suggested steps and sub-steps of the SISP

framework, there follows a set of practical guidelines for the SISP team leading the process. Some of these recommendations have been offered by other researchers in one way or another. <Andrew et al, 91>

5.8.1. Preparing the SISP Process

The researcher considers that in order to properly develop the suggested SISP process, it is important to set up an executive team with the participation of high and medium level managers, since executives are normally the people who are in a position to:

- establish criteria for defining strategic information systems,
- commit the necessary resources for their development, and
- push the organization into the required redesign of the business process (if needed).

Also, the researcher considers it important to set up a technical team which includes both engineers and technical people in charge of IT & IS developments, and representatives of IS users.

Once the committees have been established, the project's purposes, methodology, responsibilities, timetables and stages should be discussed in these committees at the corresponding level of detail, in order to clarify the organizational commitments required for the successful development of the process.

5.8.2. Getting To Know The Organization And Its Information Management Situation

Before commencing the SISP process, it is important to study in detail the organization's current mission, structure and processes. On the basis of their knowledge about these issues, analysts should coordinate the remaining activities suggested by the SISP model introduced in this chapter.

If analysts are external consultants, they should devote time to getting a closer knowledge of the organization: its history, organizational structure,

organizational market, indexes of current status, organizational culture, market and environmental demands, IT infrastructure and IS tools currently in use, these being the most relevant topics.

They can acquire knowledge about such topics through interviews and the study of printed data and the documentation of past projects on these issues (corporate strategic planning, CFSs and performance indexes, etc.).

They should subsequently meet with each of the committees in order to develop an in-depth view of organizational structure and information management situations. As suggested by most soft system methodologies for problem solving, the analysts' role in these debates should be that of catalysts and facilitators. They should orchestrate the debate between members of each of the committees, and help them reach their own conclusions about current problems within the existing organizational structure, using the available information management tools. <Wilson, 84>

In other words, system analysts should not be expected to acquire the criteria for designing business processes or recommending improvements to them, but rather develop their skills to orchestrate debate on such issues.

5.8.3. Managing The SISP Process

From a cybernetics viewpoint, an important aspect to take into account in the management of the SISP process is to supervise the interactions between the SISP team and the managers. Special care should be taken in the use of information and communication tools for smoothing these interactions.

For example, when discussing the "*diagnostic method*," it was commented that experience leads the researcher to recommend not teaching the analytical tools to managers, because of the confusion and lack of understanding they may create due to their abstract nature. Instead, she would recommend properly designing "*softer*" tools to guide debates on organizational effectiveness.

The researcher considers that it is important to develop better interfaces with users when employing the recommended "*cybernetics tools*". She suggests that this is another area of research which needs further development, but which is beyond the present study's scope.

Other tools which in the opinion of the researcher need further development are those used by the analysts in order to prepare an outline of the IS portfolio. She considers that for conversational purposes these tools should avoid technical jargon as far as possible. The use of charts, graphs, electronic presentation tools or any graphic tool which improves the quality (communication power) of the presentation, is highly recommendable.

As mentioned several times in this chapter, at each stage in the development of the SISP process it is important to validate with the executives the information and models generated.

The researcher considers that it is better to avoid as far as possible teaching managers how to use a tool, preferably leaving it to the team of analysts. On a more practical level these experiences also show the importance of preparing for meetings between analysts and managers. Sending prepared material in advance can help increase the quality of the results achieved by team work.

Finally, regarding the management of the SISP process it is desirable that analysts define measures to compare the expected versus actual stage of development or the expected versus actual results of the process. For instance, they may use these measures as conversational tools when establishing "*following up*" meetings with managers.

Analysts would allow managers to review the advances achieved in the developed activities, as well as the problems and difficulties found. On the basis of this review they can more easily negotiate the adjustments required to the SISP process.

As a final recommendation, on completing the SIS plan analysts should distribute it to each of the participants in the process, in order to debate the resources and commitments required to guarantee the implementation of the defined SIS. By the end of the negotiation process each manager

should have committed the necessary resources and people for developing the SIS affecting his area. This would significantly increase the likelihood of developing the SIS portfolio, while the measurement system would facilitate the necessary periodic adjustments.

5.8.4. Closing The Learning Loop: Debating And Following The SIS Plan

Once the implementation of the plan has commenced, it is convenient to revise the plan periodically. Both the executive and the technical teams should meet when required. This can take place when suggested changes in organizational strategies have been implemented, when there is a need for new SIS projects, when the annual budget is to be prepared, or whenever the teams consider it necessary.

Since IT technology is changing rapidly, the outlines of the required IT tools and conversational tools need permanent revision. It is convenient to ensure that people within the organization are responsible for being continually updated with respect to technological changes and new possibilities offered on the IT market. They can promote occasional meetings of the technical committee aimed at revising and updating the technical specifications of the IS plan.

As was suggested earlier, it is also convenient to make people within the organization responsible for revising the organization's structure and the organization's environment models. It is important that those responsible for the SISP process be updated on, or even better participate in, the resulting changes to both types of models.

Taking into account these and other changes to the organizational models, the technical committee should produce an annual updated version of the SISP.

A meeting of the executive committee should subsequently be scheduled to review this updated SISP and to commit the organizational resources required for the implementation of the agreed projects in the current year's portfolio.

5.9. Relevant things from the suggested SISP Framework and recommendations for using it as the analysis structure of the real situations under study

This chapter introduced a framework for describing a SISP process supported by the managerial cybernetics approach, which the researcher considers may contribute to better explain some of the previously obscure aspects of her own experience lived at the PO.

The framework employs the cybernetic ideas discussed in Chapter Four, and in particular, Cybersyn's model of effective organizations. On the basis of this designed framework of effective management, the researcher suggests some methodological tools for responding to the main questions that analysts need to answer during a SISP process.

The researcher also recommended to use some soft system's tools to represent organizational purpose, tasks and activities as the basis for modeling organisational tasks and IS requirements. However, she stresses the importance of being aware of communication problems among managers and/or workers and offers managerial cybernetics criteria and techniques to enrich the analysis of IS requirements with an analysis of communication requirements.

Such questions, in the researcher's view, refer to modeling the organization and the most strategic tasks, as the basis for defining the required SIS support, involving managers and workers criteria in such definitions. It also suggests, as most SISP frameworks do also, to analyze the nature and type of IS support which would better support such processes by analyzing their information requirements, then researching the IT market and then setting some recommendations of IS acquisitions or developments, from IS experts.

The proposed method's main assumptions are that *"if we hope to improve organizational development and effectiveness by using IT strategically, we should have criteria to improve management processes"*. And that *"VSM offers us such a criterion."*

Having into account the sort of problems addressed by looking

retrospectively at the experience at the PO, the researcher considers that the most important aspects of this framework to enlighten their analysis are those referred to at stages 1 to 5. Even in the last two stages (4 and 5) the analysis will not be focused on testing the modeling techniques suggested by this framework, for the experience showed that main problems at these situations came from non fully understanding the relationship between technical and managerial aspects involved in the definition and development of SIS. While last stage is also of a technical nature, the analysis from next chapters will not deep into technical details but will rather concentrate in observing the relationships between the definition of the SIS portfolio and the managerial aspects related to the tasks requiring this kind of support.

6. THE STRATEGIC INFORMATION SYSTEMS PLANNING PROCESS FOR THE OFFICE OF THE PRESIDENT OF COLOMBIA (1990-1992)

This chapter documents the story of the SISP process lived at the Colombian President's Office, from 1990-1992, that is the story the research pretend to analyze, at next chapter, by using "*the SISP Framework*".

It first describes what was the political context at the moment, the structure of the Colombian Public Sector and the President's Office, its strategic posture and IS current support.

Then it relates the way the SIS portfolio was defined by a consulting firm, which stages did it develop, the problems they had and the recommendations they made. It also describes one of the SIS recommended at the portfolio and fully developed by the end of 1992, "*the index system*" that pretended to be a management support system to support decisions related with defining or re-viewing the national socio-economic development policy.

Finally, the chapter makes a summary of the most important findings obtained from the SISP experience and describes some of its failures and left open questions.

6.1. THE COLOMBIAN PUBLIC SECTOR

6.1.1. The Political Flavor of the Moment

President Cesar Gaviria was elected in 1991 as Colombia's president. One of his government's most relevant initiatives was the creation of a new

Constitution. Following this up, the President promoted several strategies aimed at guaranteeing adjustments to current legal and administrative norms so that they conform to the guidelines established by the 1991 Constitution.

For instance, the PO developed the "*Strategy for the Modernization of the CPS*", designed to change the CPS' purpose so as to align it with thinking which the new Constitution had encouraged. This new thinking sketched the path towards a new democratic, open society and a decentralized public sector acting mostly as coordinator of the social and economic development of the country.

The PO assigned particular importance to developing a "*Strategy for the Modernization of the Justice Sector*", in response to the Judiciary System's historical lack of effectiveness, and the consequences felt by society from the lack of effective punishment. The aim of the government's strategy was to improve the effectiveness of the justice sector's norms, procedures and agents.

At the time this was occurring, the President developed other strategic projects for the nation. Due to a recent history of drug-trafficking and guerrilla activity, the President proposed the "*Strategy of National Security and Defense*" to more determinedly combat these social disorders, and a "*Peace Strategy*" to convince guerrilla groups to find more pacific and democratic solutions to their political differences with legal government.

Simultaneously, the President developed a "*Strategy for the Internationalization of the Economy*" aimed at creating the required conditions for all productive sectors to look beyond the national economy and begin to compete in the international market.

Finally, the government defined a "*National Development Plan*" aimed at improving the socio-economic situation of the population, by improving the infrastructure of transport and public services, improving the coverage of public education and health services, and promoting scientific and technological developments. Appendix # 4 presents in more detail the principal socio-economic development strategies.

6.1.2. The Structure of the CPS

In Colombia, the public sector consists of three arms: the executive, legislative and judicial arms. The executive arm is responsible for the nation's development, the legislative arm is responsible for implementing the law, and the judicial arm is responsible for the formulation and updating of the legal system.

At the national level of the executive arm of the organizational structure of the CPS, there are two types of organizations: government ministries and administrative departments. Most of the government ministries are responsible for policy implementation, with the exception of the Treasury which is responsible for managing the national treasury and collecting taxes. All administrative departments perform a servicing role for the respective ministries.

These services are planning (NPD), policy definition (PO), personnel management (DASC), public security (DAS), aeronautics management (DAAC), management of cooperatives (DANC) and national statistics (DANE). The Ministries are Agriculture, Transportation, Health, Education, Mines and Energy, Development, Foreign Trade, Communications, Foreign Relations, Justice, Social Security, the Treasury, and Government.

6.2. THE PRESIDENT'S OFFICE

6.2.1. Identity and Organizational Structure

The new Constitution clearly defined the President's role as the highest authority, leader of the nation and of the government. It defined the President's Office as the organization responsible for guaranteeing the logistical and managerial support required by the President in order to effectively fulfill his responsibility to the country. It also defined the President's functions, as follows:

- to take care of national security;

- to direct international relationships;
- to supervise the state's top executives;
- to re-structure those public entities he considers necessary;
- to be aware of public expenditure;
- to define and dictate directions for the execution of the body of laws; and
- to be vigilant about their strict fulfillment.

Figure 6-2-1 depicts the organizational chart of the PO. It outlines the latest re-structuring of the President's Office. The chart refers to three kinds of offices. The first is the "*Advisory Office*" (AO). It is normally a lower-level office supporting the President in the definition and coordination of the government's most relevant policies.

"The Offices of the Presidential Programmes" (PPO) are offices coordinating projects for social investment. They are the only offices with responsibilities for directly sponsoring and developing the country's most strategic development projects. *SI&Ss* are offices which provide logistical support to the PO offices for policy development. Some of them also offer technical support for the creation of presidential policies and programmes. While the AOs and the PPOs are ad-hoc offices which can be accommodated to each government's programme, the *SI&Ss* are permanent.

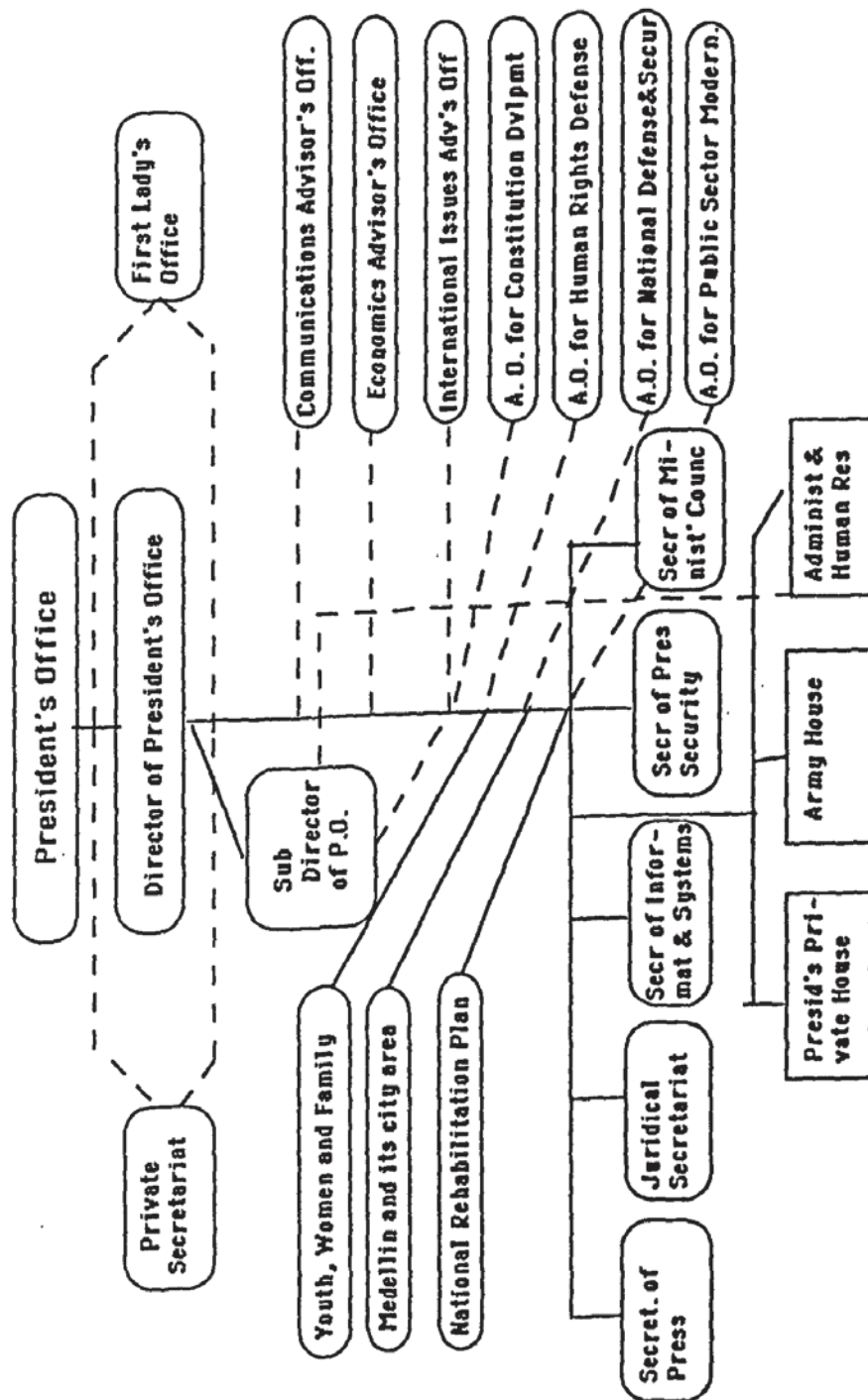
As shown in the Figure, the PPOs and some AOs support the President in the definition and implementation of the main policies defined by him (e.g. the AO for the Development of the Constitution, and the AO for Public Sector Modernization and Decentralization, etc.).

6.2.2. The New SI&S for Information and Systems

Leaving behind the roles which the SI&S had traditionally performed to support IT developments in the country, the new SI&S defined its mission as:

"To support the President and his closest advisors and executives in the achievement of their responsibilities by means of: the creation of efficient communication mechanisms between the President's Office, the nation, the public

Figure 6-2-1. Colombian President's Office
The Organizational Chart



sector, and the international environment; and the canalization of relevant information concerning them which effectively contributes to the definition of the criteria, ideas and policies required for achieving efficient, coordinated and harmonious government action."

On the basis of this mission, the following definition of functions was agreed upon:

- to assist the President in the assessment of the information and systems needed for defining, coordinating, divulging and evaluating government programmes and planning;
- to support the President and presidential executives in the creation of efficient tools for exchanging information and for effectively communicating with government ministries, administrative departments and other public sector organizations;
- to design and create those information services required to assist the President and his closest assistants in supporting policy definition and monitoring national development;
- to request the necessary information from the appropriate offices of the President's Office or the public sector;
- to define, in coordination with the different offices of the President's Office and other public sector organizations, indexes which permit the evaluation of governmental programmes and the implementation of planning;
- To provide technical support, in terms of information systems and information technology, to those offices of the President's Office which require it.

Some functions aim to provide information services for the President and his assistants on relevant topics (socio-economic development, politics, public order and so on). Other functions aim to coordinate IS development at the President's Office.

6.3. THE DEVELOPMENT OF STRATEGIC INFORMATION SYSTEMS

During the period of re-structuring, the SI&S continued to be involved in several projects inherited from previous governments, while discarding

several others from its agenda. Meanwhile, at the President's Office the SI&S consolidated its role as IS development coordinator, since the Director of the PO had assigned it the responsibility for coordinating IS developments for all offices at the PO.

6.3.1. The Preliminary Stage of the SISP Process

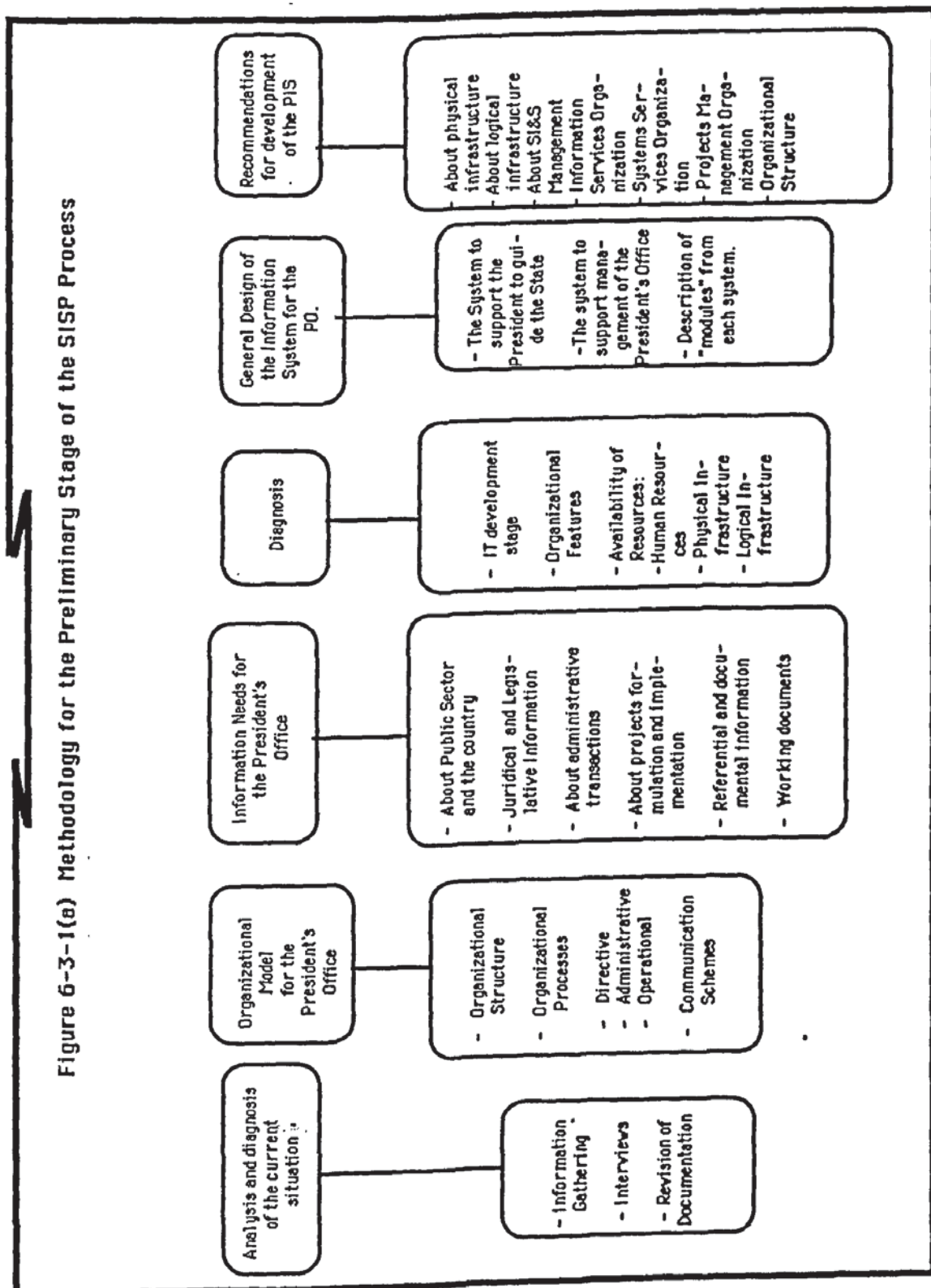
The SI&S contracted a consulting agency called Praxistemas to manage a SISP process for the PO. At the same time, the Director of the PO had ordered the AO for Modernization and Decentralization of the State to contract a consulting office for leading a re-structuring process for the PO. Figure 6-3-1(a) presents the methodology used by the consultants to develop the preliminary stage of the SISP process. <Ramirez & Stir, 91>

As shown in the Figure, the consultants commenced the project by carrying out data collection and interviews with junior managers and staff from all offices at the President's Office. On the basis of information gathered from interviews and data collection, the consultants developed an organizational model of the President's Office, from which they deduced its information needs.

They subsequently carried out a technical and organizational assessment, with an overview of existing IS resources and IT architecture, as well as a report on the limitations of current operational schemes and on the role of information management. The assessment outlined the following observations about the state of development of the IS function at the PO at that time:

- The PO needs to coordinate IS developments from different offices in order to improve the availability of qualified technical resources.
- The PO lacks the required standards for the acquisition and implementation of office systems.
- It needs to replace old technologies (closed architecture-based microcomputers, network tools and information systems) for newer and more flexible ones in order to offer better prospects for the

Figure 6-3-1(a) Methodology for the Preliminary Stage of the SISP Process



integrated growth of its IT platform.

- The development of networks is recommended, by integrating existing machines so as to improve communication facilities and increase the sharing of expensive tools.
- The President's Office should strengthen its systems development capability.
- There is an evident lack of communication systems within the President's Office to support staff in the development of their responsibilities.

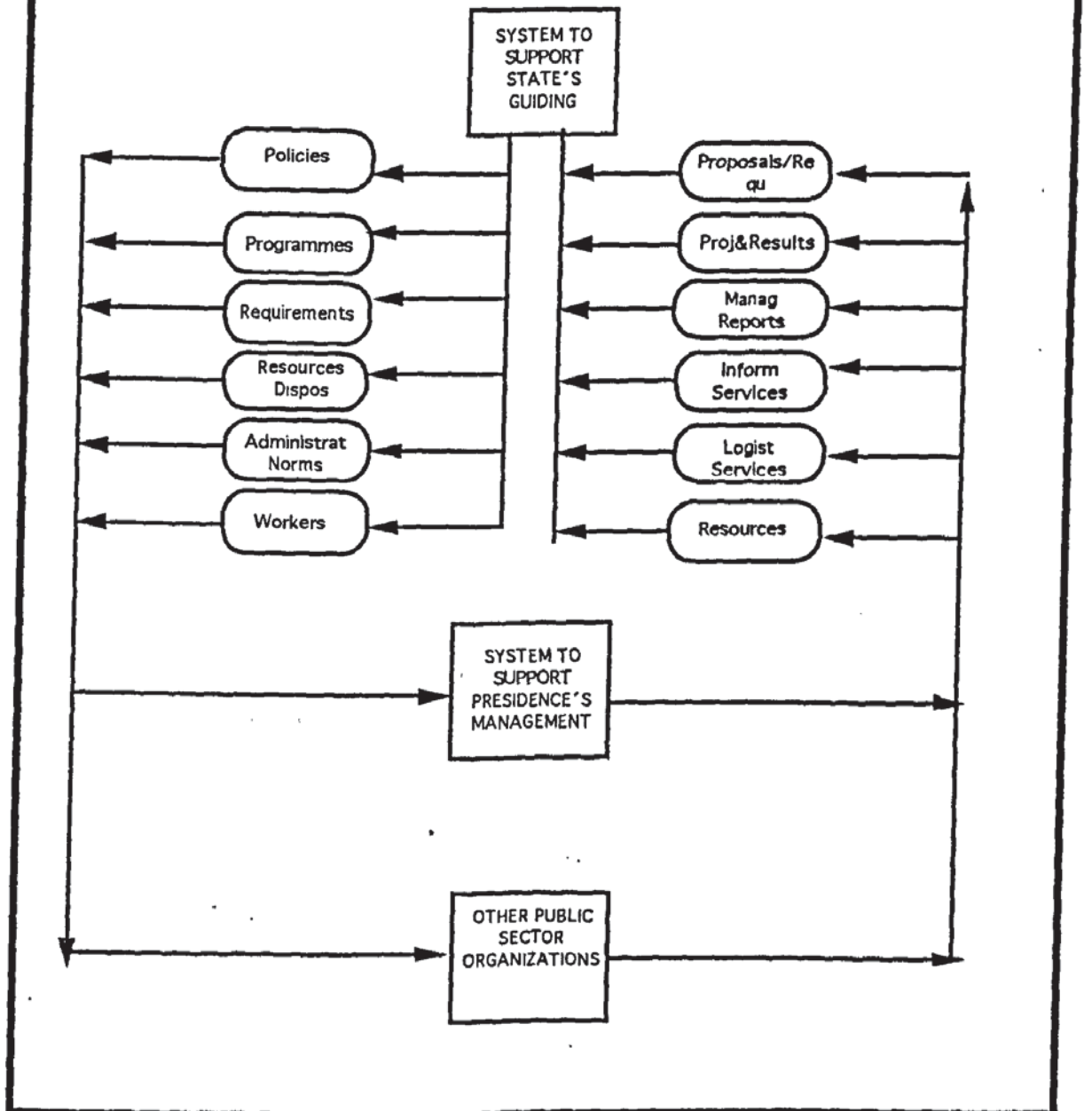
While developing this assessment, the consultants designed an *"Information System for the President's Office" (ISPO)*, as shown in Figure 6-3-1(b). As the Figure makes clear, there were two main sub-systems. The first sub-system, called the *"System to Aid Government Direction"* grouped those projects which might help consolidate information services and systems for supporting the President's role as the chief executive of the Colombian public sector. The second level, named *"Projects to Support the President's Office Management"* aimed to consolidate IS support for the President's Office.

The consultants also made some recommendations for the further development and implementation of this system, including recommendations about *the* inner organization and management of the SI&S.

They recommended organizing the SI&S into the two areas of Systems Services and Information Services. The first area was intended to coordinate computing and software acquisitions; to design and develop information systems; to train users and provide them with technical support; and to coordinate the development of the SIS plan for the PO.

The aim of Information Services was to establish and attend the need for information services at other offices of the PO; to design the required services; to search for and to obtain the data required by these services; and to manage information exchange with other offices of the CPS.

**Figure 6-3-1(b) GENERAL DESIGN ELEMENTS
OF THE INFORMATION SYSTEM FOR THE
PRESIDENT'S OFFICE**



6.3.2. The Final Stage of the SISP Process.

After completion of the consulting assignment, the staff from *the SI&S* continued to develop the strategic plan. They researched several methodologies and finally designed a *tailor-made* plan for the final stage of SISP process. It roughly followed Rockart's CSF approach to SISP. Figure 6-3-2(a) presents an outline of such a methodology.

As a result of developing the first stage of such a methodology, the SI&S's staff made a more detailed formulation of the strategic IS projects required by the President's Office. They designed the projects and subsequently validated them with the executives of the PO.

Figures 6-3-2(b) and (c) summarize the resulting portfolio of projects. Both figures highlight those projects whose development had been started -- or even finished -- by the completion of the research period (end of 1992). They are those labeled "systems" in the Figure.

Those projects which had not started by that time, but belonged to the SIS portfolio, are those called "*projects*" in the Figure. Appendix # 5 presents detail on the IS platform suggested by the SIS portfolio and Appendix # 6 presents details on the main projects developed from 1990 to 1992, from the suggested SIS portfolio.

6.3.3. The development of the SIS and the operational constraints to its development.

Even though the paths of action laid out by the SISP process seemed to be clear enough, and that there was some commitment from the Director's and Sub-Director's Offices for its development, the budget approved for supporting the technological development of the PO did not even meet a fifth of the needs expressed by offices regarding computer tools and projects development.

There were other limitations for *the SI&S* at the operational level while developing the SIS plan. One of them was the centralization of decisions at the Director's and Sub-Director's Offices. It resulted, for instance, in

Figure 6-3-2(a). Methodology for the Final Stage of the SISP Process

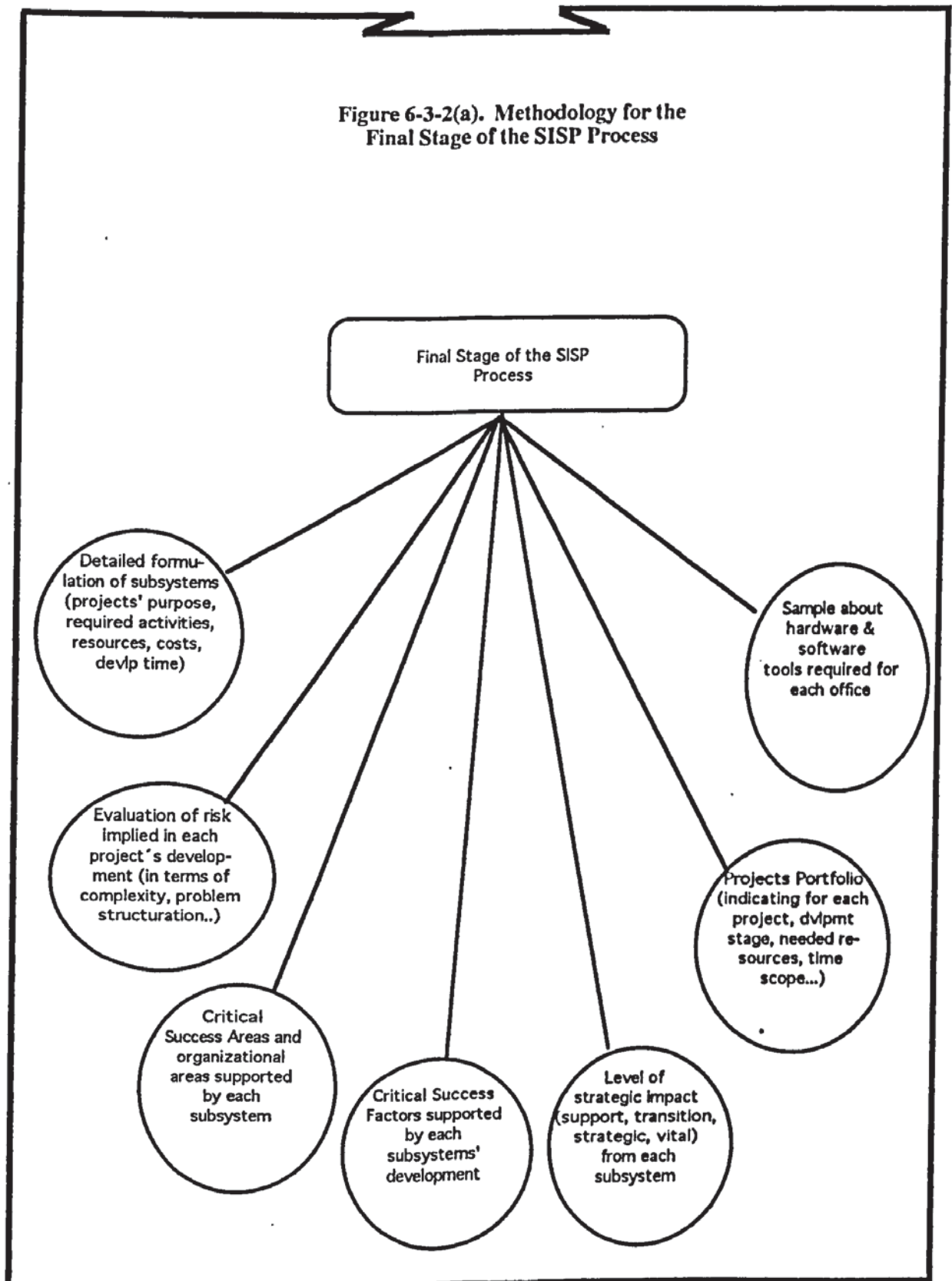


Figure 6-3-2(b). Strategic Information Systems Portfolio
Level I - Systems for Support President's role of Guiding the State

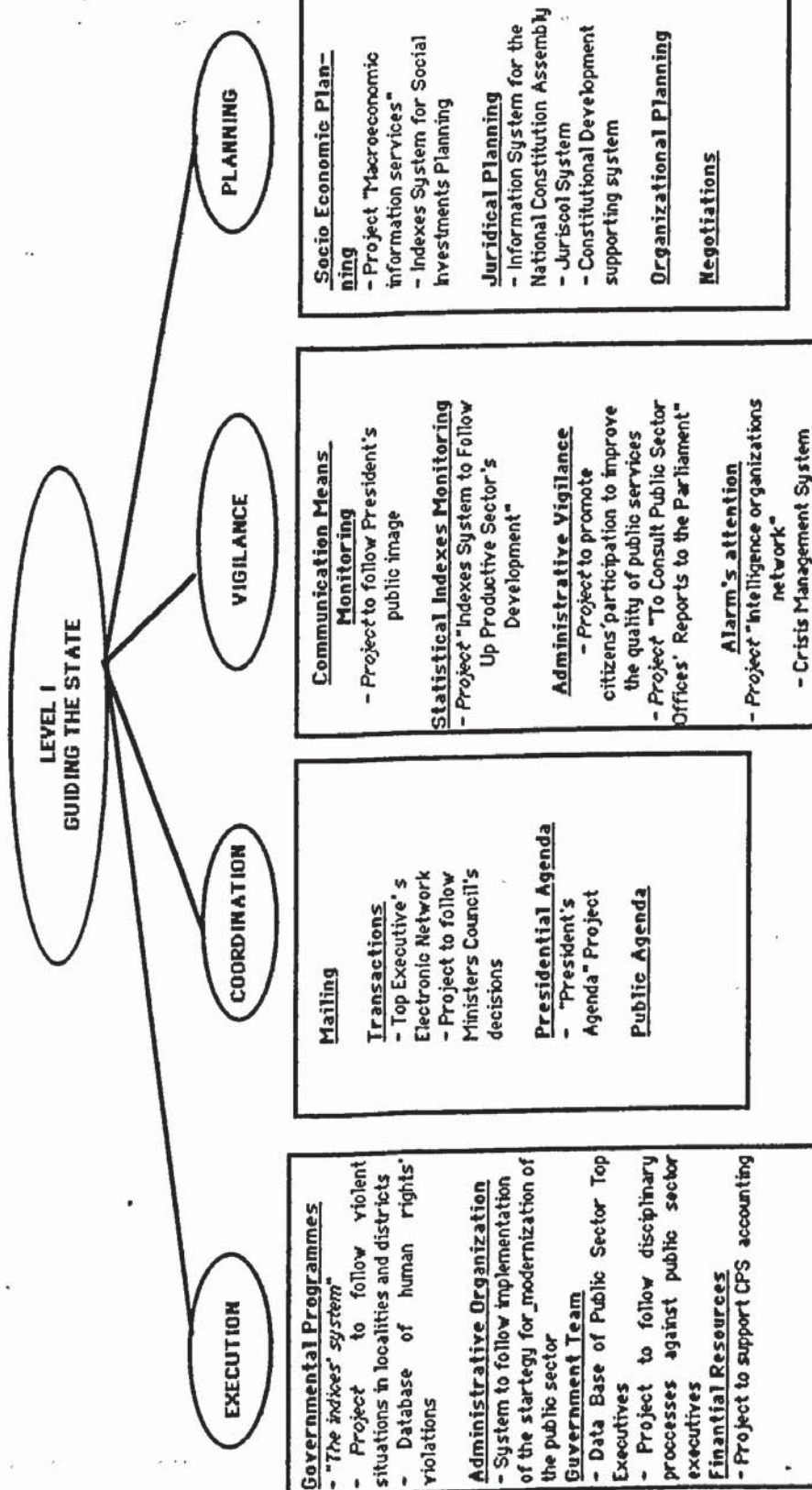
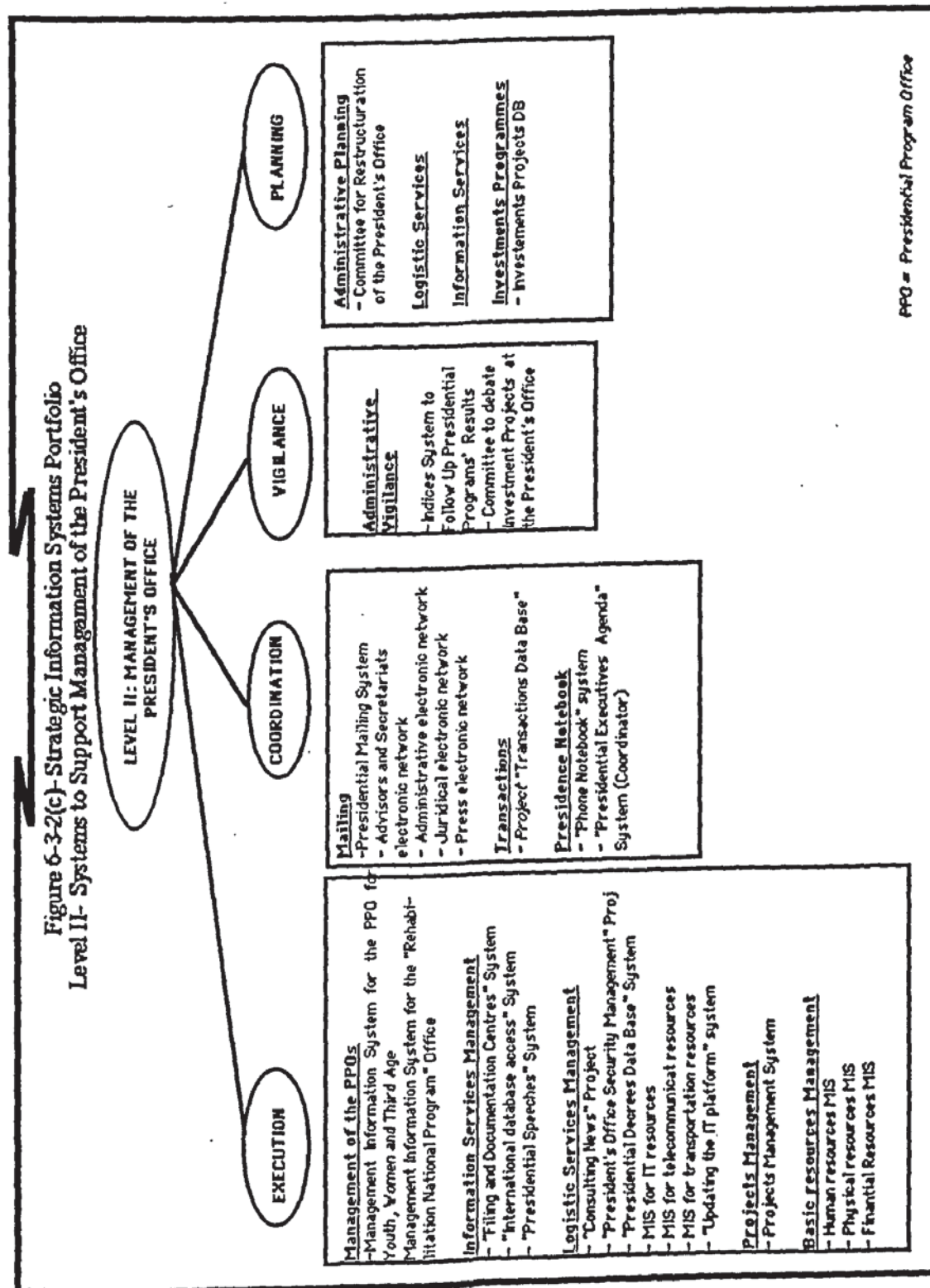


Figure 6-3-2(c)- Strategic Information Systems Portfolio
Level II- Systems to Support Management of the President's Office



continuous delays in contracting procedures (an average of three to four months from the time an office first requested the Sub-Director's Office to prepare a contract).

The Director's and Sub-Director's Offices were constantly concerned about guaranteeing the legality of management operations rather than being concerned about creating mechanisms to guarantee that operations achieved high levels of performance.

One external factor affecting the development of the SISP process were delays at the Treasury Department in allocating promised investment funds to each public organization. As a result, the investment budget (the only source of funds for the SI&S to develop the SIS plan) was made available by September - October, while for the rest of the year *the SI&S* had its hands tied.

As an inevitable consequence, it was impossible for *the SI&S* to execute in a timely manner those projects relying on contracting external services, or on acquiring computer tools from outside businesses. There was an average delay of six months in the implementation of every project in the SIS plan.

The other major difficulty in achieving successful implementation was that of creating an competent working-group within the President's Office. The Office's re-structuring not only failed to improve wage policy (which was already poorer than those of the private sector and most of the public sector at professional levels), but on the contrary, it decreased the level of professional qualifications and quantity of staff at *the SI&S*.

SI&S staff felt the effects fairly rapidly. The abandonment of posts became increasingly frequent, and there were major difficulties in replacing personnel with highly qualified professionals.

6.4. A CASE OF SIS DEVELOPMENT: A SYSTEM FOR FOLLOWING UP THE NATIONAL DEVELOPMENT PLAN

Previous sections explained the national strategy for socio-economic

development, as well as planning practices suggested by the 1991 Constitution. One of the results of the SIS plan was to support the development of a follow-up system to compare expected versus achieved results from the implementation of strategic socio-economic development programmes. The SIS plan viable, the SI&S proposed that it and the NDP jointly develop a project in this direction which it called "*The Indexing System for Following up the Results of the NDP*".

Once the purpose and expected results were agreed upon, *the SI&S* and the NDP contracted a research center of the National University to develop the system. This section summarizes the main aspects of the development of the project, its results and the problematic situations which were experienced when implementing it.

Their original statement of the *system's purpose* was:

"A system to allow the timely preparation of executive reports which record the implementation of the NDP's strategies and programmes. The indexes should make it easier to evaluate the evolution of those critical success factors defined for the NDP's successful implementation. They should also point to executive-level "alerts" for those situations which are likely to be critical."

They also set the *project's scope* by defining the following factors as the main aspects to be assessed by the system, with respect to each of the strategic programmes defined by the NDP:

- human, physical and financial resources
- normative and institutional factors affecting implementation
- implementation period
- results or products achieved

Project development was planned for those organizations with the greatest responsibility for the implementation of the NDP's main programmes (about 15 institutions from the CPS at the national level).

Next follows a brief description of the way each stage was implemented while developing the project, as well as the main problems and achievements encountered during implementation.

6.4.1. Information Gathering

There was a lot of political support from both the staff of the PO, the director of the SI&S, and the NPD. The President himself, and the PO's director and sub-director, all expressed their political support for the project. This was confirmed by a presidential directive which ordered all public sector organizations to collaborate in the successful implementation of the project.

Consequently, the consultants found that most doors opened when they arrived to collect information about the NDP project. The attitude of these organizations had changed and the project's team obtained more commitment from them. Most of the organizations provided the consultants with complete information about the definition of the programmes and projects they had carried out, and about the purpose, activities, goals and resources they had for the project's implementation.

A major problem which the consultants encountered at the initial stage stemmed from the lack of clear definitions for most of the NDP projects. Months before, the NDP and the Presidency had published two volumes describing the NDP's purposes, policies and strategies.

Theoretically, these volumes would show the results of negotiations between the National Planning Department, the President's Office, the Treasury, Congress, the National Council on Economic and Social Policy, and the Territorial Planning Authorities. However, subsequent interviews with public organizations revealed that some of them were not aware that previous agreements existed between organizations at territorial and national levels concerning the purposes and/or goals established for each programme. It was evident that the planning scheme governing practice in the organization was still a traditional one.

Moreover, some of the organizations had no clear idea of their own responsibilities in the NDP and therefore had no action plans for implementing projects. This resulted in extra time being devoted by the consultants in order to establish the project's purposes, goals and implementation plans with those organizations.

The other main difficulty was that the published volumes did not show a

standard level of development of programmes or projects. While some projects were clearly outlined, with their goals set and their required budget defined, there were other projects which were described only at a general level, with no details about the projects, goals or even the budgets required.

Consequently, the consultants had to push the officers responsible for each organization's project to define their projects and goals more precisely, with the result that by the end of the project's time frame they had only gathered information on the formulation of the projects.

The project's team also found that the National Council on Social and Economic Policy had made major adjustments to a significant number of programmes and projects after publishing the NDP's volumes. There was no clear mechanism at the PO to keep an updated version of the plan, and neither the national planning council, nor the NPD had done this work before. As a result, the consultants had to update the whole NDP themselves with this information, without being sure that the updated model of the NDP would continue to be updated until the end of the four-year period.

6.4.2. Analysis of the Information

The organizations' initial attitude towards the project was quite negative, given that the traditional managerial style of the National Planning Department was autocratic and penalizing, and because it was one of the sponsors of the project. Consequently, many organizations originally perceived the project as another control tool designed by the NPD to penalize organizations.

There were also serious communication problems between the NPD and the planning offices of public sector organizations, who felt their autonomy was always being questioned by the NPD's inquiries and penalties, and by its non-participative style.

While gathering information, the consultants analyzed it, prepared a summary of the definition of each strategy and programme, and discussed this with the public sector organizations and with senior officers at the

National Planning Department.

This process clearly contributed to a closer relationship between the organizations' planning offices and the technical units of the National Planning Department. For the first time, they debated the appropriateness of the projects which senior executives of the central government had set up for their organizations.

The consultants had to listen to complaints from each side. The NDP was not sufficiently happy with the organizations' response to the NDP, and the organizations were not sufficiently happy with the work done by the NDP when formulating the NDP.

The organizations' most common complaints were:

- a lack of knowledge of the programmes set up by the NDP or the goals established;
- non-compliance by the central government with respect to investment funds, amounts and delivery dates promised for the implementation of the NDP programme; and
- a lack of monitoring schemes for comparing operational results with each organization's planned results.

6.4.3. Index Design

Once the consultants had agreed on and updated the NDP's general structure together with the organizations, they defined a conceptual model from it in terms of strategies, programmes, sub-programmes and projects.

Additional effort followed for agreement with the responsible organizations at each level of the NDP structure, on a detailed model of each programme, sub-programme and project (taking only the most significant projects in terms of investment resources involved) with respect to:

- the activities involved in project development;
- the products or services anticipated;
- the required resources;
- the legal and institutional factors requiring development in order to implement the project;
- the organizations involved in implementation activities; and
- the social communities benefited by the project's results.

Once the consultants had collected such information, the definition of indexes took place at each of the required levels (programme, sub-programme, and project). They roughly followed the Critical Success Factors approach to strategic planning, in order to define the CSFs. Afterwards, they discussed with each organization's responsible party, the definition of indexes as well as its goal levels (minimal, satisfactory, or excellent).

This stage of index definition took place in a participative manner. Three levels of index definitions were set: the structural level, the financial level, and the level of measuring the results achieved by each strategic development project. The structural index proposed measuring time schedules and the effectiveness of those legal and structural activities which the organizations had developed for the effective implementation of the NDP's programmes.

The Results and Operational Indexes were responsible for measuring the intermediate or final results of the projects' implementation. The financial indexes were intended to measure the use of available resources for the implementation of the projects.

In practice, the consultants found it extremely difficult to measure structural indexes because most organizations did not have this kind of follow-up procedures for projects or activities. Only a few of them defined and used such indexes.

The organizations participated actively in the design of *"Results and Operational Indexes"* and the definition of goal levels. There were often huge difference between satisfactory and excellent levels of an index, so most organizations accepted the goal levels defined by the NPD as *"excellent"*.

There were no communication channels provided by the NPD or the PO for discussing this sort of differences. As a result, differences remained unchanged and the discussions needed to clear up probable problems in the implementation of the projects never took place.

6.4.4. Information System Development

From the time the project got underway the systems team began to develop their own timetable. Their own goal was to develop a *"computer-based system to permit the timely preparation of executive reports recording the NDP's implementation of strategies and programmes."*

Once they knew the requirements of the system, the team carried out market research activities in which they analyzed several available software packages (both at the academic and the commercial level). In the light of this analysis they made the decision to design a tailor-made system fulfilling the desired characteristics.

To make it portable and easily transportable, the systems team chose fourth-generation development software (Dbase with C+ interface). They used a traditional methodology for IS development which included analysis, design, development and implementation stages.

All systems engineers participated actively in the consultants' meetings with the PO, NDP and some public sector organizations. The design of the computer system followed the philosophy of the "One Page Management" approach developed by Khadem and Lorber. <Khadem and Lorber, 90>

The main problems found were a lack of technical quality in the resulting tool (too slow and not very friendly) and a lack of a network-oriented design and implementation.

6.4.5. System operation

Once the organizations' representatives and the project's team had agreed

upon the definition of indexes and goals, the project's team left the organizations with the responsibility of delivering current information for each defined index within agreed time limits. The setting of responsibilities for the operation of the system was as follows:

- The planning offices of the organizations involved were entrusted with the responsibility of getting the required information from operational units, producing the required index values and periodically sending them to the National Planning Department.
- The Treasury was charged with the responsibility of periodically sending data records to the DNP, in order to update the financial and budget indexes of the programmes.
- A new office at the National Planning Department, called the "*Budgeting Results Evaluation Division*" (BRED), was assigned to coordinate the information flow from public organizations - including the Treasury - and distribute it to the technical offices of the organizations for the evaluation of data, and to incorporate it into the Index System.
- The same office was to produce periodic reports of the system, and send them back to the users (including top executives at the National Planning Department, the President's Office and the Treasury).
- The SI&S was charged with the responsibility of coordinating the information flow from the National Planning Department to interested executives from the President's Office (notably the social policy advisor, the economic advisor, the President, the director and sub-director, and the heads of Presidential Programme Offices).
- This office was also assigned the responsibility for providing training on design and use to public organizations, receiving complaints and suggestions about the computer-based tool, and developing improvements to it accordingly.

The original intention was to provide the computer system to all public organizations committed to the implementation of the NDP, as permanent users, including the President's Office and the National Planning

Department.

As mentioned earlier, the consultants trained all organizations which participated in the project, and provided them with a copy of the computer system. Having fulfilled their contract, they left the NPD -- through the BRED office -- with the responsibility of improving the quality of the data already gathered and for obtaining the rest of it from public sector organizations.

Unfortunately, time passed and the BRED office could not finish the process. As a result, the NPD did not provide the organizations with the required data, alleging that there had been many "technical problems." In particular, the initial analyses of the data gathered by the system revealed that it showed many problems of inconsistencies, incompleteness and lack of credibility.

Evidently, the index data holds important political significance: the DNP or PO could use it to judge each organization's performance in terms of its achievement of objectives and its contribution to a successful implementation of the NDP. Moreover, they could also use it apply financial penalties to those organizations whose indexes showed a high frequency of unsatisfactory.

As a result, many organizations felt threatened by the system. Most of them did not contribute to the best of their ability by sending timely and high-quality information. Furthermore, once the data collection to produce each organization's own index data began, it became a difficult political process in which senior executives and boards intervened.

In this situation, and lacking the political support of the previous sponsors of the project, the responsible unit at the NPD (BRED) never got the timely, correct data it needed to be able to correct these problems. Also, the difficulty the consultants had in creating a network-based computer system contributed to the failures in implementation. As an example, the consultants set up a manual procedure for updating the system that was to be the responsibility of the BRED office.

It was not made sufficiently clear if the organizations were responsible for sending periodic index data or if it was the BRED office's

responsibility to ask the public sector organizations for the index data, according to the seasonal basis of each particular index.

Once the index data arrived at the BRED office, it ought to have input the data into the computer system and produce an updated version of the index data base. It should then have sent back an updated version of the index data base to each organization, so that they could consult it and produce the required reports as often as they needed them.

Due to the large number of organizations involved, their geographical dispersion, and the lack of control mechanisms for guaranteeing the timely gathering of data, the procedure devised by the consultants failed to collect the data.

One year later, the BRED office has still not completed the index data. This lack of quality data has ruined the effectiveness of the system as a support tool in the decision-making process of planning development. Unfortunately, the system remains in the hands of technical staff, and neither the NPD nor the President's Office has used its results for solving their information needs, which was the system's purpose.

The new director of the SI&S explained the system's failure from a technician's point of view, and decided to get extra financial resources and international support to improve the computer system. The director's main interest, however, is in the application of the system to measure the results of investment projects that the President's Office manages through its PPOs.

Figure 6-4 summarizes some relevant features of the project's development process. As it indicates, the main problems seem to be related to a poor understanding of the structural conditions underlying each of the organizational processes that the SIS plan pretended to support.

Fig. 6-4. Main Features of the Development of *"the Index System"*

Achievements from implementation of *"the index system"*

- Improvement in organizations' learning skills for developing follow up activities.
- Improved, widespread knowledge on the general scope of the NDP and each organisations' own responsibilities towards it.
- Participative approach involving organizations for defining goal levels, resulting in enhanced commitment from them in the fulfillment of these goals.
- Improvements in the traditional measurement system (measuring financial use of resources only and one level goals-results, occasionally).
- Easy to copy and to implement software and methodology, letting many organizations to use it at their own.
- Contributed to a cultural change from a hypothesis *"every organization is a likely source of corruption and lack of effectiveness"* to one trusting organizations criteria and good intentions for acting (by trusting each organizations' own defined plans and goal levels).

Shortcomings from implementation of *"the index system"*

- Absence of criteria from the community about their perception on the results of development programmes (indices measuring civil servants' views of programmes' results).
- The project's team defined, most of the indices of social programs, executed at local levels, using criteria from civil servants from the national level.
- Opportunity, credibility and quality on data collection, mainly due to reasons as:
 - For projects implemented at the local level but managed at the national level, there were too many scales in the scaling up process of aggregation of data;
 - Organizations did not always get data in a timely manner, or did not get it at all.
 - Fear in the public sector entities of the NPD's financial punishment as a result of *"difficult to explain"* low proficiency shown by their measurements indices.
 - Lack of design of the proper structural arrangements for debating indices' definition, goal levels, and problems found to achieve them.
- Lack of technical quality of the resulting software.
- Lack of a training program to improve systems culture at the executive level in organizations.

7. ANALYSIS OF THE STRATEGIC INFORMATION SYSTEMS PLANNING PROCESS AT THE OFFICE OF THE PRESIDENT OF COLOMBIA

This chapter uses first "*the SISP Framework*" introduced at Chapter Five to review the story presented before. While such a framework is used as an analysis tool, it does follow the recommended stages and at each stage, review what was done at the practical situation, compares it with what the framework would recommend us to do and reach conclusions about those things that the analysis made more understandable than before.

It also analyzes the development of "*the index system*", at the light of ideas and tools suggested at Chapter Four. In particular, it uses ideas from VSM to analyze the structural conditions for developing plans and for assesing performance that Colombian public sector organizations are using at the moment. Also, it uses the cybernetic idea of a management support system to assess the proposed design of "*the index system*".

The chapter ends up by summarizing the main facts that previous analyses revealed that were not clear enough for the people living the described situations, both when developing the SISP process and when developing the SIS mentioned.

7.1. EVALUATION OF THE ORGANIZATION'S STRUCTURE

According to the "*SISP Framework*", the first stages of the process should enable managers and analysts to develop criteria about the most strategic processes requiring attention if they want to develop the organization properly, as well as about the organization's current operational and structural problems. On the basis of earlier descriptions of the way the PO defined its perceived purpose, organizational tasks and structure, this and the next two sections will present an example of a cybernetics

evaluation of the structure of the PO at the time. *The "diagnostic method's"* recommendations and tools were employed, as described in Chapter 5.

7.1.1. Establishing the Organization's Purpose.

As explained in Chapter 5, the purpose of this evaluation is to produce a model of the organization "as it works" (from the point of view of either the relevant actors or that of the analysts) so that it serves as the basis for later organizational analysis.

First of all, the researcher will define the purpose of the Colombian Public Sector, and then the purpose of the President's Office, according to the perceptions of the senior and junior executives of the PO between 1990 and 1992.

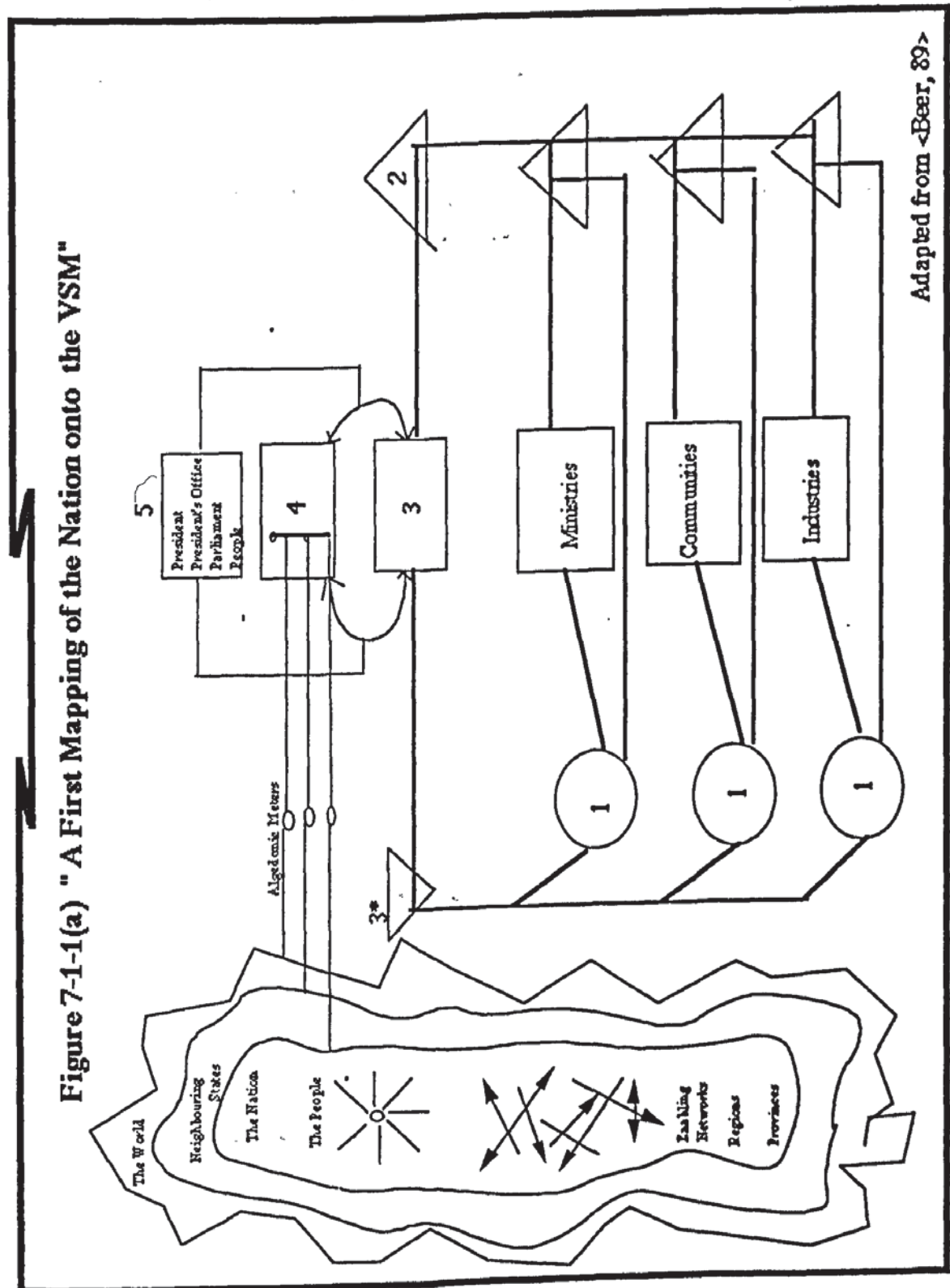
The researcher considers that Beer's own model of the nation may be useful as a starting point for modeling the Colombian Public Sector. It is presented in Figure 7-1-1(a). By observing the sector, we see that at the national level the "ministries" are primary activities. <Beer, 89>

The researcher presents the Colombian Public Sector's purpose as follows:

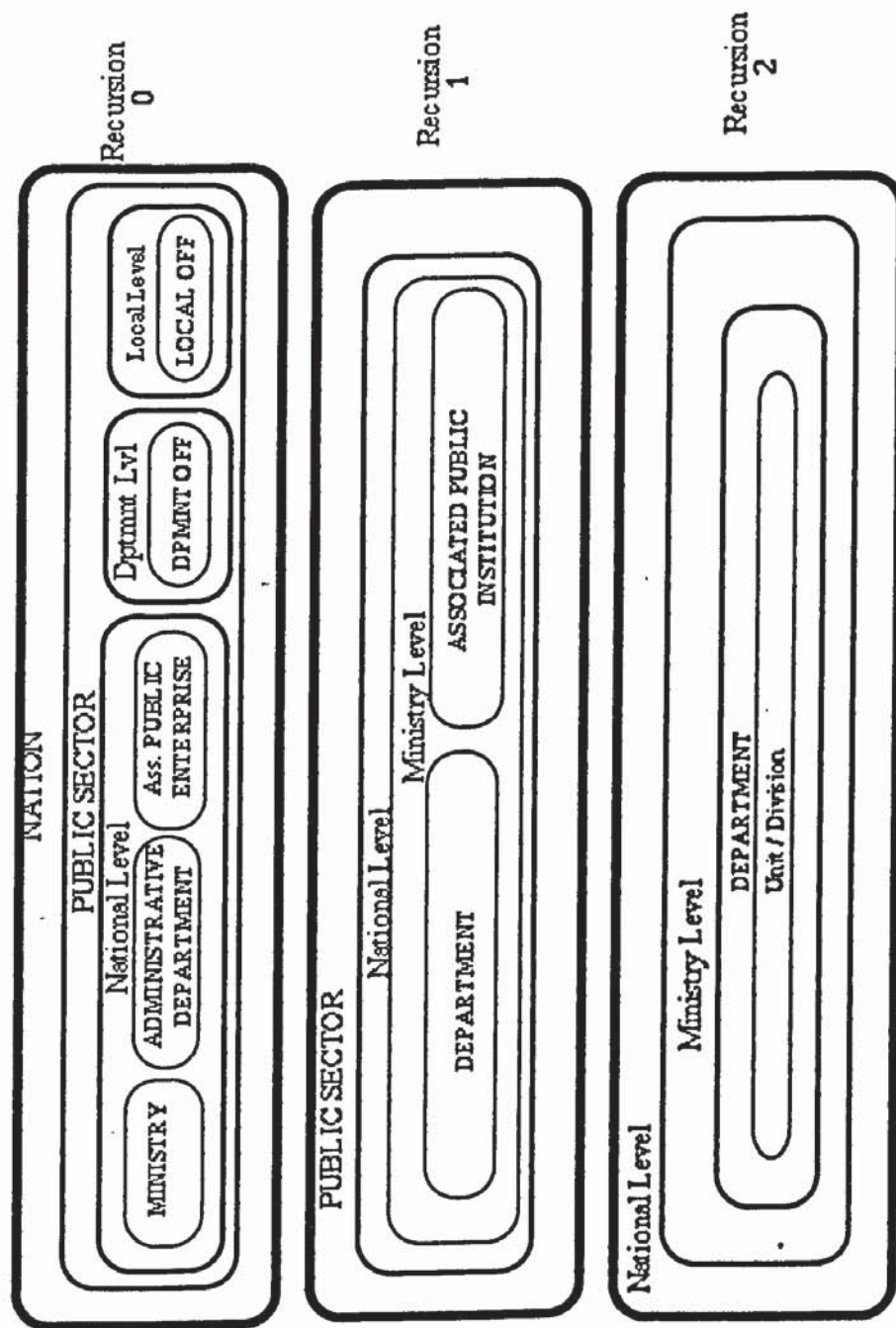
"The Colombian Public Sector is the national management, administrative and governmental system for improving the overall situation of the nation and its people, while preserving constructive international relationships and preserving the nation's ecosystems."

In order to implement such objectives, this purpose requires multiple recursive levels, given the complexity of the whole task. Figure 7-1-1(b) illustrates the way the CPS has developed the first of these recursive levels in order to implement its perceived task.

The figure employs the original diagram presented by Mohammed for the Malaysian Public Sector and adjusts it to the Colombian case. As does Mohammed, it recognizes the nation at recursive level 0, the public sector at the national level as the next recursive level, and a ministry as the next



**Figure 7-1-1(b) Recursive Levels of the
Colombian Public Sector**



level after that.¹⁷

In this sense, the basic structure is the same in both nations. However, due to the process of decentralization followed by the CPS, the researcher considers it important to distinguish between the "departments" level, headed by the governors, and the "local" level, headed by the mayor from each city or town.

There may also be different interpretations concerning what each nation understands as the purpose of a "public enterprise" or that of an "associated public institution." In Colombia, a public enterprise is an associated public institution and there are public enterprises at the national level as well as at sector levels (e.g., associated to a ministry).

There are also "mixed" institutions in the CPS working with financial funds coming from both the private and public sectors. Some of their operations are ruled by public sector laws and others by private sector laws.

According to the researcher's own experience and debates with other executives from the PO at the time, the PO's purpose may be defined as follows:

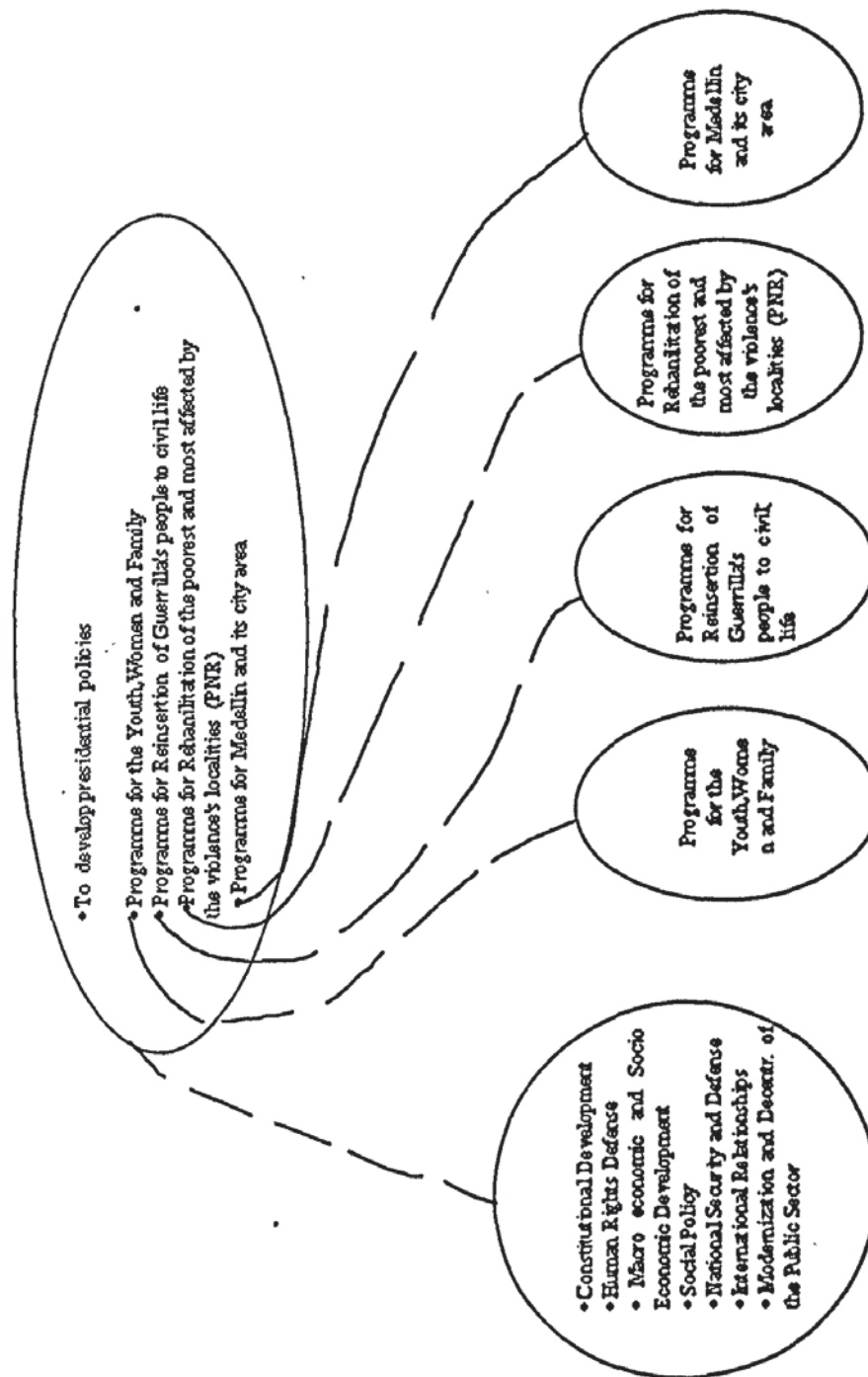
"The PO is the organization that supports the President in the performance of his responsibilities towards the country, as the Supreme Administrative Authority and the State and Government Leader. It is supported in this by Colombian Public Sector organizations."

7.1.2. Modeling Structural Levels

Following "*the diagnostic method*", figure 7-1-2 presents the "*unfolding of complexity diagram*" of the PO's primary activities, as currently defined. As shown in the diagram, the primary activities were policy formulation and the different services that the PPO offered to the poorest communities.

¹⁷ Mohammed made his doctoral thesis modeling the First Minister's Office of Malaysia, using cybernetic ideas. For further reading, see <Mohammed, 90>

Figure 7-1-2. Unfolding of complexity of the President's Office



The dotted lines on the left branch of the figure represent the fact that the PO had not recognized those activities as primary ones -- as of end of 1992 -- and consequently did not have a regulatory capacity attached to them.

7.1.3. Modeling the Distribution of Discretion at the PO

Table 7-1-3 presents an example of the "*Table of Recursion Function*" of the PO, illustrating the relationship of current primary activities with only some of the servicing activities. One of the first things that the figure clarifies is the fact that the activities of policy definition did not have enough administrative discretion.

Although some of these activities possessed internal legal support systems and personnel and mailing systems, clearly all of them relied on the Buying and Contracts, Maintenance, Personnel, Financial Management, Internal Control, Auditing and Inventory functions, developed at the level of the Assistant Director's Office.

It would have been acceptable if there had been less complexity in policy definition activities, but in almost all cases such activities required high levels of specialization and good skills for managing highly complex political situations, whereby each office's skills for responding to situations relied heavily on their effectiveness in the management of resources (human, financial, physical and technological).

No matter what each office's capacity for managing their own businesses was, the Assistant Director's Office assumed personal control over most management issues, including contracting, personnel management and budgeting. Each office's performance would, as a consequence, rely heavily on the performance of the PO as a whole and on the efficiency of the Assistant Director's management.

Attempting to not lose control, senior executives overburdened the central administrative team with the tasks of supervising every transaction made by the offices (acquisitions, contracts, etc.). We could have predicted, by applying cybernetic criteria of effectiveness, that this management model

TABLE 7-1-3 TABLE OF RECURSION - FUNCTION OF
THE PRESIDENT'S OFFICE

FUNCTION	Buy&Cont		Maintenance		Human Reso		Finnci Mngm		Operational Control				Systems
	Buying	Contracts	Locations	Comput	Select	Contract	Budget	Inv Scdl	Legal Supp	Int Contr	Audit	Invent	
Recursion Level													
0 President's Office	•	•	•	•	•	•	•	•	•	•	•	•	•
1 Developmnt President Policies							•						•
2 Constitutional Development							**						•
2 Human Rights' Defense							**						•
2 Moderniz ... Public Sector							**						•
2 National Security & Defense							**						
2 Macro&socio-economic dvlpm													
2 International Relationships													
2 Social Policy													
1 PNR	*	*	*	*	**	**	•						•
1 Reinsertion guerrilla's peop	*	*	*	*	**	**	•						•
1 Youth, Women, Family	*	*	*	*	**	**	•						•
1 Medellin & city area	*	*	*	*	**	**	•						•

* contracts whose value is less than "x" million pesos

** only if approved by Diretion and Subdirection

would overburden the Assistant Director's management capacity, as indeed occurred.

For example, the PO's Inventory Office totally centralized the inventory function for all offices and could never manage the quantity of transaction information it had to deal with. Its information processing system resulted in permanently out-of-date inventories and delays in delivering the acquisitions.

Summarizing, it seems clear that the PO had distributed autonomy unevenly among its operational offices, leaving most of the managerial discretion at the level of the Assistant Director's and Director's Offices.

7.1.4. the Regulatory Mechanisms.

On the basis of the PO's purpose as described above, this section presents a VSM of the organization, as shown in the Figure 7-1-4. It will serve to support analysis of the regulatory mechanisms in use.

7.1.4.1. The Monitoring - Control Mechanism: Resource Bargaining

It also became clear from reviewing the "*Table of Recursion Function*" that none of the primary activities have the required autonomy for negotiating resources -- including the PPO who are responsible for service implementation.

For instance, with respect to the hiring of personnel, the PO's Director and Assistant Director reserved the right to take the final decision on each new employee that PO hired -- even for those employees hired by the local offices of the PNR. They also decided, according to their own political criteria, on the investment and operating budgets assigned to each office, and the schedule for delivering the resources to the corresponding offices as the PO received them from the National Treasury.

Assistant Director's Offices were not able to fulfill their commitments

with other offices in a timely manner, which resulted in organizational ineffectiveness.

7.1.4.2. The Monitoring - Control Mechanism: Corporate Intervention

Unfortunately, the legal system supporting public contracts and worker accountability in the CPS was -- and is still -- extremely bureaucratic and ineffective. As a result of both the legal system and the current structural arrangements, it took the PO an average of four months to issue each contract.

The PO's Director made significant efforts to change the administrative laws governing the PO's actions. He succeeded and by the end of 1991, the PO had a new body of administrative laws -- different from the one governing other public sector organizations -- which created better conditions for effective management.

Even with the advantages of the new laws, the centralized management style and the lack of trust in decisions taken by other offices continued to dominate relationships between senior and junior executives. As a result, most junior executives felt constantly constrained in their autonomy, slowing the pace they had tried to maintain in their operations, and frustrating their capacity to produce the expected results.

The Director also overcomplicated the legal steps of each contract and invented new bureaucratic steps to guarantee that every action was carried out legally. In reality he was under pressure, since current law established that it was the Director's legal responsibility to answer to the judicial system for any loss of money or inappropriate administrative action undertaken by any person with authority in the organization.¹⁸ In order to protect himself, the Director attempted to diminish as much as possible the chances of inappropriate administrative action by his staff, even if it represented a risk of being less efficient, as indeed occurred.

¹⁸ This law has not been properly revised yet, at the CPS.

7.1.4.3. The Monitoring - Control Mechanism: Monitoring

The new constitution had recommended that organizations should control themselves, in terms of the effectiveness of the results each one produced and not only in terms of the financial management of the resources used to produce results (as was traditionally the case in the Colombian Public Sector).

Attempting to apply this recommendation, the Assistant Director gave the Audit Office the responsibility of developing monitoring schemes, as suggested, but he obliged them to review each operation before it occurred. He even imposed this role at his own level of authority, fearing lack of control if he let the PO's offices develop self-control mechanisms.

As would have been expected, this office became the worse bottle-neck for most of the operations attempted by the other offices, as a result of the delays in reviewing and approving them, exacerbated by scarce personnel. While on the one hand auditors had the discretion to veto any project proposed by the PO's offices, on the other they did not have the requisite variety or knowledge required to assess the validity of each project.

In addition, there was nobody else at the PO developing monitoring functions. For instance, the PPOs have not developed proper monitoring channels for their own operational results at local levels.

7.1.4.4. The Monitoring - Control Mechanism: Coordination

The PO Director and Assistant Director over-used the control mechanisms because they did not properly design coordination and monitoring mechanisms. This resulted in their negotiating personally with each one of the office's directors -- there were twenty-two of them -- for their required investment and operational funds.

They constantly felt that they lacked control over the activities and results from the PO's offices and found no way to solve this, other than by designing more control mechanisms for supervising the development of

such projects and issues.¹⁹

By not designing proper coordination mechanisms they were forced to over-use the corporate intervention channel. As a natural consequence, what often happened was that they did not give the required attention to the junior executives, so the latter had to act according to their own criteria.

7.1.4.5. The Mechanism of Adaptation

With very few exceptions, there were no formal responsibilities in any office to carry out research on policy issues or future development schemes for the PO. The responsibilities for defining the PO's model of its future were in the hands of the President and the Director of the PO. It was the Assistant Director's responsibility to disseminate their views in order to guarantee cohesive operations.

With regard to the definition of organizational strategy, the presidential program was the clearest statement governing strategic thinking at the President's Office. However, the PO did not set up a communication mechanism for debating it, nor any responsibility for generating such a discussion.

There are many examples demonstrating the imbalance in the adaptation mechanism of the PO, such as the following:

- Earlier studies of the PO have already recommended that it create research functions. Nevertheless, the restructuring committee interpreted it as the need to create a financial planning unit as part of the Assistant Director's Office. It was created at the fourth level of the PO's chart but employing only two professionals, with responsibility for supervising the financial and operational plans made in all offices. As a result, this office ended up as a new financial control mechanism, but with no research responsibilities.
- There were few people devoted to linking the President's Office to

¹⁹ This phenomenon has been coined as the "control dilemma". See <Espejo, 88>

the community and to the CPS. The PO had no clear channels for filtering information about each of the most strategic issues, (e.g., for monitoring national development, social order, and so on). We can state that most of the PO's structure was designed to make the PO a viable organization in itself, while little of it was intended to properly link the PO to the CPS or to research relevant issues concerning national or international communities.

- As a result of the lack of communication channels for debating policy and strategic issues, there was no cohesive point of view about current policies proposed by the PO, which often resulted in in-coordinated actions by the different offices. It caused a permanent feeling of "uneasiness" among the office directors whose criteria were rarely the ones accepted and supported by the senior executives.

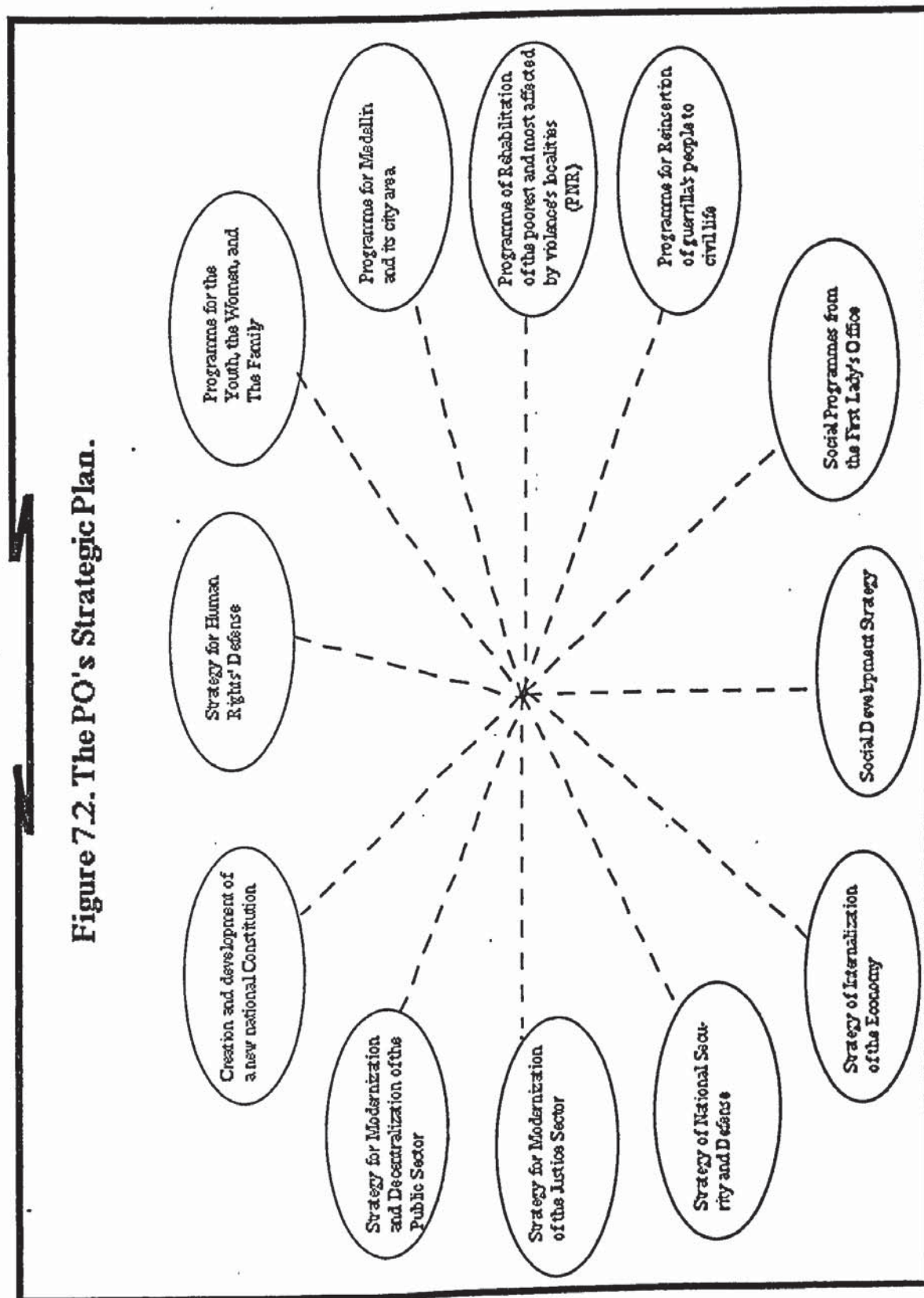
7.2. DEBATING CORPORATE STRATEGY

This analysis clarifies the lack of proper structural arrangements for debating strategic issues at the PO. This resulted in policies and strategies defined only by senior executives. The only criterion they shared was that set by the president's political programme, but each executive could make his own interpretation.

Because the PO had not developed any strategic planning process at the time, the SI&S also had to use this political programme as the basis for defining the CSFs for the PO. It was not easy to properly involve senior and junior executives in the debate of CSFs, for they saw the SISP process as a technical process that should be attended mostly by technicians. Nonetheless, the director of the SI&S managed to debate with them some of the most relevant strategic issues and she obtained criteria for guiding the definition of the CSFs. Figure 7-2 summarises the strategy of the PO.

According to the suggestions of the "*SISP Framework*", it seems clearer to the researcher now, that one of the main failures of the real SISP process was due to the lack of commitment from managers towards the development of the SIS portfolio, which might had been improved by

Figure 7.2. The PO's Strategic Plan.



their participation in this kind of debate. Also, it could be said that the PO lost two opportunities to develop its own strategic thinking: as a result of the development of this process or through the development of the restructuring process.

7.3. WORKING OUT THE STRUCTURAL ADJUSTMENTS (As Required for the Effective Implementation of the Organization's Strategy)

7.3.1. What was done in the real situation

Returning to the analysis of the real case presented in chapter 6, we noted that the consultants developed a model of the PO, supported by the legal definition of functions and by their own interpretation of the tasks the PO should develop in order to effectively implement such a legally defined purpose.

By comparing this methodology with that suggested by the "*SISP Framework*", we find that the consultants' methodology merged the recommended initial cybernetic stages (diagnosing current organizational structure, working out future strategy and required structural adjustments) into one single activity, which was that of studying the organization's structure in terms of the legal definition of its identity and functions.

Earlier sections have given an example of the sort of exercise proposed by the "*SISP Framework*" as the initial one for guiding an SISP process. The main diagnostic points obtained from the exercise illustrate the sort of criteria which might be developed from the initial stages recommended by such a framework.

On the other hand, the consultants emphasized developing the organization's model -- devised by the analysts on their own -- while giving less importance to the activities for validating it. Their resulting model of the PO suggested two structural levels, which they called the "*main sub-systems of ISPO*", and they suggested for each of them management processes (calling them sub-systems) that were, in most

cases, not properly linked to the current management processes.

The complexity of the final model they suggested made it difficult for the SI&S personnel to validate it or check it properly, and it was also quite a difficult job to debate it with the managers due to the abstract nature of the representation language and to its distance from real life management processes.

In the end, there were no activities oriented to assess current structural conditions for developing organizational policies. The only recommendations produced by the consultants at this level were those concerning adjustments to the SI&S role, which provided quite a lot of help during the re-structuring process of the PO.

7.3.2. What the SISP Framework would have recommended to do at this stage

The "*SISP Framework*" would recommend, for this stage, reviewing the current structure in the light of CSF criteria, aimed at defining strategic development processes that required structural adjustments, re-designing tasks, or the design of new tasks, in order to develop the organization as expected according to current development policies.

There follows an example of the sort of exercise recommended by the "*SISP Framework*". It is clearly biased by the researcher's own perception of the development policies; however she debated her own views with most of the other PO's managers at the time.

We have noticed from previous analysis that, while on the one hand senior managers perceived the PO as the organization for supporting the President in policy development, on the other they also perceived it as an organization doing some of the most strategic development projects on its own. This situation lead the researcher to consider that a better way of designing an efficient PO would be to separate the current purpose of the PO into two main primary tasks, each one of which would require their own regulatory and adaptation mechanisms.

The PO discovered this on its own, and by the end of 1992 had adjusted the restructuring law by creating the FOSES as a new organization attached to the PO, which would have the responsibility of leading all the presidential programmes, and was assigned the required autonomy and resources.²⁰

If the PO had been assigned only the responsibility of coordinating policies, we would not need to consider the PO as a viable system on its own, but rather consider the CPS as a viable system responsible for developing the country, and headed by the PO. The final sections of this chapter will analyze the PO from this point of view.

The following is a summary of this and other structural adjustments which, according to previous diagnostic exercises the PO would require in order to properly develop itself as a viable organization.

- As recommended earlier, the creation of FOSES as a new primary activity of the PO would imply the need to develop a proper management capacity for this organization, in terms of both regulatory and adaptation mechanisms. In particular, previous analysis clarified the need to develop management tools for self-managing issues such as Buying and Contracts, Maintenance, Personnel, Financial Management, Internal Control, Auditing and Inventory functions. The conclusion sets out these as strategic areas requiring IS support, to be taken into account when defining the SIS plan for the PO.
- Analysis of the monitoring channel evidenced the need for the PO to develop proper monitoring systems and, in particular, index systems with which to monitor each primary activity's results. This confirms the relevance of defining projects as the "index system" in the SIS portfolio; it also leaves open the need to review the system by including other measuring systems for monitoring CPS results in the development of other strategic policies (e.g., the policy for improving the current judicial system, the policy for improving national security and defense, and so on).

²⁰ FOSES is the Spanish acronym of *"Economic and Social Emergency Funding Organization"*

- The PO was lacking properly-designed coordination schemes. A new scheme promoting mutual adjustment is highly recommended. Also, there is a clear need to define standard procedures for developing servicing functions at each office, such as personnel recruitment, budgeting, contract issuance and auditing. This is also illustrative of the strategic areas requiring development and likely SIS support.
- There is also a clear need to develop intelligence functions for each office, or at least for some of the AO with responsibilities in policy definition and for the PPOs investing in the poorest communities. It would also be advisable to improve the mechanisms for defining current policy by including the views of junior executives in the process of defining strategic paths and policies. This confirms the importance of developing information services to improve each office's access to research information on its policy or the main related issue of the service.

The following section goes deeper into the implications of using these diagnostic points as criteria for guiding the formulation of an SIS portfolio.

7.4. ESTABLISHING CURRENT INFORMATION SYSTEMS SUPPORT

When the SISP process began at the Colombian PO, the consultants carried out initial interviews with most office directors in order to gather data about each office's identity, functions, IT resources and information needs. The consultants mostly asked questions about each office's information needs and flows, sources for the required information, and the IS support they possessed. They asked few questions about the organizational purpose or organizational tasks of each office.

They employed questionnaires to collect information about IT resources and IS support. The first set of questionnaires was for researching the current activities of the systems areas of each office. The second type of questionnaire attempted to establish each office's needs for information services. Nevertheless, there were no explicit questions on the organizational tasks of each office; instead there was an abstraction of

them through the information services and IT tools supporting the implementation of their tasks.

What the proposed "*SISP framework*" now makes clearer to the researcher, is that by proceeding in this way, the consultants did not have sufficient information about each office's own tasks and operational practices. They were not talking in the language of professionals and managers, so their highly abstract questions may not have been the right sort of questions to ask if they wished to find out about the appropriateness of current IS support.

Instead, the "*SISP framework*" would suggest developing, with professionals and managers from each office, an exercise of their own strategic tasks as the conversational basis for establishing the appropriateness of the IS support that each office was receiving.

Also, it would recommend using the criteria obtained from previous diagnostics to orient the conversations with managers and professionals towards those issues considered as critical for improving current operational schemes. The choice of those tasks which previous diagnostics had outlined as those requiring greater attention, would significantly simplify the scope (and maybe also quality) of this step of the process.

Not surprisingly, the answers the consultants obtained from the different offices were not as in depth as expected and they had to work with the general criteria they formed on the basis of the partial answers they had received.

7.5. COMPARING CURRENT VERSUS REQUIRED INFORMATION SYSTEMS SUPPORT AND DEFINING THE SIS PORTFOLIO

7.5.1. Analyzing the final definition of the SIS portfolio

The consultants used the information gathered from the interviews as a basis for designing several sub-systems which they would recommend the PO develop in order to support its management processes. They described

each sub-system in terms of the management processes the PO should link, the information sources it should manage, and the information output it should produce.

Once the consultants defined their model of the PO, the SI&S tried to use it as the basis for developing the IS portfolio. The first thing they did was to imagine the sort of IS projects which would support the implementation of the described "sub-systems".

Once they had evaluated each defined IS project, they knew they should then define criteria for prioritizing them. Since it was not possible to commit junior or senior executives' time to defining their perceived CSFs, the consultants defined them in the light of the President's political programme and used these CSFs as criteria for prioritizing the SIS projects.

On completion of the exercise the SI&S sent the PO's executives a survey showing the projects and sub-systems it had defined, and asked them to assess the priority and strategic impact of each project, and to propose new ones. Most of them answered the survey, which allowed SI&S staff to validate their criteria.

When the SI&S tried to use these systems and sub-systems models for defining the SIS portfolio, it did not understand that such models had not been properly validated. Today, when comparing them to the real life situation, the researcher finds that some of these processes did not occur as described, or simply did not exist.

Even in some cases where the processes mirrored the real ones, systems staff did not possess sufficient criteria to define which were the most strategic, feasible and desirable ones to implement. Consequently they could not compare their models of sub-system design with the PO's real ones in order to determine improvements to the design of current processes.

This account illustrates different aspects which can be re-interpreted through the "*SIS Framework*", as follows. First of all, it shows the consequences of not addressing the SISP process as an strategic process, requiring the participation of managers for debating such issues as

corporate vision and structural impediments to the expected development of the organization.

If properly carried out, the process of debating these issues would have improved the managers' collective understanding of them, which would have probably consolidated a shared universe of discourse. Without such a common context of understanding it consequently becomes more difficult to parachute into a debate of required SIS support.

Furthermore, by failing to take into account the organizational tasks developed by each office (as well as those which each office pretends to develop and find the necessary resources for), it would be difficult to help them evaluate the SIS support which each strategic task would really need to receive.

Not surprisingly, the consultants did not, in the end, make a detailed description of IS requirements but rather a general description of the technological standards they required, in the same way that they did not present recommendations for adjustments to the PO's management processes, but only the required changes for the IS function. It was the SI&S staff who finally detailed the SIS portfolio, as shown in Figures 6-3-2(a) and (b).

Finally, with respect to the formulation of the SIS portfolio, previous analysis and examples suggest criteria which in the real situation would probably contribute to adjust the defined portfolio.

7.5.2. About the process of implementing the SIS portfolio

Once the SI&S had a first version of the IS plan, its Director, supported by the IS portfolio and budget, re-negotiated with the PO Director the investment budget for SIS developments, but failed to convince him of the need to increase the current IS's budget, which represented at the time only 0.6% of the investment funds of the PO. It meant that without the expected resources, the SI&S could only commit to developing about 15% of the first year's SIS plan.

The Director also asked each office for their annual investment plans, and

then he and the Assistant Director would discuss these with the National Planning Department. They would then take unilateral decisions about which plans would be curtailed and which would be left as is. Clearly, the criteria they used for taking final decisions on budgeting needs was far removed from the technical criteria recommended.

As a result, the SI&S had to renounce the implementation of some of the projects that had been suggested as having higher priorities. Instead it implemented those projects with higher priority whose budget was acceptable within current PO investment funds for IS developments. The final section analyses one of the most important SIS developments fully implemented by the end of 1992, in spite of the scarcity of available resources.

Another impediment to the proper implementation of the SIS plan was the fact that other offices did not have to commit their own resources to information systems development. This was because the Director of the PO wanted to control spending on computers and authorized only the SI&S to manage this budget item for the entire PO.²¹

At the end of 1992 the director of the SI&S, as well as most of the junior managers and the Assistant Director, resigned their posts. The managers who replaced them were not familiar with the SISP process and did not commit themselves to its implementation. In this way, the SI&S never completed the implementation of the IS portfolio and it aborted the learning cycle achieved over the last two years. Unfortunately, there were no structural arrangements at the PO for preventing this kind of breakdown from occurring. Consequently, when the current sponsors of the SISP process left the PO, the process was aborted.

From the viewpoint of "*the SISP Framework*" the SISP process should be a continuous learning process.²² However, what this account makes clear is that, independently of the method used for developing an SISP process, if the right structural conditions do not exist to guarantee completion of the learning cycle for the staff responsible for developing IS roles, we

²¹ This fact has been also observed as a common obstacle for properly developing a SISP process. <Galliers, 91>

²² Other researchers demonstrated that the clearest benefits from following developing an SISP process are evident after several years of carrying out the exercise. See <Galliers, 91>

should not expect this kind of process to be useful for improving organizational effectiveness.

7.6. SOME CONCLUSIONS REACHED FROM USING "THE SISP FRAMEWORK" TO GUIDE THIS ANALYSIS

Previous analysis of the SISP process, within the cybernetic "SISP Framework", has thrown light on the following aspects:

- By not properly defining the system in focus, the SISP process went into modeling a complete set of organizational processes, which was unnecessary and costly.
- The analysis showed that the SISP process, as experienced, did not promote agreements among the managers about the organization's purpose, resources for implementing the strategy and the structural adjustments with which to implement it. Consequently, the consultants had to base the analysis on their own interpretation of organizational strategy and processes, and could never get the required commitment from managers to define or implement the SISP portfolio.
- By employing as their main information source for modeling organizational processes that arising from the functions defined by the restructuring law, the SISP's consultants risked producing a "theoretical model" of the PO, as it turned out unlinked to current practices.
- The "*SISP Framework*" helps understand that, by ignoring current structural constraints for developing the intended strategies, the consultants broke the link between strategy and structure and consequently found it more difficult to properly understand the real processes in greatest need of IS support.
- An important aspect noted by the consultants was the lack of effective communication mechanisms among PO executives. However, the consultants only made technical recommendations to improve such mechanisms (e.g., improvements to the electronic

networking structure of the PO), while leaving untouched the problems of coordination (e.g., a lack of standard development of procedures, lack of mechanisms promoting mutual adjustment, etc.) which they were suffering from.

- Neither the re-structuring committee nor the SISP consultants addressed the subject of relating structure, strategy and information needs as the researcher does here, because the analysis they carried out was either about each office's functions or about their information needs, and not about the interaction of functions and the structural requirements for making their relationships effective.
- Finally, it can be concluded from the analysis that by using the sort of conceptual framework that the consultants used, they concentrated on defining information systems support, but risked defining it for ineffective organizational processes, without suggesting improvements to them at the operational level.

The final section of this chapter focuses the analysis on the development and implementation of "*the index system*", one of the most strategic projects developed jointly by the SI&S and the NPD. For this purpose it refers to the managerial cybernetics' model of management, Cybersyn, as described in Chapter Four.

7.7. REVIEWING A SIS (THE INDEX SYSTEM) EMPLOYING THE CYBERNETIC CONCEPT OF A MANAGEMENT SUPPORT SYSTEM

The principal motivation that the SI&S found for developing "*the index system*" was the lack of information that both the PO and the NPD possessed about the results of the socio-economic development investment programmes developed by the CPS. When formulating the project, the consultants defined it as one of the most strategic projects in the SIS portfolio, aimed at supporting the PO in its role as "*the organization leading the national development process and consequently, the organization giving this identity to the CPS.*"

On the basis of this argument, the next sections "*the index system*"

project in two senses. The first one: the structural conditions of the CPS for defining plans and for evaluating results from their investment programmes. The second one: the technical aspects concerning the design and development of the index system. In both cases, the researcher would use Cybersyn's model of effective management and Cyberfilter's model of a management support system as the conceptual frameworks guiding the analysis.

7.7.1. Analysis of current structural arrangements for defining policy in the CPS.

While previous analysis of the PO observed it as an organization requiring viability in itself, we shall now observe the PO as an organization servicing the CPS, this being the organization requiring viability. We have already defined as the main purpose of the CPS that of promoting the socio-economic development of Colombian citizens.

The previous chapter presented a brief description of the purpose of the CPS and a definition of the PO as the organization heading it. It also introduced a model of the CPS showing the different recursive levels it has developed, and a short description of the principal policies it was developing between 1990 and 1992. The chapter includes a summarized version of the way CPS organizations make their plans and the way they link them to the national (socio-economic) development plan.

In this section we shall concentrate on analyzing the mechanism of adaptation of the CPS, in which the PO is playing the role of a system five in Beer's language. In this sense, the PO should serve the President as a variety operator, filtering CPS decisions on policy-making to him, as well as its information on operational results and performance indexes.

Beer would also suggest that a good way to build such a mechanism is by developing a measurement system which relates strategy and structure through quality information. This section will analyze how the PO and the CPS are or are not achieving this purpose by developing such measurement systems as "*the index system*". Figures 7-7-1(a) and (b) represent, respectively, the control and intelligence functions of the CPS. The following section comments on these current arrangements and

illustrate what cybernetic criteria would recommend to improve them.

7.7.1.1. The Adaptation Mechanism of the CPS

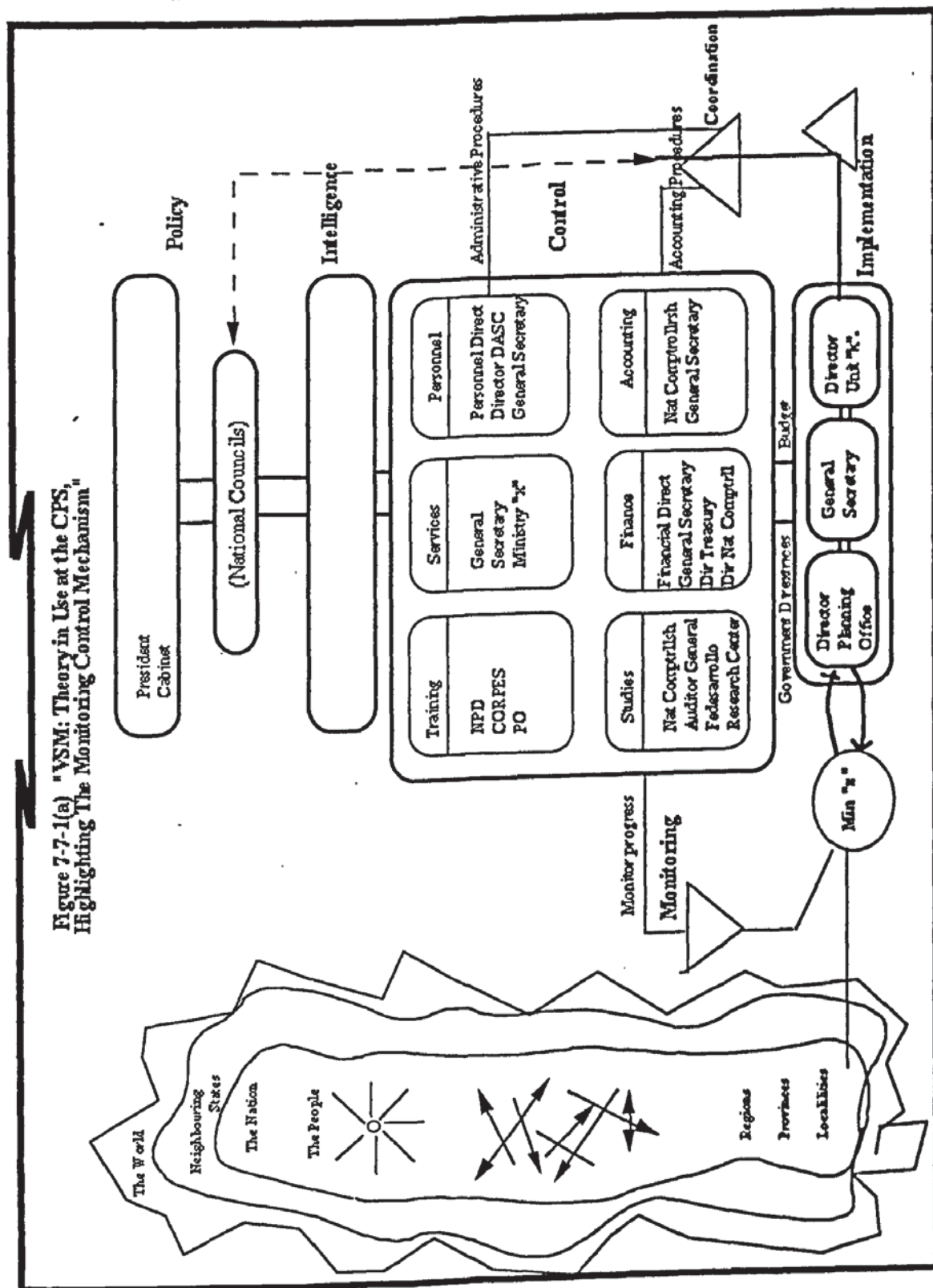
Most of the examples shown in Chapter Six outlined the CPS as a still-centralized organization which has only just begun to understand its own need for a more adaptive structure. For instance, it undertakes the activities of policy formulation at the higher recursive level only.

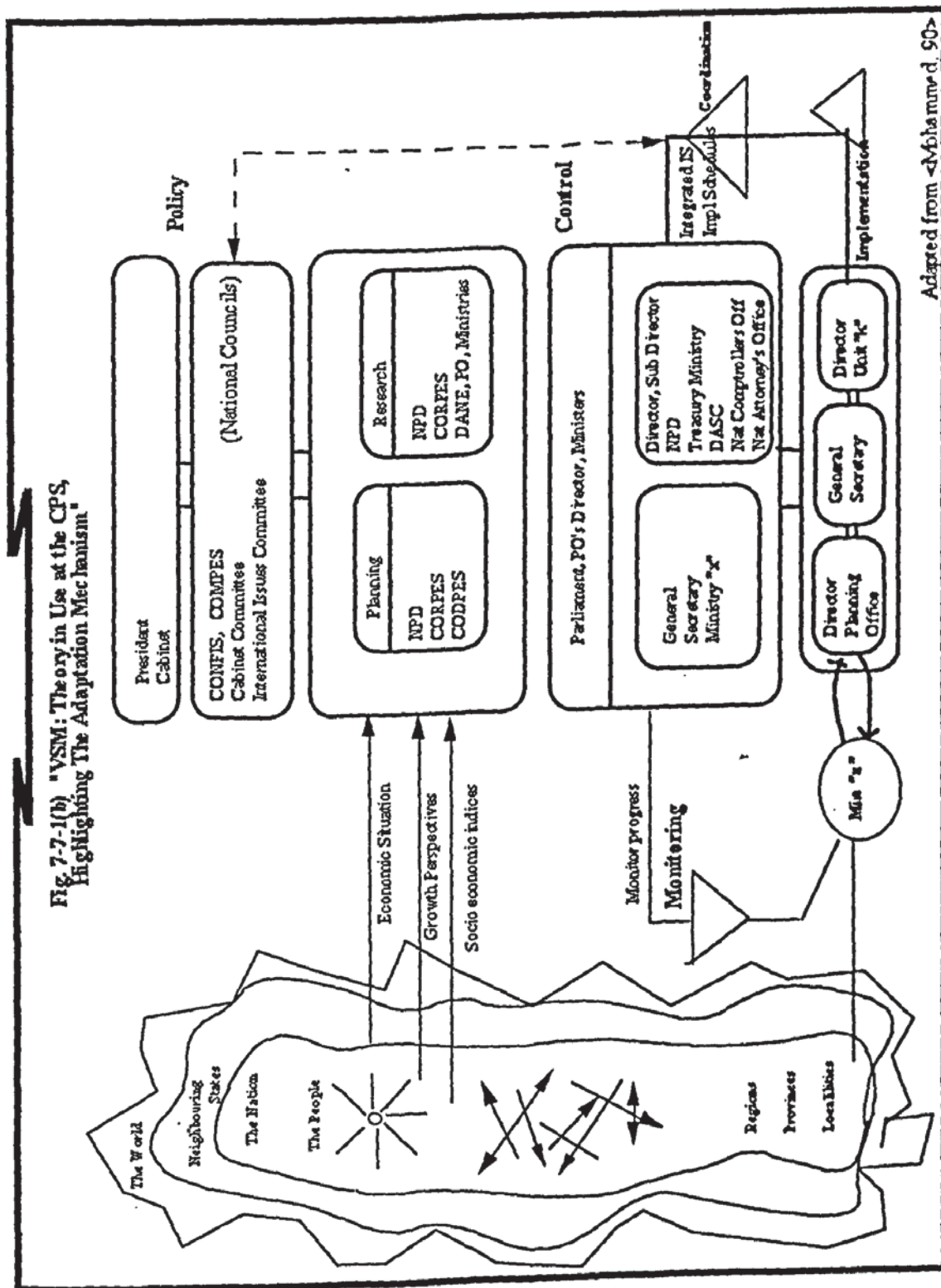
However, as suggested by the 1991 Constitution and by the decentralization and modernization of State policy, the CPS should give more discretion to territorial government agencies so that they can formulate their own programmes and projects, and negotiate the required resources for their implementation. In other words, the principal conclusion that cybernetic analysis helps us to reach is that intelligence activities, as well as policy functions, should still be decentralized to local levels of the CPS.

The CPS has made just two major decentralization efforts. Firstly, it ordered progressive financial transfers so that local government could come to manage its own resources for local development, see Figure 7-7-1(a) on the CPS-Control Mechanism. Theory in Use. Secondly, it invested important resources in educational programmes for improving local management skills.

Nevertheless, the CPS has not yet carried out the exercise of analyzing its own current communication mechanisms, with a view to adapting them to a more decentralized structure. This explains why in a supposedly decentralized state, there are still no channels linking local and regional, or regional and national organizations, to debate their perceptions concerning the most appropriate development paths for each geographical area. In other words, it has not yet properly developed the structural arrangements required to maintain cohesion in a decentralized organization.

Moreover, most legislation on administrative contracts is inherited from the old centralized administrative model of the CPS, concentrating all legal responsibilities in a few senior executives concerning all kinds of





problems arising from their servant organizations. Consequently, the CPS is suffering from contradictory game rules: some ordering organizations to encourage local autonomy, others stopping them from doing so in practice.

In the case we are reviewing, the people responsible for defining development plans are experts from the National Planning Department who are isolated from the real situations they pretend to model. They do not develop strong enough criteria from local communities to support the definition of the development plan or to assess the social impact of investment projects. Nonetheless, when defining them, the experts from the NPD analyze, to the best of their abilities, what they perceive as the opportunities each local community has for its own development.

A cybernetic diagnosis of this situation would predict that plans produced in such a way would most probably fall on stony ground, since they do not take into account current organizational constraints from the local levels (e.g., from those responsible for the implementation of programmes) or indeed information about local people's real development needs.

According to VSM, it is only by incorporating the criteria of those requiring services in local communities as the basis for formulating the Plan, that planners and civil servants would have the requisite variety they currently lack. They themselves would need to support their planning activities with the results of permanent research on the community's real needs for public services to improve their quality of life.

The initial cybernetic conclusion, then, is that the CPS is lacking such research activities and that current policy formulation mechanisms do not possess the required variety. At a more practical level, such a conclusion would imply that the CPS needs to balance the design of its local planning councils so that they involve not only civil servants, but also local communities' representatives or researchers. It would need to create a real participative culture of planning and policy making, involving local actors.

It would also require designing appropriate communication mechanisms so that higher-level territorial planning councils (at county, regional, and

national levels) take into account the views of lower levels and negotiate their own plans on the basis of local needs. It would imply that these territorial planning councils accept representatives from the local communities and give them authority to defend their views on local development needs.

Finally, there is a clear need to design better communication mechanisms in order to disseminate the content of the Plan to all levels of the CPS, to promote serious debates about it, and to generate the required level of commitment from the managers at each recursive level about the implementation of the Plan.

A final aspect made evident from applying cybernetic criteria to the analysis of this situation, was that when developing "*the index system*," both the PO and the NPD ignored the importance of leading a cultural change process in order to promote a new culture of self-management and self-control. The lack of training programmes for managers from other organizations may have contributed to the only partial success of the system's implementation.

7.7.1.2. The need to properly develop a Monitoring Mechanism for assessing the operational results of strategic development programmes.

Figure 7-7-1(a) shows that certain organizations in the CPS have clear control functions, such as the National Planning Department (in terms of negotiating investment resources), the Treasury (in terms of delivering investment resources), the Comptroller's Office (in terms of monitoring the adjustment of public actions to current administrative laws and the correct use of funds).

Even if the purpose of "*the index system*" was to integrate information about results and resources from the NDP, the description of the system in the previous chapter showed that it only assesses the current organization's effectiveness in using investment resources. It does not help assess if they are using them for the right purposes in terms of the communities' development.

The traditional planning culture in the CPS was that of assigning investment resources according to the criteria suggested by the experts of the NPD and the national planning councils. Then the proposed NDP went for revision by the PO and Parliament, who finally approve or disapprove the technical proposal according to political interests.

This culture, as well as the distance between decision makers and local communities, clarifies why most of the nation's planning decisions are taken basically in the light of the criteria provided by the financial analysis of current resources and operational constraints, and not in the light of community expectations.

As a matter of fact, people participating in the national councils would scarcely obtain information about development projects and results, but rather information coming from other civil servants in terms of the financial resources employed for developing strategic programmes.

These ideas may also help better understand the difficulty encountered by most managers of national-level organizations when attempting to reconcile information about operational results versus planned results. Normally their distance from the social communities benefiting from social investments is too great, so that the only information they receive is about the percentage of the investment funds that was finally spent.

This is the reason why a cybernetic analysis of these situations would also suggest giving more discretion to territorial government agencies in the monitoring of results.

For instance, at present the NPD collects information for the evaluation of plans through "*the index system*", but the information is not getting back to the CPS organizations that provide the data. It is not giving feedback to local civil servants about the results and effectiveness in the use of investment resources, so it does not contribute to closing the learning loop concerning their achievements in the development of their local communities.

In practical terms, cybernetic criteria suggest that the CPS should redesign the index system so that it collects information about results as perceived by the users of these results and not only as perceived by the

civil servants trying to provide such results. Only by discovering mechanisms to assess real changes in the local communities produced by public investments, can each local government know if it is worth investing as they are, re-assess investment and social development strategies, and negotiate with solid criteria the resources required to encourage further developments.

By continuing to do what it is doing now, the CPS is risking spending a lot of money and time to improve the quality of the system flowing through the chain of bureaucratic channels, from the bottom to the top levels of the governmental agencies, without much probability of improving current problems.

7.7.2. Analysis of the "*index system*" using the cybernetic idea of a management support system

A first and major criticism of *the "index system"* is that it was always perceived as a system to collect and process information concerning the use of resources for the most strategic development projects, taking into account only civil servants' views (and most of them only from the national level).

We have seen that the consultants in charge of the "*index system*" interviewed the executives of the Planning Units of each Ministry and of the Technical Units of the NPD and asked them about the variables they would suggest as the most critical ones to monitor, in order to have a clear idea about the development process of each programme.

Consequently, the indexes defined helped monitor management perceptions but they did not reflect the perceptions of the general public about the improvements on the services offered by the CPS as a result of implementing the development programmes.

According to Cybersyn's criteria, it is necessary to define the CSFs and indexes with people having the requisite variety about each issue, which was not the case when defining indexes for this project. Properly done, CSF definition and index definition --according to the proposed framework -- would have resulted from a debate among different

operational levels and senior managers from within each organization.

This way of doing things would theoretically contribute to improve managers' commitment to the defined indexes, particularly if they themselves make the definition. By not generating such commitments, it is less likely that managers from lower levels would be truly interested in contributing to the success of the measurement system. It may explain the lack of credibility shown by most index data today, which have in practice frustrated some of the expected benefits of this project.

Another major criticism which could be made concerning the current system is that the consultants never researched the structural conditions under which the system would operate, but assumed they possessed the proper conditions for negotiating goals and for flowing information from organizations to the NPD and the PO and back again.

We have seen Cybersyn's recommendations on creating the structural conditions for generating debates among senior and operational managers from different recursive levels, about their perceived CSFs, indexes and levels of measurement (e.g., capability and potentiality values). It suggests managers debate these issues with the next upper recursive level, and reach agreements about each definition first, and then about each value.

However, the consultants did not promote these kinds of debates in the CPS. They only asked executives for information about the current value, minimum goal value, and satisfactory and excellent goals, ignoring the negotiation processes required to secure the commitment of all levels involved in the targets chosen.

As mentioned earlier, the situation was more critical since the NPD had already defined a target level for each programme, without taking into account the individual criteria of each organization. When asked about their perceptions on these goals, most decided to maintain NPD's goals at the "*excellent goal level*" and fixed the other goal levels -- satisfactory and minimum -- according to their own perception of their operational capacity, but without debating them with the NPD. As a result, goal levels from these later indexes too often show wide differences with respect to the "*excellent*" levels suggested by the NPD.

Since there were no communication channels for debating such definitions and targets except for those created by the project, once the project ended there were no structural arrangements left to guarantee any subsequent debate of indexes and targets.

Their view of the system blinded developers from understanding the relationship "*strategy - structure - information*" which cybernetic ideas help us discover more clearly. As a result, developers never really worked out the relationship between the information about the results expected from projects, the organizational processes for producing such expected results and the negotiation of the required resources for developing them.

By analyzing the "*index system*" using cybernetic ideas, we can state that its design divorces strategy from structure, and structure from information. It does deal with the results of strategic projects as such, but without links to the organizational resources available for implementation, and without attempts to measure such results as a measure of each organization's efficiency.

Analysis of the system employing the cybernetic framework also pointed out the need to redesign the current information distribution system, as well as the system of measurements used. The researcher feels that the idea of MSS suggested by cybernetics would provide criteria for redesigning both aspects of the current system.

Another conclusion from the analysis of the system is that the difficulty in obtaining quality information resulted principally from the lack of attention given to the management processes required to produce and to discuss indexes and goals, rather than to the lack of good quality data.

Finally, by comparing the technical design of the "*index system*" with that suggested by Cyberfilter as described in Chapter Four, we can also generate criteria for improving the former.

For instance, in terms of the system of measurements used by the current system, one may notice that it measures the current value of each index and then compares it with "satisfactory" and "excellent" goal levels which may have no relationship to the organization's experience. The

comparison helps us understand that the current system reflects a 'snapshot situation' but has no dynamic processing modules to capture the behavior of the index.

It does not keep a record of experiences from each organization in developing strategic programmes, but only offers intermittent information about each period's achievements which does not promote learning. On the contrary, a system of measurement like the one proposed by Beer would better promote learning organizations.

In order to apply these suggestions, however, it would be necessary to improve the design of current software by giving the system some statistical management capability, as well as better user interfaces and a module for self-adjusting systems sensitivity when generating alarms. In other words, it would work better if re-designed as a system incorporating a learning capacity.

Nevertheless, before any attempt is made to do that, the researcher considers that the PO and the NPD should pay attention to creating the required structural conditions for such a system to work properly.

8. RESEARCH CONCLUSIONS

This final chapter is an assessment of the entire research process. It reviews the research's purpose and development, attempting to find out which of the problems detected at the starting point the research has properly solved.

The chapter also reviews the use of the suggested SISP Framework to analyse the process followed at the PO between 1990 and 1992, as well as the implementation of one of the most strategic IS projects developed. It assesses the conclusions reached by the analysis as the basis for reviewing the usefulness of the proposed "SISP Framework": its explanatory force, coherence or shortcomings.

Then the researcher reviews her own choice of conceptual model of social organizations and efficient management (VSM and Cybersyn, respectively) for supporting the development of the SISP Framework. It assesses them in terms of the usefulness of the ideas they provide, the appropriateness and applicability of their suggested models for guiding this kind of conceptual development, and even for more practical applications.

Later sections review suggestions from alternative approaches which also provide guidance for SISP processes, and offer the researcher's current view on them after completing this research process. It comments on aspects about which the proposed framework has proved to be helpful, and other aspects which are more suitably addressed by other frameworks or methods.

On the basis of past comments, the researcher offers her views on what still remains to be done in the future in order to continue the path opened up by this research, both in terms of additional methodological or conceptual developments and in terms of additional testing of the proposed framework.

Finally the chapter describes what the overall research has shown to be relevant and to be taken into account for managers, IS managers and IS researchers.

8.1. THE PRINCIPAL ACHIEVEMENTS AND FAILURES OF THE RESEARCH

The research was successful in identifying some of the causes of success or failure when developing the strategic information systems plan at the Office of the President of Colombia during 1990-1992, which were not sufficiently clear before. There follows some of the most relevant points that the overall exercise illustrated, as well as the questions it left open.

The research also succeeded in suggesting an approach to prevent similar problems occurring in the future. The comprehensive framework for SISP it developed provided the necessary structure for the analysis of the real situation, and it also overcame some of the perceived shortages of the frameworks used by the people in charge of the process in the real situation.

With the completion of this analysis and framework, the researcher feels that the exercise was worth doing. The main finding was that the "SISP Framework" provides a coherent language that is equally valid for managers and systems analysts when developing an SISP process and may help them uncover strategic issues which other frameworks fail to identify. The steps it recommends may well lead an organization into the development of coherent debate about its structural, strategic and informational needs.

Nevertheless, the proposed framework still requires specific skills from analysts, in particular a profound understanding of managerial cybernetic ideas and some experience in using the proposed soft systems tools. In this respect, the researcher recognizes that further research would be required to present the suggested framework as a more easy- to-use framework which does not require so much training from analysts.

It would be desirable to test the framework in a number of cases, but this goes beyond the scope of this particular research. The following sections

go deeper into the analysis of these conclusions.

8.1.1. The usefulness of the conclusions obtained from analysing the SISP process at the PO in the light of the suggested framework

The analysis of the SISP process experienced by the PO revealed some conceptual failures related to the SISP, and to the planning practices and frameworks used in real situations, which Chapter Seven has already described. Summarizing them, there were failures related to:

- Not properly linking the discussion on corporate strategic planning to that of the SISP, resulting in a lack of commitment from managers to the SISP process, and a lack of coherence between the suggested SIS portfolio and the managers' view of required strategic developments for each area.
- Not properly setting up a measuring system and related structural arrangements to help managers from the PO to close their learning cycles by comparing their expected results with the ones finally obtained.
- Not focusing the analysis on those organizational processes representing critical success factors, resulted in an unnecessarily complex formulation of the required SIS.
- Not developing a coherent model of organizational tasks, as understood by managers. The framework employed lead people in charge of the SISP process to seek formal information about tasks, instead of searching for it from managers' experience in executing tasks. It distorted the focus of the analysis.
- Not developing criteria to correct current structural problems in order to create appropriate conditions for the strategic development of the organization. This resulted in a SIS portfolio which did not give enough priority to projects aimed at improving current management or administrative processes, or did not even detect such needs.
- The sort of questions posed to the managers aimed to principally evaluate their information management problems, and ignored problems related to inappropriate communication mechanisms between responsible managers at all levels.

The researcher considers these conclusions to be relevant because they improve understanding of the real situations which remained obscure in other frameworks of analysis. As a matter of fact, neither the restructuring consultants nor the SISP consultants addressed the sort of conclusions that current analysis provides because the analysis they carried out was either about each office's functions or about their information needs, and not about the interaction of functions and the structural and technological requirements for making such relationships more effective.

Finally, the analysis clarified that the sort of conceptual framework employed by the consultants lead them to concentrate on defining information systems support, and consequently run the risk of defining such support for ineffective organizational processes and without suggesting improvements to them at the operational level. By using a framework such as the one suggested here, this risk is significantly diminished since it obliges managers to debate problems of effectiveness and to address the required solutions, before they debate the required IS support to strategically develop such processes.

8.1.2. The usefulness of the conclusions obtained from analysing *"the index system"*

This section evaluates the conclusions obtained as a result of the analysis of "the index system". It assesses them in terms of the usefulness of the ideas they provide, the appropriateness of the models and tools suggested by the proposed framework for guiding this kind of analysis (Cybersyn and its MSS) and their limitations for practical applications.

8.1.2.1. Concerning previously misunderstood structural failures in the CPS.

The analysis showed the CPS as a still-centralized organization, which has only just begun to understand its own need for a more adaptive structure, and which still needs to make more efforts to create the right structural conditions for debating plans and performance measures for each local level. It also highlighted the need to adjust administrative legislation to the

ideas of autonomy and decentralization.

The use of a cybernetic model of effective management showed the risks of developing plans at the national level which are not properly supported by local research activities and do not use sufficient local experience to interpret real local development needs. It also signaled the importance of promoting the development of a real participative culture of planning and policy-making involving local actors, as well as a culture of self-management and self-control involving civil servants from all territorial levels.

In terms of current planning practices, it signaled the need to design better communication mechanisms with which to disseminate the content of the NDP to all levels of the CPS, to promote serious debates about the NDP, and to generate the required level of commitment from the managers at each recursive level about the implementation of the Plan.

The examples provided by the analysis also illustrated the risk of not properly relating structural problems to SIS requirements, since later developments would leave unsolved situations that necessarily undermine the expected improvement to organizational performance, with respect to the development of the SIS defined in the portfolio.

The documented history about "*the index system*" made it clear that by addressing the project as a purely technical one, and by not relating it to adjustments in the planning culture and to interactions between roles and institutions in the CPS, made it much less useful than it could had been if this aspect had been properly understood.

8.1.2.2. The usefulness of the cybernetic idea of a management support system for analysing the "index system",

The analysis in Chapter Seven showed that the "*index system*" assesses only the current organization's effectiveness in using investment resources, but does not help to assess if organizations are using them for the right purposes in terms of the development of the communities.

It also showed that the system did not foster the required conversational

process at all operational levels within the organizations, and that it is not giving feedback to local civil servants about the results of their actions and about their effectiveness in using investment resources, so the system does not contribute to closing their learning loop about achievements in developing their local communities.

An important conclusion is that the NPD is risking spending a lot of money and time to improve the quality of the information system that is currently pushing index data through the bureaucratic pipeline, from the bottom to the top levels of CPS agencies, without much probability of improving current problems if more profound structural arrangements are not properly established and a better-designed system developed.

The consultants assumed that there were proper conditions for negotiating goals and for flowing information from organizations to the NPD and PO and back again, which the analysis, applying Cybersyn criteria, clearly showed was not the case in the CPS. Under such an assumption, the consultants did not design any structural arrangements to guarantee later debate of indexes and targets, which Cybersyn's criteria signaled as one of the main causes for failure in achieving a system's original goals.

The analysis also illustrated that the difficulty in obtaining quality information resulted more from the lack of attention given to the need for management processes which produce and discuss indexes and goals than to the lack of good quality data.

One of the most important insights obtained from using the managerial cybernetic idea of a MSS is that it highlights an issue poorly developed by most of the other researchers on executive or strategic information systems: again it refers to the importance of designing a space for carrying out conversations about indexes, goal levels and achievements, rather than concentrating only on the informational and technical domain; that is to say, in the definition of indexes and the required software tools.

Finally, the suggested measurement system emphasizes the relevance of building up goal levels supported by each manager's experience in executing tasks, and in the organization's commitments to invest in each area and not only in each manager's desire to improve things as they are.

By comprehending this, one can understand some of the problems which other measurement systems suffer from, such as those employed in the CPS which let managers or organizations self-define goal levels with no reference to previous experiences or to the commitment of investment resources by higher-level organizations.

These conclusions throw light on previously obscure situations which made the users of the system feel that something was not working properly, without quite understanding what it was.

This confirms the researcher's hypothesis that for the successful development of an SIS such as the one proposed by the PO and NPD, one must properly address the context in which such a SIS would operate; otherwise one risks being left with a less effective and strategic impact on SIS developments. Once again it confirms the importance of using a context-oriented SISP framework such as the one presented here, and of exploiting the potential for more solid practical applications which such a framework provides.

8.2. REVIEWING THE CHOICE OF THE MANAGERIAL CYBERNETICS MODEL OF EFFECTIVE MANAGEMENT AS THAT SUPPORTING THE DEVELOPMENT OF "THE SISP FRAMEWORK"

The relevance of the conclusions reached for the CPS leaves the researcher with the conviction that current paradigms are not helping us to highlight the importance of carrying out the required conversations and creating the conditions for conversing about organizational performance.

Most of these paradigms assume that the development of a SIS will promote performance improvements for the organization or for some of its areas. But in reality few of them offer a coherent language for modeling the organization, for guiding the required conversations about operational problems, or for creating a system of measurements with which to observe real improvements (or lack of them) and to adjust the SIS portfolio accordingly.

Consequently most of these paradigms do not promote learning about successes and failures when developing the SIS portfolio, or more generally-speaking when developing any kind of organizational development strategies. By contrast, Cybersyn provides criteria for designing such a measurement system as well as designing the required conversations for making the learning process more effective when developing strategic projects. It also offers a language for modeling the organization and for coherently discussing its structural failures and possibilities (the VSM).

The researcher considers that the structure of debates suggested by Cybersyn provides better possibilities for managers and IS managers to relate discussions about organizational strategy, the required adjustments to the organization, and the SIS support required for each process. Analysis of the real situation showed that the structure of these debates (or the lack of them) in the real situation left out many issues requiring attention, both at the PO and in the CPS, which later resulted in the development of a SIS portfolio with less impact.

The researcher also considers that the use of Cybersyn as a model of efficient management provided a sound analytical framework which lead to uncovering severe problems that need to be properly addressed if improvements to organizational performance in the CPS are to be attempted.

Other frameworks do not provide the required language for describing or debating structural problems, which are real problems causing much of the ineffectiveness of the institutions, so the researcher believes that from this perspective it was worth choosing Cybersyn's model as that supporting the development of the SISP Framework.

However, the use of Cybersyn and the suggested MSS, as those tools providing criteria of effectiveness for strategic management, still requires further translation of the implied VSM ideas into a more understandable language for managers. To understand and properly use these ideas and tools requires at least a doctorate level of preparation, which makes it unusable at a practical level for most people who do not have such training or have access to an expert to guide them. It is quite likely that most managers and IS managers will find it difficult to grasp the main

ideas as they are presented in this research.

However, with the experience of an analyst trained in these ideas it is possible to re-formulate them, as well as the proposed SISP Framework, as a set of more practical guidelines requiring less understanding of VSM ideas. In the researcher's own case, she regards the idea of translating VSM ideas into more practical guidelines for managers as an exciting and open research path to be followed up at a later date.

The researcher's perception is that it was worth choosing the managerial cybernetic framework as that supporting the analysis of the Colombian case, but it also leaves her with one important question unanswered, which concerns the applicability of managerial cybernetic ideas. Most of them are still little known even though many researchers have found them to be very powerful ideas, possessing considerable explanatory force.

This indicates that much more effort is required to re-phrase them into a less formal and technical language so that most people can benefit from their explanatory force in terms of improving organizational development and workers' potential. In this sense she expects that this type of research, relating such little-known ideas to practical situations, contributes to this purpose.

This type of research lets us relate ideas to practical situations, so that the reader can learn about them more quickly. It would be even better if the proposed framework could be used to guide the development of the real situation, since it would allow the researcher to compare practical results with the expected results, in accordance with the theoretical framework.

In this sense, the research managed to use only the proposed conceptual framework to guide retrospective analysis of a real situation. It leaves open the possibility for using it later on as a methodological tool for guiding the development of several real situations, and to properly test the usefulness of the proposed framework. The following sections go deeper into the analysis of the proposed framework from a technical viewpoint, and then present the researcher's conclusions about aspects which require further research in order to continue this effort.

8.3. TECHNICAL STRENGTHS AND SHORTCOMINGS OF THE PROPOSED FRAMEWORK

This section reviews the suggestions from alternative approaches which also provide guidance for SISP processes, and offers the researcher's view on them after completing this research process. It comments on the aspects about which the proposed framework has proved to be helpful, and aspects about which other frameworks or methods are more suitable.

8.3.1. About the suggested stages of the "*SISP Framework*"

The structure of the proposed framework intended to delve further into the relationship between strategy, structure and information. Supported by managerial cybernetic ideas of effective management, organizational structure and strategic information systems, it aimed to suggest solutions to some of the mentioned shortcomings in current practices, as a result of using the available frameworks.

In this context, the research confirmed that the use of the "*SISP Framework*" as an analytical structure for the case study presented here, resulted in the discovery of important connections between strategic, structural and informational issues, about which people living in the real situation had not been previously aware.

In this sense, and given the limited scope of the exercise and the need to repeat it several times and in different situations, the researcher considers that the "*SISP Framework*" will permit people to be more aware of such relationships and consequently create better conditions for strategically using IS.

In comparison to the other models of SISP researched, this model is more context-oriented and provides criteria with which to align corporate and information technology planning processes, and which provides criteria of effectiveness for redesigning the structure of current business processes. The model is also better for linking strategy and structural issues, and for relating structural issues to information management needs, than other more traditional approaches.

However, the researcher recognizes that other models go deeper into important issues that this model does not do properly, as will be described later on. Furthermore, as she already stated, this framework in its current presentation requires too many skills from the user, while other frameworks are presented in a way that any untrained analyst or user can follow the suggested stages and more easily understand the analytical language employed.

8.3.2. Reviewing the choice of methodological tools to set up the "SISP Framework"

8.3.2.1. The tools for guiding organizational diagnosis, modeling, and the discussion of adjustments and resources for developing strategic processes.

Reviewing the methodological choices made to link the proposed framework, the researcher feels that Espejo's tools (i.e., the "*Method to Study Organizations*", "*Unfolding of Complexity Diagram*", "*Technological Model*" and the "*Table of Recursion Function*") were very useful once properly understood, but required a lot of effort and training to reach such a stage.

She found that the published papers and books illustrating the tools were not precise enough and lacked many examples and relations to practical situations. It created unnecessary difficulty in the learning process and made the execution of the exercises and the understanding of the ideas quite a long and sometimes frustrating experience. Undoubtedly the profound and positive discussions she had with Espejo made it possible to overcome most of these problems and were very helpful to the learning process.

For this reason, and given that a user untrained in VSM ideas may find it frustrating to risk using the tool without proper training or advice from an expert, the researcher considers as a desirable research path to follow up, the presentation of a simpler reading of the proposed framework, that includes fresher examples of the application of the framework in order to facilitate understanding and possibilities for its application.

Nevertheless, the lack of a comparable coherent set of systemic tools for modeling organizations with criteria of effectiveness, diagnosing and assessing their performance and structural problems, makes it worth choosing managerial cybernetic tools for guiding the development of the "*SISP Framework*".

This, together with the perceived strength of the findings, convinces the researcher that it is worth making the effort to achieve the goal of improving the current presentation of the framework and testing it properly in different situations.

It is closer to everybody intuition to include Rockart's idea of "*Critical Success Factors*," together with Espejo's tool for discussing autonomy and discretion ("*The Table of Recursion Function*"), as a way of linking strategy and structural problems. However, the researcher's experience in using them for analysis purposes left an open question about the lack of tools for coordinating more detailed conversations about environmental aspects influencing an organization's strategic posture.

"*The SISP framework*" did not make suggestions about the means to develop models of an organization's environment, but rather only made suggestions with respect to developing the CSFs.

The researcher considers that more research in this area of modeling the organization's environment may be useful (for instance by using the work from Porter and his followers), in order to improve the strength of the organizational model developed at the initial stage of analysis. It would be very useful to have more researchers interested in building the link between Porter's ideas and those of managerial cybernetics, as Schwaninger has already begun to do.

There are also some aspects of Galliers' "*Scenario-Based Approach*" which the proposed SISP framework has not properly addressed yet. In particular, the researcher considers that the suggested activities for developing scenarios for the organization using soft systems tools, may well contribute to enrich the current tools currently proposed by this research.

8.3.2.2. The tools for modeling the organization, its structure, tasks and IS requirements

The use of "*the SISP Framework*" for guiding the analysis of situations showed that one of the key problems to properly developing a SIS portfolio arose from the lack of understanding between managers, workers and IS professionals when modeling processes and trying to find out which was the required SIS.

At this level the researcher proposed the use of soft tools (e.g. the "*Conceptual Modeling*" technique from Wilson), since she considers they would overcome the communication problems better than other "harder" tools (e.g. flowcharts, BSP diagrams). Wilson's tool is very coherent and easy-to-use and it works well at an intuitive level, easily shared by most managers and analysts.

Nevertheless this research did not go deeper into the use of this modeling technique, since the analysis concentrated on the organizational and managerial aspects of business processes (which is the aspect less developed by other SISP approaches) and not so much on the technical aspects of analysing the required IS support for each process (an aspect better developed in most of the other current frameworks).

Even though many uses of this modeling technique have been reported, further research is desirable in order to test the appropriateness of the tool in the context of the proposed framework for modeling the activities of each process within the proposed framework. Such an additional research effort would aim to verify if Wilson's "*Conceptual Modeling*" technique really helps to coordinate the debates about the SIS support required for each of the organization's processes.

The proposed framework also suggested a matrix to relate primary activities to servicing functions, servicing functions to activities modeling a particular process, and relating these to their required IS support. The focus of this research did not permit the researcher to use this technique at the depth at which it used other techniques, so an additional research effort is needed in order to test its use within the suggested framework.

8.4. WHAT NEEDS TO BE DONE IN ORDER TO CONTINUE THIS RESEARCH EFFORT

This section outlines the most important points which previous conclusions revealed concerning what has to be done in the future in order to continue the research effort.

8.4.1. What is required to do before testing the "*SISP Framework*" in a real situation

Current experience in using the "*SISP Framework*" as an analytical structure of a real situation left the researcher with the following ideas about things that should be done, before using it for guiding a practical situation.

The first one is the need to make the framework less dependent on a particular skill of analysts or users. A suggested research path to achieve this goal is to design a training tool for people involved in the *SISP* process, explaining in a natural manner the principal ideas about organizational effectiveness, performance and learning, and the approach of strategically using IS to support organizational development. Such a training kit, even if inspired by VSM ideas, should avoid using technical jargon but still be able to help people to understand the principal criteria it provides and to relate it to their own work situations.

On the same line of thought it is desirable to re-write the "*SISP Framework*" in a language closer to business and systems language so that analysts can learn to use it more quickly. Particularly useful for achieving these goals, would be to develop examples and exercises illustrating the use of the suggested tools in real life situations.

8.4.2. Improvements in the details of the "*SISP Framework*"

There are some details of the suggested framework which the researcher considers could be improved by further methodological research. This section summarizes those aspects already recognized as having potential for further methodological development.

8.4.2.1. Better describing the proposed soft tools to guide the analysis and definition of a SIS

Not all reports from users of Wilson's tools and other soft systems tools support the idea that they are ready to be used on a broader level than academic tools. In practice, they suffer from the same sort of difficulties that managerial cybernetic tools do, including dependence on the analyst's skill and understanding of the background systemic ideas.

It is also possible that additional efforts need to follow to make the presentation of this tool easier to read: the current tool is comprehensible for experts but less so for users. Guidelines to aid designing meetings with users, the sort of questions that will be put to them, the information expected from them and a means of representing conceptual models, are all examples of details which need to be incorporated before the *"SISP Framework"* is used to guide a real-life SISP process.

Also, this kind of detail is necessary for using the suggested table to relate the structural model of the organization to its need for SIS support. The current version of the framework does not provide details about how to assess current IS support for each organizational process studied.

8.4.2.2. Developing tools to assess the organizational impact of a SIS and the effectiveness of current IS support.

An aspect that the SISP process from the PO did not deal with properly, was that of jointly debating issues of strategic use of IS between managers and IS experts. Nevertheless, the cybernetic-based model of the SISP contributed only partially to filling this gap. It recommended using the suggested MSS and design for conversations for assessing the development of the organizations in strategic areas. However, it did not describe in detail criteria to measure organizational impact when developing the SIS portfolio.

This leads the researcher to conclude that more research would be advantageous not only within the cybernetic paradigm but also for more traditional SISP approaches, to develop methodological tools to help

practitioners debate these issues jointly with managers and technical people. In other words, it would be very convenient to develop guidelines for designing a system of measurement for assessing the strategic impact that each SIS has on the organization, as the basis for re-assessing the SIS portfolio.

The researcher considers that similar tools should be developed for assessing the effectiveness of available IS and IT tools in supporting each process. Again, further research into using soft tools to assess the effectiveness of the process (e.g., Galliers & Sutherland's "*Revised Stages of Growth Model*") would be highly recommendable.

8.4.3. Testing the current design mode of the "*SISP Framework*"

The researcher considers it very important to start testing the current version of the "*SISP Framework*", since feedback from such an experience will significantly enrich the possibilities of improving it. She acknowledges, however, that it would be better if previously suggested research paths were developed first.

If the required training tools were properly developed, it would be easier to use the framework in a number of different situations and to test its effectiveness in terms of the results or problems discovered. If details still pending were properly worked out, there would be a greater likelihood of success in its being used properly.

Nevertheless, the current version provides a methodology for any expert in systems thinking with previous experience in using VSM for guiding a SISP process. In that sense it is recommendable to use it at the research level, with access to experts, on the understanding that lot of interaction would be required in order to provide feedback for both practitioners and researchers.

8.5. SUMMARIZING THE MOST RELEVANT ASPECTS THAT THIS RESEARCH OUTLINES

The final section summarizes those aspects which according to the

researcher are the most relevant ones that this research has outlined for interested IS researchers managers.

8.5.1. For managers and IS managers

The most relevant aspects which this research outlines for managers and IS managers concerns the importance of creating appropriate conversational spaces for jointly and coherently working out the issues of modeling the organization, its operational failures, its required structural adjustments, its critical success factors and indexes for measuring them, and the support required by its strategic information systems.

The research highlights, at both the theoretical and practical level, what the consequences of not developing proper conversations on these issues could be in terms of properly developing a SIS portfolio.

The case history of the CPS clearly showed some of the contradictions which resulted from not properly developing such conversations, but only considering those related to the content aspects of strategy formulation.

The analysis showed people's focus on debating the definition of investment programmes, indexes and goal levels, while ignoring the structural conditions for bringing about conversations and for effectively producing the desired actions (e.g., re-formulation of plans and investment budgets). The analysis also showed the undesired consequences of defining indexes and goal levels at the wrong organizational levels and without the participation of the right representatives from each operational group.

The analysis also clearly illustrated how, by failing to develop proper communication devices for debating the views of managers and technicians on business and administrative processes, runs the risk of becoming a model which does not possess the necessary variety and which may lead to wrong decisions about required SIS support or about priorities between the SIS projects identified. The analysis indicated that such a situation produced a feeling of failure with respect to the SISP process, yet no guilt can be attached to either the technicians or managers, but rather to the shortcomings of the conceptual frameworks guiding

their thoughts and actions.

8.5.2. For the community of IS researchers

The researcher describes here what aspects of her research has been shown to be relevant at a level which could also be interesting for other IS researchers.

Firstly, the research threw up a new way of questioning the strategic nature of information systems and the relationship between their use and organizational effectiveness. It linked previously unconnected references found in managerial cybernetics literature concerning the idea of a viable organization, the related model of effective management and a management support system, and the nature of the strategic information systems as a process needed in contemporary organizations to foster organizational learning and development.

The research also linked methods suggested by managerial cybernetics for the study of organizations (from Espejo), and those for the design of management support systems (from Beer and Espejo), to those proposed by other researchers in strategic management and SISP, such as Rockart, Wilson and Galliers.

The research illustrated the use of the proposed "*SISP Framework*" to scrutinize the case history of the SISP process experienced by the Office of the President of Colombia which motivated the research interest. It served to explain some previously unclear aspects of the experience, demonstrating the power of "*the SISP framework*" as an analytical structure. It left the path open for further testing of such a framework in more practical situations, and also for further developing some of the methods and tools suggested by the analysis.

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APPENDIX # 1. BACKGROUND ON MANAGERIAL CYBERNETICS APPROACH

Since past century, there have been outstanding contributions to the scientific discipline called "*organizations' theory*" whose main objective has been to explain as accurately as possible what a social organization is and how would it work more effectively. More than summarizing a coherent and cohesive body of theories, this discipline seems to have glued up several observations of phenomena at the real world of enterprises as well as the explanations about them, made by the international community of researchers.

Many scientists nowadays agree that we should rather understand the different views of organizations as "metaphors," by accepting that organizations are not unique systems, but multisystems where several viewpoints may be valid to explain the same observed phenomena, due to its complex nature. <Espejo, 88>

On the other side, Beer has defined cybernetics as the science of effective organizations. He used ideas developed by previous cyberneticians who observed phenomena from the viewpoint of understanding the relationship between a system and the environment where it operates.

In order to explain the nature of any social relationship, these cyberneticians developed the idea of complexity as "what an observer distinguishes as differentiable aspects of an observed situation." They explained that we may even measure complexity, by defining variety as "the number of differentiable aspects of the observed situation."

Beer develops the principles of the new "Managerial Cybernetics" discipline in his book "Cybernetics and Management" <Beer, 67>, then he presents the methodology for model building in "Decision and Control" <Beer, 65> and finally he presents the resulting model or theory of

social organizations in "Heart of the Enterprise" <Beer, 79> and "Brain of the Firm" <Beer, 81>

He explains the idea of "viability" as the primary goal of any social organization who is developing itself in a fast-changing environment. He argues that today, due to the rapid rate of change that most international markets and technological environments are undergoing, most organizations find themselves operating in an extremely fluid external environment. In this context, a viable organization is one that learns to adapt quickly.

Managerial cybernetics' main hypothesis is that we may foster this learning process by designing the proper structural arrangements to improve communications among the members of the organization, and within them and their external interlocutors.

Beer then applies some systemic laws that several scientists had already observed as the ones ruling communications in different parts constituting complex living systems, such as the Law of Requisite Variety, the Conant- Ashby Theory, the Self-Organizing Systems Law and the Feedback Law <Clemson, 84>.

Then he summarizes the way these laws constrain the possible behavior of social organizations and the way they affect their chances of survival in changeable environments. He also describes some mechanisms that social organizations develop in order to obtain control, learning and adaptation and built them into the VSM (i.e., filters, attenuators and amplifiers, self vetoing homeostats, transducers and black boxes).

By re-applying these principles and by suggesting the usage of such mechanisms he builds up a model of a social organization, which he calls the "*Viable System Model*" (VSM). VSM provides a language for debating organizations' viability and a method to structure them. According to the scientist, by using the model we may help a social organization to develop the required communication mechanisms; and as a consequence, to become an adaptive organization with improved survival capacity. <Beer, 81>

Managerial cybernetics suggests that organizational effectiveness has a

close relationship with the organization's skills for developing the potential from each one of its members, while, at the same time, preserving the organization's identity. It highlights the danger of developing extremely centralized or decentralized organizations and suggests the criteria for designing balanced ones.

Many critics of Beer have argued that VSM is a purely structural device that ignores the political nature of social organizations. For instance, Ulrich argues that it ignores the contradictions that exhibit most organizations due to domination of some groups over others. <Jackson, 88>

The researcher considers that even if VSM does not address the political issue in the way that political sciences would normally address it, it does portray the political nature of social communications in a fairly clear way.

In the researcher's understanding, however, there is an aspect that Beer does not present explicitly most of the time -- even if he does deal with it very well tacitly -- and this is the linguistic aspect of communication processes. Fortunately there are many other cyberneticians who have studied in the linguistic aspects of the social learning process in depth.

Maturana, for instance, helps us to understand the true nature of our biology, from a new perspective, by defining "language" as a social practice that changes it, by letting us to develop self consciousness, not only as individuals but also as a species. <Maturana, 88>

Harnden attempts to link Maturana and Beer's ideas, by developing the idea of "observing systems" as social groups that while talking collide with each other's natures and change each other's development path. He re-draws the true nature of organizations and re-describes organizational structure in terms of our coupling, as cognitive beings, with whatever the domains we find ourselves linked to. In his view, VSM provides a handle for a deeper involvement in the emergence and evolution of social forms as human individuals interact in a "consensual domain". <Harnden, 88>

This posture of contemporary cyberneticians has been called "Second Order Cybernetics" or the "Cybernetics of the Observing Systems." It

clearly argues for an interpretivist re-interpretation of former cybernetics' ideas. However, some researchers have criticized them strongly by arguing that the main concepts of cybernetics are strongly influenced by the structuralism and there is no meaning in attempting this sort of re-interpretation <Jackson, 92>.

Espejo had previously explained that the results achieved when acting jointly for producing a transformation, relies on the maintenance of the criteria of stability underlying the social relationship. This idea of criteria of stability refers to the common interests that the actors producing any transformation on a real situation find for acting together as a social organization. <Espejo, 88b>

In order to improve the likelihood of producing the expected results of the transformation, we should design properly the communication mechanisms between the interlocutors, for improving the quality and speed of their social learning cycle. <Espejo, 88>

On the basis of this argument, Espejo extends Checkland's proposed Soft System Methodology, for guiding social learning processes and defines as an alternative, the "Cybernetics Methodology" for problem solving. The advantage of last one, in the researcher's view, is that it makes people more aware of their own organization's structural conditions, guides us to analyze them explicitly and offers us criteria of effectiveness for suggesting the improvements. <Espejo, 89d>, <Espejo, 93a>, <Espejo & Bowling, 93>

Espejo, in another piece of research, made an important contribution to a review of the VSM as originally presented by Beer. He uses Maturana's ideas to stress the importance of language in the effectiveness of social learning, as well as the importance of individual cognitive style and technological available tools to improve the likeliness of effective learning cycles. <Espejo, 88>, <Espejo & Watt, 88>, <Espejo, 89a>, <Espejo, 89d>

At the methodological level, it is important also to mention the "Method to Study Organizations" that he offers us as a tool for applying VSM for diagnostic purposes. <Espejo, 88> <Espejo, 89c>

Although Beer had already published a set of methodological recommendations for applying VSM, in the researcher's experience as a user of both tools, they does not seem to be explicit enough in some respects that Espejo solves better (see <Beer, 85>).

On the other side, Espejo and Harnden edited a first book on applications of the viable system model. It refers to many different situations where several practitioners or researchers have used VSM for explaining or analyzing real life situations. <Espejo & Harnden, 89>

More recently, Espejo and Swchanninger published a new book presenting newer theoretical developments on managerial cybernetics and more recent applications of the ideas of management cybernetics for improving problematic social situations. <Espejo & Schwaninger, 93>

Beer and Espejo also developed the ideas, methodological and technological tools for measuring organizational effectiveness -- as managerial cybernetics would define it. -- They are going to be further developed by next chapter. <Beer, 81>, <Espejo, 80, 89e, 91, 93b>

Finally there is some theoretical and practical work explaining the relationships between information, structure and strategy, and opening the way for re-understanding the process of SISP, using cybernetic ideas. <Espejo & Watt, 88>, <Espejo, 93b>, <Schuhmann, 93>

APPENDIX # 2. THE CYBERNETIC IDEAS OF ORGANIZED COMPLEXITY, SOCIAL TASKS AND THE VIABLE SYSTEM MODEL

1. THE CYBERNETIC IDEA OF SOCIAL TASKS

The basic principle underlying the managerial cybernetic approach is the principle of complexity management. This principle is useful for describing a human being dealing with a specific social task. Beer uses it for developing the VSM model of a social organisation.

A social organisation is an autonomous network of people's interactions for developing social action. In other words, every group of human beings wanting to commit themselves to develop a joint action, constitutes a potential organisation.

In order to observe the social organisation, at the light of cybernetic ideas, we may first detail the organisational tasks that most coherently define the organisation's purpose. Beer says that the way we name these tasks would determine highly the organisation structure we design for supporting their implementation.

The recommended way of observing tasks is by making distinctions between the following elements of real situations:

- The environment (i.e., the network of interlocutors that those responsible from each operation relate to, for producing products or services, like clients, providers, etc.),
- The operations, (i.e., the activities people develop and the products it produces),
- The management of each operation (the one feedback to the operational group about the effectiveness of the results they produce, in terms of both internal and external criteria of effectiveness)

They constitute the elements of System's One, as suggested by Beer. Each element communicates with the other elements, by using "*communication channels*" that serve for carrying on materials, money or information. Beer analyzes these communication channels from the viewpoint of information flows, by understanding information as a mechanism for dealing with complexity, that human beings have developed through linguistic interactions.

As noted earlier, the amount of distinctions that an observer makes on a real situation (the amount of variable it observes,) constitutes the complexity it perceives in the situation. As a consequence of the "*law of requisite variety*" we may say that,

- the complexity of the environment (V_E) is orders of magnitude higher than that of the operations;
- the operations' complexity (V_O) is much higher than that of its management; and finally, that
- the management complexity is much higher than that of the models it uses to regulate operations (V_M).

In other words, we may say that neither a manager possess sufficient variety to control the operations, nor the operations have sufficient variety to control the environment. This and the other cybernetic laws help us to realize the role that communication mechanisms have for maintaining stability between the actors involved in a social interaction (i.e., among people from environment and operations, from operations and management, or from management and senior management).

People develop communication devices naturally, in order to deal more effectively with the complexity implied by social interactions. However, Beer suggests that we may contribute to improve the quality of interactions by designing these mechanisms appropriately. .

The attenuators are filters that we use for choosing what we consider is the most relevant information, from the whole set of information coming from the higher complexity side of the relationship. The way we choose the relevant variables determine the complexity of the situation we have to deal with.

For instance, if a manager chooses to observe too many variables from the real situation, he loses the capacity to deal with all the information he receives due to the limited information processing capacity that he has as a human being. Therefore, he needs to attenuate such complexity, without losing track of the critical variables that offer him information about the most important changes in the situation observed.

Because the manager's object is to regulate the tasks, he needs to have some feedback about the operation. The attenuator reflects the feedback variables it chooses as well as the communication mechanism's it chooses to use in order to reach this information.

On the other side, the manager has a limited capacity to change the way operations develop on their own. For this reason, he needs to design amplifiers, in order to have a wider impact on the organisation. In other words, attenuators are all type of structural, operational and informational mechanisms reducing the complexity of a situation, vis a vis the viewpoint. Amplifiers are all those mechanisms increasing the observer's capacity to appreciate the situation's complexity. <Beer, 81>

Summarizing, cybernetics define an organisational task as the set of actions performed by an autonomous operational group, for developing the organisation's activity. Once the organisation agrees on the definition of the task (what should it do), each operational group interprets them in one way or another and consequently, it acts guided by such an idea.

2. TASKS DEVELOPMENT: The Implied Social Learning Process

Normally when people develop a task they learn; and as a result, they improve their skills for developing it. Cybernetics principles explain learning processes by using the ideas of feedback, control and modeling situations. <Espejo, 88b>

This section summarizes some of the variables that cybernetics describes as the most relevant to a proper understanding of the way people perform social tasks and learn from this development.

2.1. The Individual Cognitive Venue and The Social Learning Process

People learn from their experience in doing tasks. Learning results from both the ability to understand the situation and the ability to act upon it effectively according with the stated purpose of the interaction. From the individual's viewpoint, important variables affecting these learning results are the individual's background of understanding and skills in dealing with the particular type of situation.

As a consequence of a learning process, we may expect individuals to improve their "*cognitive models of the situation*" <Weick, 79> and to improve their skills to deal with the inherent complexity of tasks. The linguistic distinctions that a person is able to make when describing a particular situation represents the complexity he recognizes in the situation. The researcher will call this perceived complexity of a particular situation as the "*individual model*" the person has of it.

2.2. The Conversational Nature of Social Learning Processes

As suggested earlier, change in individual models results not only from an individual's own experience when dealing with a task, but also from his attempts to make sense of it, when sharing it with other individuals who have also experienced or observed the same or a similar situations. These linguistic interactions about a particular social situation result from people finding out better ways for describing or explaining such situations.

In other words, social interactions imply recurrent negotiation of the individual meanings used to explain events and recurrent exchange and adjustment of individual cognitive models. Such negotiations occur through complex linguistic interactions intended to give meaning to a shared reality.

The researcher will define a "*public model*" as the shared understanding of a social community about certain kind of situations, that a particular community within the organisation has defined -- explicitly or not. -- Sometimes, a comment on a meeting serves as a tacit guide for action,

depending on the perceived authority of the speaker. The researcher's understands social culture as *"a set of public models that strongly influence criteria to define public action in a social organisation, or in a social community within an organisation."*

Culture would indirectly influence (through selection of criteria) the (tacit or explicit) shared agreement followed by a community to organize social action in a specific situation.

2.3. The Importance Of Communication Mechanisms For Achieving Effective Social Learning Processes

According to Espejo, organisational structure is the set of communication mechanisms constituting the forms of interaction between parts of an organisation that permits them to work as a whole. He uses Giddens definition of *"signification"* as *"forms that, through the modality of interpretative schema, underline communication at the level of interaction."* <Giddens, 77> <Espejo, 89a>

Communication mechanisms represent *"stable forms of interaction"* between members of an organisation. In other words, they represent accepted role-interactions, hierarchies, authority levels and so on. They also strongly influence public learning processes and the resulting public models; according to the author, the organisation structure might act either as a facilitator or as a delaying agent of social learning.. <Espejo, 88a>.

Changes in public models and/or in organisational structure may result as a consequence of the organisational need to adapt to a changing (internal or external) environment. In order to increase the effectiveness of the learning cycle, we should make the models supporting our management schemes more explicit, so that we may debate them and adjust them when the situation merits it.

In order to achieve a good learning cycle it is also important to guarantee the structural conditions for making this sort of debate -- about the changes required in our organisational models and perceived action strategy or current action schemes. We should also ensure that the people

who have different views of a situation take part in this sort of debate. If the organisation wants this to happen, it should design communication mechanisms (attenuators, amplifiers, monitoring tools, coordinating tools, homeostatic devices and so on) to improve the likeliness of effective communication between the different parts of the organisation.

Only by guaranteeing the availability of this sort of mechanism and structural arrangement, can we expect the organisation to have an improved capacity to learn and adapt.

2.4. Information technology tools as a way for shortening our learning cycles

There is an explicit set of communication mechanisms that organisations use and they are the technological tools to manage information and communication. They include the physical network of communication facilities in the organisation and the set of Information Systems as tools for supporting organisational activities and management functions.

All of them together paint the picture of what Whitaker would call the "*depictive venue*". They act either as attenuators or as amplifiers and the organisation design them mostly to help each role's satisfaction of its needs to manage complexity when developing a task. <Whitaker, 92>

Research makes apparent that human beings have a limited capacity to process information. Given the increasing amounts of available information that we find in our work, it sounds reasonable to think of our need to filter all this information without losing track of the most relevant aspects of the situation we are dealing with.

It is clearer now also that people need to amplify their capacity to generate action by using the relevant information appropriately and promptly. People design and use technological tools to fulfill this need, like the telephone, the computer, information systems and so on. Such tools act either as communication mechanisms in the communication processes that we follow in our day to day activities.

3. THE VIABLE SYSTEM MODEL OF A SOCIAL ORGANISATION

VSM is a language for discussing organisational survival in a complex environment. It distinguishes some basic elements like the **operations**, the **environments** and the **management** of these operations. It also explains the role that have the models held by the managers of the perceived operational or environmental complexities, as tools for helping them to regulate the organisational tasks.

VSM also describes the communication mechanisms as the amplifiers and attenuators previously described. This section introduces the other main elements of the VSM language, that Beer defines as the five vital systems that every social organisation develops when implementing a task, in order to guarantee its viability (see Figure 2-5-4.)

3.1. System One: The Implementation Function and the Recursivity in VSM

System One, according to Beer, identifies the set of organisational basic tasks producing the main organisational products or services, together with the required mechanisms for developing on their own a particular task, as a viable organisation in itself. Accordingly, each system one should be responsible for the production of a given task, have its own management, self decide its policy -- coherently with the organisation's own task -- and implementation schemes and self organize its resources for achieving effective implementation results.

Espejo refers to system one as the set of primary tasks with managerial autonomy that produces the organisational products or services, at each recursive level. He refers to each task's purpose as the production of a particular transformation required to develop the organisational task, at a particular level of recursion. <Espejo, 89a>

According with VSM's criteria of effectiveness, each system one should reproduce in itself all the characteristics of a viable system. It implies that each system one should have enough autonomy to guarantee closure in its

learning cycle. This is the **"principle of recursion"** of the viable system model.

VSM assumes that by releasing as much of people's potential as possible, in order to permit them to handle autonomously the multiple problems they face in their jobs, is what gives organisations the flexibility they need to survive in complex and rapidly changing environments <Espejo, 89a>

Beer helps us to understand the main problems that may occur in communications between operations managers and senior management, the main mechanisms they use for solving such problems and the relationship between the design and use of such mechanisms and the effectiveness of the organisation in achieving its purposes.

For analyzing a system one, using cybernetics language, we observe, at the real situation, the current communication channels and tools and their effectiveness for helping each social interaction to develop effectively. For instance, we observe the relationships between the clients and the operations, these ones and the operational manager, the latter and the clients or providers, and so on.

For each pair of social interactions, we analyze the effectiveness of current communication mechanisms in use for developing the agreed transformation. Each social relationship is developed as a conversational network that may require information and communication tools for effective development.

Any system one is an autonomous organisation working as a part of a higher level organisation, that is also a viable system. It implies that there must be some mechanisms for linking the different autonomous organisations, and for maintaining stability in the relationships of each organisation with its internal and external environments.

Beer defines the mechanism for keeping internal stability as the *"Mechanism of Monitoring Control,"* and the elements it includes as the systems three, three* and two. He refers to the *"Mechanism of Adaptation"* as the one for keeping external stability and says that it includes Systems Three, Four and Five. Homeostasis is the name given to the quality of keeping stability among the organisation and the

environment or among the organisation's autonomous units.

According to this scheme, system three is part of both mechanisms, for its role is to link different organisational tasks and to serve as a feedback mechanism to the higher level about the operations of lower levels. To explain these mechanisms is the topic of the following sections.

3.2. The Mechanism of Monitoring Control: Systems Three, Two and Three*

If we let each System One develop its own identity we need to design some communication mechanisms between all System-Ones in order to guarantee that the organisation also develops its identity as a whole and that the results of each System One agree with the expected results of the organisation.

According to Beer, if we let all autonomous units develop their potential while providing no mechanisms for maintaining organisational cohesion (the commitment to a cohesive organisational identity at all autonomous levels or recursion) we may predict that the organisation will eventually split out into several new organisations.

In order to avoid this, the organisation ought to define, for each level with autonomy, corporate mechanisms like coordination (System Two), control (System Three) and monitoring (System Three*). VSM calls these mechanisms for guaranteeing a cohesive identity of all the organisational tasks, as the mechanism of monitoring control. The "*monitoring control*" mechanisms are the command, accountability, monitoring and coordination channels.

Within these four channels that link the senior manager with the operations managers, only the first two constrain the variety of the implementation function (i.e., the operations). The coordination channel involves both, to amplify the variety of the control function, and to attenuate the variety that the control function needs to control from the implementation function. The fourth channel -- monitoring -- aims at amplifying the variety of the control function.

3.2.1. Command Channel (System Three)

Beer says that we must name each channel by whatever gives it identity, that is to say, by what it does. The three next described communication channels are all part of the **command channel**, used to debate orders, to negotiate the resources given by the upper managerial levels and to respond to or question the responsibilities each operational manager is committed to.

The command channel is the one used for developing the control function, which Beer calls "*System Three*." Perhaps it is the easiest function to understand. Its aim is to guarantee that senior management has requisite variety for regulating effectively each of the operations. In cybernetics terms, the function of the manager is to serve as the regulator of the operation.

In other words, the manager's role is to provide feedback to operations with regard to the appropriateness of their results and their efficiency as resource managers, from the viewpoint of the organisation as a whole (or just from the viewpoint of the next upper recursive level of the organisation).

Since the variety that a senior manager has is much smaller than the confirmed variety of the managers of all operations, the senior manager needs to design attenuators in order to filter irrelevant information about the operations while keeping himself informed of the relevant variables whose changes he must know in order to be able to act promptly when deviations from expected results are too high.

In other words, the senior manager must be always alert to some feedback variables and must have the required communication channels, each with enough capacity to guarantee effective debates (resulting in timely action) when the variables run out of control. We may distinguish different communication channels serving these purposes and describe them as follows:

- **Corporate intervention:** This channel regulates non acceptable behavior from the organisation towards its social, political, physical

and economic environment, and the non acceptable behavior (actions) from organisational members toward clients, providers, and toward other organisational members or resources. Such kinds of rule are necessary in all cases where "the perceived costs of breakdowns outweigh the benefits of freedom at lower structural levels" <Espejo, 88b>

The structural level responsible for establishing or working out a "control" and for monitoring its implementation is the "intervening" level: This level is constraining the freedom of lower structural levels. It acts as an attenuator of operational variety.

- **Resource bargaining :** This is a permanent process by which managers of two consecutive structural levels seek for agreements on the formulation of programmes that each one attempts to implement and on the resources they need for their execution. This may or may not be a two way channel, according to the senior management's style. It may either serve for transmitting proposals of projects coming from operational managers to the senior manager or only orders from the senior manager, about projects expected and resources assigned.

In any case, while implementing tasks, this is the channel most permanently used to negotiate the required human, physical and financial resources and to assess the results versus the original goals set. The control channel is also the vehicle for corporate policy, strategic plans and criteria for dividing up resources, all of them agreed at upper recursive levels. It also serves for transmitting these norms to lower recursive levels.

- **Accountability:** Each one of the operational managers is responsible for the development of potential in the individuals working in his operational group. They are also responsible for the operations' results and for managing the resources that the organisation gave them in order to facilitate operations.

This channel serves senior and operational managers for debating the achievement of responsibilities. In a centralized organisation, it is a one way channel, where the only person with authority to question

the other's behavior is the senior manager. But a decentralized organisation may be open minded enough as to accept the questions coming from the lower levels and to debate them properly at upper recursive levels, until the group asking the question receives an acceptable answer.

3.2.2. Monitoring Channel (System's Three *)

According to Espejo, we may expect that each senior manager will act as a transducer when interpreting the agreed norms, goals and criteria coming from upper managerial levels. We may even expect that operational managers also re-interpret them all and then act, according to their own interpretations.

Operational managers may also have communications problems, due to transducer's effects, when they feedback senior manager about the results of the operations each one is responsible for. Each one may pretend to adjust the obtained results to the senior manager's expectations, in order to smooth its own interaction with the senior manager.

As a consequence, the senior manager may receive a distorted message leading him to build up a mistaken mental model of the reality and or losing control of some critical variables. Without opportune and valid information about these variables, the manager would eventually become unable to respond to the critical situations that they try to measure.

Aware of the fact that these situations are more the norm than the exception in social organisations, Beer proposes us to create alternative communication channels that may access fresh information, directly from the source, sporadically. It could be information about the organisational climate, the mood of the staff towards the organisation, the technological and administrative problems they face, and so on.

By using this channel, called the "*monitoring channel*" managers might follow up detailed development of tasks at the next recursive level, in order to keep track of problematic situations altering normal development of organisational- activities or projects.

The object of obtaining such information is to become quickly aware of problems arising during project development and to act promptly to secure the required resources or generate the required organisational support to solve them. In order to do this effectively, managers have to improve their skills in observing results and in comparing them with the results expected by the upper management level.

Observations on the manager's way of developing this function have shown that the managerial style is an influential variable on the effectiveness of the monitoring results for guiding management decisions. The closer the operational managers are to operational details the higher the managers' risk of losing the general dimensions of the situation. Nevertheless, the more distant a manager is from operational details, the greater the risk he runs of losing control.

It may happen that the senior manager is not even aware of the relevance some variables might have for helping him to regulate the operation for which he is responsible. If he does not control them, a situation might arise which threatens the health of the organisation, without managers being remotely aware of it.

When the command channel runs out of capacity for dealing with this sort of situation, Beer suggests, as noted earlier, the creation of the monitoring channel. Through this channel, the senior and operational managers may create monitoring information systems. Their purpose would be to define some critical variables to be measured permanently and to guarantee the opportune debate of abnormal behavior in their current values in order to act timely to unexpected situations.

On the other side, there are always people whose responsibilities make them operate as volatile agents, traveling across the organisational borders and interacting with many organisational members from different recursive levels. Managers might also maintain sporadic conversations with this type of employee and use them as an informal monitoring system. He might even visit operations occasionally, and talk to people in order to get a fresh idea of the organisational climate.

Finally there are also formal monitoring devices like contracting or developing a technical programme to analyze the state of "health" of

physical resources (buildings, machinery, computers and so on). All these are Beer's examples of monitoring channels. He makes it clear that any senior manager may design several monitoring channels and use them all.

3.2.3. System Two Channel: Coordination

Due to the constraints on the availability of resources that organisations normally face, their operational units frequently have to share some of these resources. At least they have to share the financial resource, not only in terms of operational budget, but also in terms of investment budgets.

This fact creates a situation where the managers have to find criteria for distributing scarce resources among the operational units. The way they set up this criterion for sharing the resources is a matter for another VSM functions. But the way they implement such a criterion into administrative procedures that guarantee the smoothness of the interaction among primary activities from all recursive levels, is responsibility of the coordination function.

Beer has said that the sickness of the Homeostat is oscillation and that this channel acts in order to prevent oscillations to happen too often (to become a permanent illness). It does it by creating the communication devices that serve for creating a common language between the operations from the same recursive level and among them and upper and lower recursive levels.

In other words, the coordination channel serves to facilitate communications between different recursive levels. The communication devices it creates may be of a different nature, as in the case of monitoring..

For instance, the coordination channel may operate by direct supervision or by mutual adjustment or by a combination of the two. Beer suggests that monitoring devices be designed at the level of senior management, with the help of experts and be implemented directly by the operational level. We may expect a permanent feedback from the operational level about the effectiveness of the mechanisms designed so that designers may

permanently improve the mechanisms.

System-Two produces normally those public models resulting from social agreements on operational schemes to coordinate action. According to Espejo, there are different types of coordination systems, as the following ones: <Espejo, 88b>

- Systems to detail the results of resource bargaining from within the control function (i.e., timetables in a school, production schedules in a plant);
- systems to facilitate local communications among primary activities, aiming at producing a "*common language*" at local level (i.e., schemata for planning, accounting systems, costing standards, production control systems);
- systems that increase the likelihood that primary activities will behave in a co-ordinated fashion; they intend to reduce the need for "*one to one*" communication in favor of "*one to many*" communication (i.e., use of newsletters, notice-boards and development of social customs and traditions in the organisation).

If coordination mechanisms (System Two) do not work properly, it is likely that each System One would take divergent action courses, without adhering to organisational perceived purposes. This situation would result eventually in oscillations in the actions taken from the organisation as a whole.

3.3. The Adaptation Mechanism: Systems Three, Four, Five

From the preceding sections, we can see that we may describe System One as a recursive model in itself who is responsible for performing a major organisational task, or primary activity, to which the organisation offer the required political support and resources for it.

Also it seems clearer now that managerial cybernetics recommends us to give each operational unit the most of autonomy we can, without challenging organisational cohesion; and that to ensure that this structural

arrangement will become a reality, it offers us criteria to design the so-called monitoring control mechanism.

The functions of this latter mechanism suggest it would be operate to ensure that organisational learning cycles about the "inside" and "now" issues occur smoothly.

However, Beer reminds us that the organisation as a whole is also interacting in a changeable and competitive environment; and that available technology is changing and improving at an amazing rate; and if we fail to keep up with it, we may lose competitive advantage.

Or even worse. We may even lose many opportunities to develop the organisation's potentials. As a consequence, Beer suggests that we design and to develop the "intelligence" function, at each recursive level. This section briefly describes this function, which Beer calls "System Four." The next section describes the System's Five Function. There is then a detailed description of the adaptation mechanism suggested by cybernetitians.

3.3.1. System Four: Outside and Then

Beer says that, in order to remain viable, an organisation have to be adaptive to changes in the critical environmental variables. This means that the organisation has to accept a certain level of disorder and change in its own action plans, organisational structure and procedures, so that it can react promptly to environmental changes attempting towards organisational survival or organisational development. Next section discusses the idea of homeostasis or the equilibrium organisation environment.

What cybernetics laws help us to understand is that if the organisation is going to follow certain action development path, it needs to be aware of the environmental constraints and also it needs to make the necessary organisational arrangements to develop its own identity. Beer describes the set of organisational activities aiming to contribute to these ends as the **System Four**, or "Outside and Then" system.

System's Four functions are:

- To develop useful models of the environment, from the viewpoint of the residual varieties of the environment of interaction's - operations left unattended by operational managers. The models' aim would be to improve the managers' variety about the interaction "organisation - environment" and therefore, to increase their skills for acting promptly when this interaction becomes oscillating. <Espejo, 92>
- To develop useful models of the organisation as a whole, so that we may modify its structural arrangements quickly in order to adapt to the environmental changes, when a non adaptive behavior from the organisation is threatening organisation's survival or development .
- To create, on a permanent basis, an adaptive model of the organisational future, detailing expected products and expected quality, suggested production techniques, suggested organisational management and operational structures, information technology architecture and communication facilities, information systems portfolio, marketing strategies and so on.

These suggested future schemes should refer to innovative production techniques, new products' design and the exploration of new market. They ought to refer to those things the organisation is not currently doing but must be doing in order to remain viable. In other words, System Four's aim is to discover viable futures and environments for action for the organisation, within the changing social, economic, physical and political external environments.

Figure 2-5-4 helps us to visualize the relationship of the organisation and its environment from this viewpoint. As shown by the Figure, System Four has direct communication channels with the environment. What this means, according to Ashby's law is that System Four needs attenuators for filtering environmental complexity and amplifiers to make its message reach as many environmental actors as possible, depending on the content of the message.

According to the laws of cybernetics, the organisation must develop the mechanisms for self regulating its interaction with the environment.

System Four provides System Five with requisite variety about the environmental critical variables that the operations are not taking into account (i.e., the variables describing interaction of the organisation as a whole and the environment.)

The laws of Cybernetics also suggest us that, in order to maintain stability, the organisational systems Three and Four ought to have roughly equivalent varieties of scope. Following section comments on the recommended criteria for maintaining organisation's homeostasis.

3.3.2. System Five: Giving Closure To The Organisation

Figure 2-5-4 also helps us to understand that the organisation has -- as a whole -- the need for observing itself and for observing its relationship with the environment, in order to regulate such a relationship, or in cybernetic terms, to give closure to this relationship, that is, a permanent learning cycle.

System's Five is the Policy Function whose responsibility is precisely this one of giving closure to the learning cycle between the organisation and its environment, or in other words, of maintaining organisational identity (not necessarily unchanged, but alive or viable).

While people assuming System Three's responsibilities have the knowledge and experience about current production capabilities and constraints of the organisation, those responding for System Four's functions, know different alternatives that might improve organisational capacity to adapt to the changing environment.

Understanding human's behavior, we may expect some level of conflict to happen between those developing control and intelligence functions. If we leave this sort of conflict to develop on its own, it may happen that negotiation between them takes too long, and the organisation loses strategic opportunities for developing its potential.

Since the course of action the organisation chooses to take at certain stage, results from the negotiations between Systems Three and Four, then it seems reasonable to design communication mechanisms for smoothing

the learning process they both have to follow. Beer suggests that the role of System Five is to guarantee that these negotiations result in a coherent and timely definition of the organisation's action course, that secures organisational survival and organisation's potential development.

In order to guarantee the appropriateness of the chosen action path, the organisation must design a permanent debate among those viewpoints with major expertise in "outside and then" issues (as well as communication skills for debating them) and those viewpoints with major understanding of the current organisational structure, resources, technological level and constraints (i.e., experts in the "inside and here" issues).

Beer suggests that only by guaranteeing that this debate happens on a permanent basis and that it is developed with a balanced participation of both types of view, can the policy function of an organisation achieve the requisite variety for dealing with the environmental changes effectively.

It would be easier for the organisation to overcome difficulties relating to the environment, by using at its best, the possibilities discovered by System Four that favor organisational development. The organisation might also learn to recognize its own faults and to find out the proper mechanisms to overcome them.

The learning process is easier if the organisation has a model of itself and a model of the environment. By using such models the organisation may prepare a formal model of its likely futures. But is also important to create the structural arrangements for these debates to take place and this is a responsibility of System' Five.

As said before, the recursive principle means that at each one of the recursive levels of the organisation, the whole model applies. Beer's hypothesis is that badly-designed mechanisms might result in organisational unbalanced relationship with the environment. When there is a balanced relationship between the organisation and the environment we may say that they achieved **homeostasis**.

Beer suggests the use of VSM for discussing whether or not the lack of proper design in any of these mechanisms is a threat to the organisation's chances of survival. In other words, VSM then serves us as a language for

debating organisation's survival.

Given the recursive nature of the model, we may conclude that, in order to guarantee survival or development of the whole, we may first guarantee survival and development of the parts.

Using this idea, we may say that the role of Systems Three and Five is to maintain internal and external homeostasis, respectively, while System Five takes care of the organisation's homeostasis with the environment. The criteria used by a private's organisation to keep homeostasis is given by the stockholders. In a public organisation these criteria may come from the community who should own and regulate its own government team.

APPENDIX # 3. INFORMATION SYSTEMS RESEARCH: RESEARCH METHODS AVAILABLE AND CRITERIA FOR CHOOSING A RESEARCH METHOD.

1. The Nature of Information Systems Research

According to Galliers, the very nature of information systems has a profound impact on what constitutes appropriate information systems research and what approach might reasonably be adopted in undertaking it. <Galliers, 92a>

There is broad agreement among contemporary researchers in IS about the social nature of IS and about the importance of the context in which they happen to be useful. For instance, Land argues that the organisational and social context as well as the individual context have a considerable impact on the need for a particular information system and on the way we design it. <Land, 92>

Similarly, Tricker comments on the fact that the reason for using IS in social organisations is to develop more knowledgeable organisations, not just to use tools. <Tricker, 92>

Hirschheim says that these and other similar arguments lead us to accept that we need a post-positivistic stance as a paradigm for IS research. He argues that the IS research community should seek research conclusions that the community accepts as an improvement of its previous level of understanding. Furthermore, he raises the issue of methodological pluralism as a necessary outcome of a post-positivistic posture, emphasizing the need to develop different IS research methods. Lastly, he makes it clear to us that scientific progress must not happen only through the accumulation of research, but also through the challenging of that knowledge. <Hirschheim, 92>

2. The Available Research Methods in the Field of Information Systems

Galliers makes a distinction between research methods and research approaches which seems valuable to the researcher. He compares Weick's definition of a method as *"simple ways to systematize observation"* <Weick, 84>, with his own definition of the approach as *"a way of going about one's research, that may embody a particular style and may apply different methods and techniques."*

On the basis of this comparison, he defines scientific approaches as the ones based on scientific tradition (repeatability, reductionism and refutability) assuming that observations of phenomena under investigation can be made objectively and vigorously. On the other hand, he defines the interpretative approach as the one arguing for the possibility of many interpretations of social phenomena. He makes a categorization of research methods, between the two approaches, as shown in the following table.

Table A3-2. IS Research Approaches In The Context Of The Scientific And Interpretivist Philosophies (Taken from Galliers, 92a>

Scientific	Interpretivist
Laboratory experiments	Subjective/argumentative reviews
Field experiments	Reviews
Surveys	Actions Research
Case studies	Descriptive/interpretative
Theorem proof	
Forecasting	Futures research
Simulation	Role/game playing

Among all these methods, the case study is defined as *"an attempt to describe the relationships that exist in the real world, usually within a single organisation or organisational grouping."*

The strength of this method may be in the greater detail of reality that it provides and the greater number of variables it gives us for analysis purposes (in comparison with other research methods). However, the author warns of the difficulty in generalizations and the different interpretations of some real situations that can come from individual researchers.

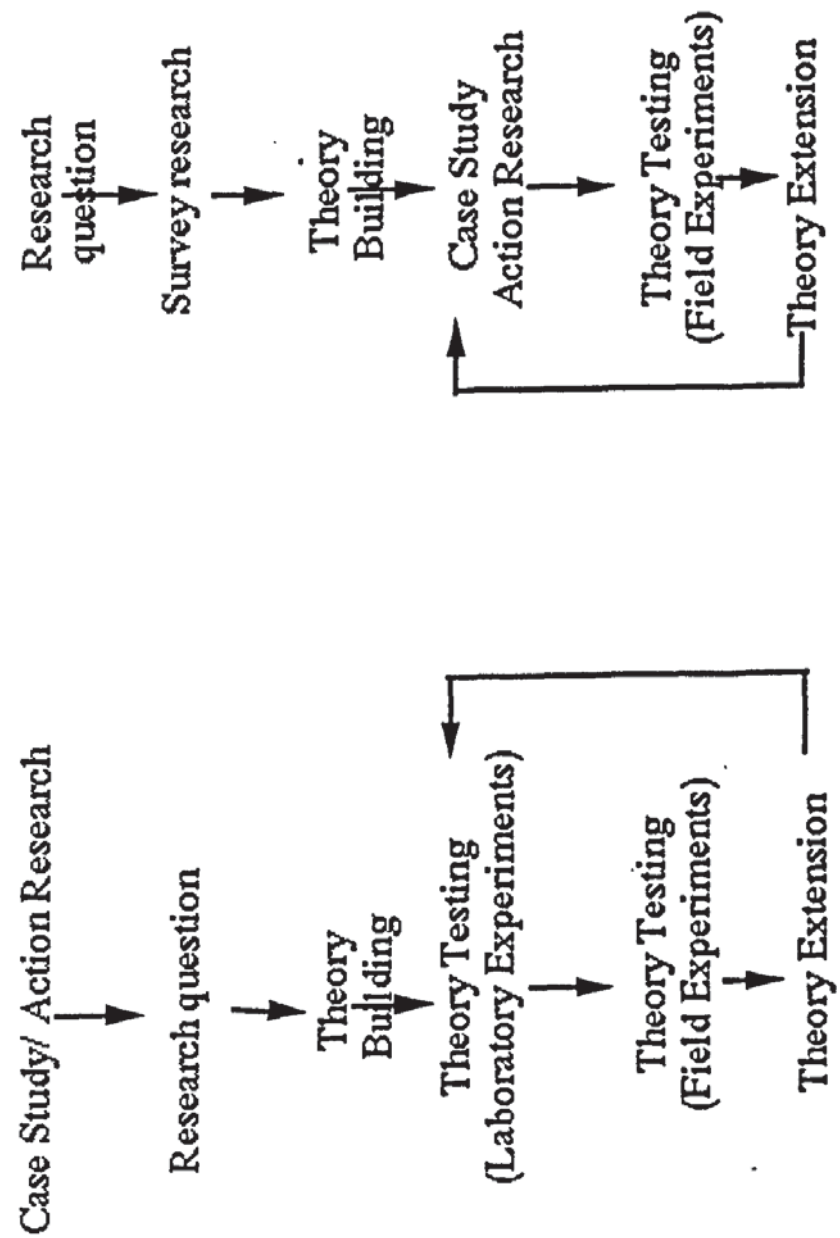
A similar research method coming from the post-positivistic approach is the so-called "Action Research." We may consider it also as applied research, where there is an attempt to obtain results of practical value to groups the research is allied with, while, at the same time, adding to theoretical knowledge.

Action Research's strength is the production of practical as well as theoretical outcomes, while its weaknesses are similar to those of case studies, it gives more responsibility to the researcher's objectives and ethics and more awareness to the researcher on the way her/his presence in the situation being investigated would influence its development.

Galliers also recommends the use of his proposed taxonomy to identify the most likely approaches to adopt in the context of building, extending and testing theory, as shown by Figure A3-2. This figure describes the *"Use of Alternative IS Research Approaches in the Process of Theory Building, Testing and Extension."* <Galliers, 92a>

As shown in the figure, if we follow the second approach to IS research, after a stage of theory building, we can expect stages of case study or action research from which we may build the basis for theory testing that, consequently, may provide the basis for theory extension, then feedback to the case study stage. The aim of a case study or action research method is to test a body of previously structured knowledge.

Figure A3-2. The Use of Alternative Information Systems Research Approaches In The Process Of Theory Building, Testing and Extension <Taken from Galliers, 92a>



He suggests to review previous research in one's particular field of study, from the perspective of the research approaches that have been employed and then to assess the convenience of adopting another approach in order to look at one's chosen topic in a different light. By interpreting these ideas in the field of managerial cybernetics, it seems to the researcher that most current literature shows efforts in theory building while there are only a few, and very recent, references to case studies, action research or theory testing. This situation reinforces her view that it appears worthwhile to follow one of the latest methods. By considering the purpose of this research, and by using Galliers' recommendations for choosing the research method, we might say that the methods, presented under the interpretivist philosophy are the most appropriate ones for supporting its development.

3. Criteria for choosing the research method

Following Beer, a model is never the "*right*" model or the "*wrong*" model of a situation, but a more or less useful one. Therefore, in order to test a framework, we try to verify the explanatory force of the supportive analysis framework, in terms of the usefulness of the conclusions resulting from the analysis made. <Beer, 85>

Ramírez offers a complementary view of scientific research by arguing that validation of social theories occurs in the socio-historical context over time and in the process of confrontation between theoretical knowledge and social practice. He says that valid knowledge is constituted by those theories that survive the selective process of confrontation with the real world. <Ramirez, 81>

Taking these criteria into account, as well as the objective of this research and the scientific methods described, it seems even more clear to the researcher that she might conduct the research, approaching it as the interpretivist paradigm suggests us to do.

The path for developing this research is, then, to observe a real situation that needs further explanation and then to set up a framework for analyzing it, based on "*state of the art*" scientific ideas explaining the

particular type of situations observed. In the light of the main ideas proposed by such a framework, one may review and re-interpret the real situation.

The comparison between the observed situation with and without the focus of the proposed framework, produced by using good common sense, would then be the basis for reaching final conclusions. Conclusions would serve also to verify the usefulness of the proposed framework for describing and for understanding this type of real situation.

In the context of this research, there are expected research conclusions about managerial cybernetics' explanatory power, which should result from assessing if it served one for better describing some aspects of the real situation that other conceptual frameworks have not yet done properly.

APPENDIX # 4. THE "PEACEFUL REVOLUTION". (THE NATIONAL DEVELOPMENT PLAN)

1. The purposes of the NDP

One of the most important objectives underlying the National Development Plan 1990-1994 (NDP), called "*The Peaceful Revolution*," was to re-direct the current national development model towards a more open market and internationally oriented economy. Consequently, the NDP suggested a profound institutional reform to both the market's structure and the public organizations that offer services to private businesses. Both types of reforms promoted the private sector's autonomy. <Presidencia de la República & Planeación Nacional, 91>.

The "*economic opening up*" was the initial implementation framework; among its main objectives were the following:

- To make external markets a new source for dynamic growth, well-being and progress for the country;
- to open up the productive system to make it more efficient and competitive;
- to open up imports;
- to generate more and better employment; and
- to increase exports.

Short term strategies included a series of institutional and legal reforms to effectively implement the proposed changes, such as the following:

- Modernization of the Public Works Ministry, the Health and Education Ministries, Colpuertos (National Port Authority), Aduanas (National Customs Institute), Telecom (National

- Telecommunications Institute);
- Creation of the Foreign Trade and the Environment Ministries; and
- Decentralization of most public services and investment plans.

Some of the purposes of these organizational changes were:

- To specialize the State in those functions that are better implemented if they are the responsibility of the public sector.
- To guarantee efficient provision of those services that are complementary to the economic sector's activities (i.e., transportation, customs, etc.)
- To improve profitability of public resource use by eliminating those structural and organizational elements that limit the operation of competitive market mechanisms; and to decentralize those services and functions in which local operation presents competitive advantages.

In order to avoid social disorders caused by the process of economic opening up, the National Development Plan presented a main strategy called "*Adjustments to the Labor Conditions.*" Complementary to this strategy for the productive sector, the NDP destined a substantial part of investment resources to projects aiming to improve the security and peace conditions in the national territory. These strategies were the "*Security and Social Emergency Fund*" and the "*National Security Strategy.*"

The Presidential Programme Offices for "*National Security and Defense*" and the "*Social Emergency Fund*" -- created by mid 1992 -- were responsible for an important part of the investment resources that the NDP assigned for implementation of these strategies.

The "*Long Term Productive Transformation*" aimed to promote the formation of human and physical capital through improvements in public education and health services. It also promotes physical stocks' formation, by offering recompenses for developments in the transportation infrastructure, in science and technology and in the preservation of the environment.

There were long term strategies in NDP for developing the environment, the scientific and technological skills from the people and the businesses and the social or physical infrastructures. Finally, the NDP defined a macroeconomics policy that aims to be consistent, compatible with inflation goals, and with a healthy evolution of the foreign trade market.

2. The 1991 constitution and the planning process at the Colombian Public Sector

As mentioned before, the 1991's Constitution set out the principles for the planning process at national, regional and local levels; according to these, CPS organizations should frame their planning processes within democratic, participative and decentralized schemes. It also stated precisely that a national planning organization designed by law would be responsible for the formulation of the National Development Plan (NDP); accordingly, the NDP ought to establish:

- purposes and general objectives for national development over the long term;
- strategies and general guidelines for the economic, social and environmental policy that the government will set;
- a Public Investment Plan, in terms of,
 - yearly budgets for the main national public investment programmes and projects, and
 - specification of the main financial resources required for their execution.

Also, the Constitution established that the territorial organizations ought to formulate Territorial Development Plans and to set, in agreement with the national government, both their orientation and the resources required for their execution.

Lastly, it established that the National Planning Council and the Territorial Planning Councils ought to create a "*national planning system*" and that the competent organizations at the national level must formulate and approve the NDP (i.e., the National and Territorial Planning Authorities, the Main Council of the State.)

Once approved, they must submit the NDP for review by the Congress, which, as a result of its review, must issue the "*Public Investment Law*;" that would be finally reviewed and approved by the President's Office. This law defined the organization of the national planning system, the national and territorial planning council functions, the procedures to make effective citizen participation in the formulation of development plans and the corresponding modifications to the proposed NDP.

It even says that is the responsibility of the national planning authorities to design and organize the evaluation systems for the public administration (i.e. a system to follow the process and results of implementation of the NDP). The territorial authorities should then define programmes, sub-programmes and development projects at the territorial level, following the guidelines proposed by the NDP, and in accordance with general resources approved at the national level.

They should also establish detailed resource requirements for each programme, subprogramme and investment project. While executing programmes and projects, the territorial organizations must assume responsibility for the physical and financial expenditure of resources, and for the impact evaluation and adjustments of the formulation of programmes or projects.

At the territorial level, the Constitution establishes that territorial organizations should define their programmes and projects, supported by "*social investment focusing systems*". These systems should be able to determine the amounts and destination of public investment funds required from each particular territorial community in order to properly meet its basic needs (housing, health, education). Also, this information should be available for citizen review so that they can exert social control over public sector investment decisions.

APPENDIX # 5. THE INFORMATION TECHNOLOGY PLATFORM PROPOSED BY THE SIS PLAN

At the beginning of Gaviria's administration, the IT platform at the President's Office was incoherent given that it resulted from each office's own decisions in past governments. There were four computer centers and many individual micro-computers with different IT tools, at the President's Office; each computer center had a different branch name's mini-computer.

Due to high maintenance costs combined with scarce use of two of the mini-computers -- used only for word processing purposes -- the SI&S dismantled them. Then it replaced them with micro-computer based networks that offered new services and more independence for individual users -- mostly office automation tools. The SI&S also replaced the main computer center, that used to belong to the Sub-direction and was devoted to administrative purposes, by a newer network with open architecture.

Then, it contracted the re-programming of most applications (particularly the transaction processing systems). It also acquired many new intelligent stations for individual users, and trained them properly. The whole project -- the most expensive one in the whole portfolio -- was the *"Modernization of the Sub-Direction"* project.

On a smaller scale, a similar refashioning process happened to the last mini-computer center, at the Press Secretariat. By the end of 1992, following suggestions by the consultants, the President's Office presented a more coherent picture of its IT platform.

One of the most important networks developed was the *"Electronic Network for the Public Sector's Top Executives."* It consisted of IBM

compatible micro-computers running DOS and networked by means of a networking software called MHS and an expert system called "*Coordinator*." Its purpose was to support dialogue management among the top executives of the country (i.e., Ministries and Heads of Administrative Departments) and the top executives in the President's Office.

The SI&S also developed an internal network for the executives of the President's Office. It runs with Macintosh micro-computers and interconnected them through a phone net. Its purpose was to provide an efficient means for electronic conversations among the executives of the President's Office themselves; its name was "*Electronic Network for Directors of Advisory's Offices and Secretariat*."

National Program for Re-habilitation (PNR) installed -- under the supervision of the SI&S -- another big network to link all its local offices to the central office at the PO. Also the SI&S installed smaller networks for the Press Secretariat, the Human Rights Advisory Office, the First Lady's Office, the Peace Advisory Office, the National Security and Defense Advisory Office, the Youth, Women and Family PPO and the Private Secretariat.

Finally, it designed and contracted implementation of an electronic network, under DOS and using Coordinator, for the Sub-direction of the President's Office; its aim was to link the Sub-direction to the rest of the offices in order to improve communication among them -- most on the management of resources.