J. Galbraith

Designing Complex Organizations

Chapter 1
INTRODUCTION

The field of organization development in general and to some degree this series in particular has developed out of an emphasis on change and on planned change. This book on organization design offers a different but complementary set of ideas. The differences and complementarities are best illustrated by a schematic, as shown in Figure 1.

Assume it is possible to represent the important features of an organization by a circle. Then at some moment our organization is

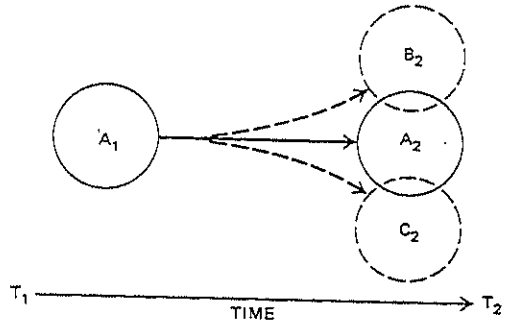

Figure 1

represented by A_1. If left alone the forces already set in motion will drive the organization to some state A_2. If the people or groups in positions of influence are dissatisfied with the current state of affairs they may want to intervene and divert the organization's path toward B_2 or toward C_2. Much of the organization development literature is concerned with planned interventions and strategies for diverting the organization. But what are these states B_2, C_2, or D_2 toward which the organization can be diverted? These states are different forms of organization. The purpose of this book is to present a model with which we can identify and evaluate these alternative organizational forms.

CONTINGENCY THEORY

The design of organization structures is an old topic which has passed through a number of stages of inquiry. The current stage, as usual, is characterized by a number of schools of thought. The author finds himself in a school labeled as contingency theory. This theory is based on two conclusions drawn primarily from large-scale empirical studies.

1. There is no one best way to organize.
2. Any way of organizing is not equally effective.

Thus we can observe a wide range of effective organizations but their differences are not random. The form of organization makes a difference. All of which suggests a new set of questions. On what factors does the choice of organization form depend? What are the characteristics of organizational contexts which appear to make a difference? Research in the past ten years suggests several.

One of the first studies was performed by Burns and Stalker.[1] In observing 20 British and Scottish firms they identified two types of organization—organic and mechanistic. More important, they suggested that each was effective. The mechanistic form was effective in stable markets, while the organic was effective in rapidly changing markets and technologies.

In another study of 100 British firms, Woodward found a relation between structure and effectiveness only when the production technology was controlled.[2] Among other features, small-batch, custom-design technologies used flat organizations with relative little staff personnel.

Mass-production, stable technologies were tall with a large indirect labor component.

Alfred Chandler, using the methodology of comparative historical analysis, studied over 70 of America's largest industrial firms.[3] He was interested in the creation and spread of the decentralized multidivisional structure. He discovered that the multidivisional form was not uniformly adopted throughout industry. The determining factor appeared to be the growth strategy of the firm. Those firms pursuing a growth strategy in a single industry utilized the centralized functional form, while those pursuing growth through diversification assumed the decentralized product division form or geographical division form. These results have been confirmed and extended to international diversification in a recent study of 170 American firms.[4]

A study by Richard Hall, a sociologist, has produced an interesting variation.[5] The previous studies accounted for variations in structure between organizations by analyzing task predictability and diversity. Hall pointed out that the same differences in task predictability occurred within as well as between organizations. Using categories conceptually equivalent to Burns and Stalker's mechanistic and organic types, Hall found the predicted internal structure variation. That is, the research and development departments had organic forms, while the production departments approximated the mechanistic form. Hall's study adds greatly to the generality of the previous findings.

The last study to be described here is one which combines the approaches of the previously mentioned studies.[6] Lawrence and Lorsch's proposition was that there are two considerations in the organization design problem. The first is to organize each subtask in a manner which facilitates the effective performance of that subtask. To the extent that subtasks vary in their predictability, different structures should be used. It also follows that different cognitive and emotional orientations will arise in the different structures. This aspect of the design problem is called *differentiation.*

The other aspect of the design problem is to provide for the *integration* of the differentiated subtasks so as to achieve successful completion of the whole task. The appropriate way to achieve integration depends first upon the degree of differentiation, since the greater the differences between two subtasks the more difficult it is to achieve effective collaboration. Also the integration problem varies with the rate at which new

products are being introduced. This approach would account for task predictability differences which exist between and within organizations.

The results of the study, carried out with ten organizations in three industries, strongly support the propositions. That is, the successful organizations had differentiated internal structures when the subtasks varied in predictability. They also adopted integrating mechanisms in proportion to the amount of differentiation and the amount of new product introduction. The study confirms again the proposition that the predictability of the task is a basic conditioning variable in the choice of organizational forms.

Several other studies could be added to the list but the results would be the same.[7] All lead to the conclusion that the best way to organize is contingent upon the uncertainty and diversity of the basic task being performed by the organizational unit.[8] What remains to be done is to explain why uncertainty should have such an effect and to relate uncertainty to the design policy variables.

UNCERTAINTY AND INFORMATION

The basis of the design framework presented in this book is the proposition that the greater the uncertainty of the task, the greater the amount of information that has to be processed between decision makers during its execution. If the task is well understood prior to performing it, much of the activity can be preplanned. If it is not understood, then during the actual execution of the task more knowledge is acquired which leads to changes in resource allocations, schedules, and priorities. All these changes require information processing *during* task performance. Therefore *the greater the task uncertainty, the greater the amount of information that must be processed among decision makers during task execution in order to achieve a given level of performance.*

The basic effect of uncertainty is to limit the ability of the organization to preplan or to make decisions about activities in advance of their execution. Therefore it is hypothesized that the observed variations in organizational forms are actually variations in the strategies of organizations to (1) increase their ability to preplan, (2) increase their flexibility to adapt to their inability to preplan, or (3) to decrease the level of performance required for continued viability. Which strategy is chosen depends on the amount of uncertainty and the relative costs of the

strategies. The function of the design framework is to identify these strategies and their costs.

Before articulating the design framework in the next chapter, we need to clarify the concepts of information and uncertainty.[9] *Uncertainty is defined as the difference between the amount of information required to perform the task and the amount of information already possessed by the organization.* Thus the amount of task uncertainty is a result of the combination of a specific task and a specific organization. The amount of information needed to perform a task is a function of (1) the *diversity of the outputs* provided as measured by the number of different products, services or clients, (2) the number of different *input resources* utilized as measured by the number of different technical specialties on a project, number of different machine centers in a factory, etc., and (3) the *level of goal difficulty* or performance as measured by some efficiency criterion such as percentage of machine utilization. The greater the diversity of outputs, number of resources, and level of performance, the greater the number of factors and interactions between factors that must be considered simultaneously when making decisions. The organization may not, however, possess the necessary amount of information. Uncertainty is the relative amount of information that must be acquired during task performance. It is relative to the amount of information required and the amount already possessed by the organization.

It is not uncertainty per se that is of interest. It is information processing, and specifically information processing during actual task execution, that is the key concept. It was suggested earlier that in predictable situations most of the coordination could be planned in advance of task execution. It is not implied that there is no information processing in this preplanning. There is usually a great deal, depending on the division of labor, diversity of outputs, and level of performance. For example, a great deal of information is necessary to balance the several thousand jobs along the automobile assembly line. Here the work is divided into thousands of highly interdependent subtasks. The line produces many diverse models and sizes, and it runs at a high level of efficiency. The result is that when decisions are made about rate of production or model mix, the impact of that decision on every job must be taken into account. This is a complicated decision known as the assembly line balancing problem. However, if customer demand, labor skills, and technology are predictable, there is little information to be processed after the line has been balanced.

In the case of uncertainty, the organization does not know the total demand, or the mix of station wagons, sedans, and convertibles. However, the organization estimates these factors, treats them as certainty equivalents, and processes them as in the certainty case in order to balance the line. But the estimates will probably be wrong. Customers will order more or fewer automobiles and proportionally more or fewer station wagons than initially estimated. When the organization changes its production rate it must rebalance all several thousand jobs along the line. It must process all that information again. The same issues arise as engineers create new process and product designs during the year. The line requires more rebalancing and more information processing. As the volume of information becomes substantial, the organization either finds ways to process the information or discovers ways to avoid having to do so. The framework presented in this book identifies explicitly how the organization can make these choices.

SUMMARY

This first chapter has very briefly presented a contingency theory basis for organization design decisions. The degree of task uncertainty was identified as the key variable on which the alternative designs are contingent. It was hypothesized that this is because alternative organization forms represent alternative capacities for processing information. The concepts of uncertainty and information were also briefly defined.

In the next chapter, a mechanistic model is introduced to illustrate how organizations can be conceived of as information-processing networks; this model provides a basis for the remainder of the book. Then the alternative strategies for dealing with information processing are related. Most of the book is devoted to so-called matrix designs. The theory and case illustrations make up the last half of the book.

NOTES

1. Tom Burns and G. M. Stalker, *The Management of Innovation* (London: Tavistock Publications, 1961).
2. Joan Woodward, *Industrial Organization: Theory and Practice* (London: Oxford University Press, 1965).
3. Alfred Chandler, *Strategy and Structure* (Garden City, N.Y.: Anchor Books, 1966).

4. Lawrence E. Fouraker and John M. Stopford, "Organizational Structure and the Multinational Strategy," *Administrative Science Quarterly,* June 1968, pp. 47–64.
5. Richard H. Hall, "Intraorganizational Structure Variation," *Administrative Science Quarterly,* December 1962, pp. 295–308.
6. Paul R. Lawrence and Jay W. Lorsch, *Organization and Environment* (Boston: Division of Research, Harvard Business School, 1967).
7. Jerald Hage and Michael Aiken, "Routine Technology, Social Structure and Organizational Goals," *Administrative Science Quarterly* **14** (1969), 366–377; and Robert B. Duncan, "Characteristics of Organizational Environments and Perceived Environmental Uncertainty," *Administrative Science Quarterly,* September 1972, pp. 313–327.
8. It should be kept in mind that there are other points of view on contingent variables. Some suggest size is the most important. See, for example, D. S. Pugh, D. J. Hickson, C. R. Hinings and C. Turner, "The Context of Organization Structure," *Administrative Science Quarterly* **14** (1969), 91–114.
9. For a more complete statement see Jay R. Galbraith, *Organization Design* (Reading, Mass.: Addison-Wesley), forthcoming.

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Chapter 2
INFORMATION PROCESSING MODEL

In this chapter the basic model is created and the overall structure of the framework is outlined. Subsequent chapters will expand the major strategies put forth in the framework. Of necessity, the remainder of the chapter is fairly abstract. The purpose is to conceive of organizations as information-processing networks and to explain why and through what mechanisms uncertainty and information relate to structure. In order to accomplish this explanation, the basic bureaucratic mechanical model is created. The value of the model is not that it describes reality but that it creates a basis from which various strategies are formed to adapt the bureaucratic structure for handling greater complexity.

MECHANISTIC MODEL

In order to develop the model and the design strategies, assume that we have a task which requires several thousand employees divided among many subtasks. For example, the task of designing and manufacturing an aircraft or space capsule requires a group to design the capsule, a group to design the manufacturing methods, a group to fabricate parts and components, a group to assemble the parts, and a group to test the completed unit. The result is a division of labor which involves considerable interdependence and therefore coordination among the groups. The workflow is shown schematically in Figure 2.

In order to complete the task at a high level of performance, the activities that take place in the various groups must be coordinated. The behavior of the product design engineer must be consistent with the behavior of the process design engineers, etc. Although the behavior of several thousand people must be coordinated, it is impossible for all of them to communicate with each other. The organization is simply too large to permit face-to-face communication to be the mechanism for coordination. The organization design problem is to create mechanisms by which an integrated pattern of behavior can be obtained across all the interdependent groups. In order to see what these mechanisms are and the conditions under which they are appropriate, let us start with a very predictable task and slowly increase the degree of task uncertainty.

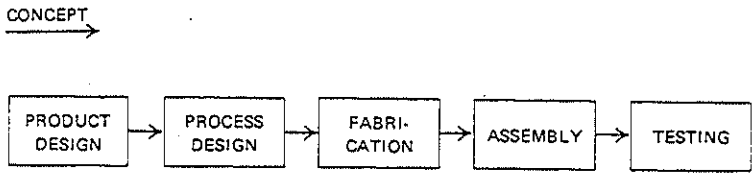

Fig. 2 Horizontal workflow across a functional division of labor.

First we have a task, like the one represented in Figure 2, in which there is a high degree of division of labor, a high level of performance, and relatively large size. A good deal of information must be processed to coordinate the interdependent subtasks. As the degree of uncertainty increases, the amount of information processing during task execution increases. Organizations must evolve strategies to process the greater amount of information necessary to maintain the level of performance. Let us follow the history of a fictitious organization performing the task

represented in Figure 2 and observe the mechanisms that are created to deal with increasing information loads caused by increasing task uncertainty.

Rules, Programs, Procedures

The simplest method of coordinating interdependent subtasks is to specify the necessary behaviors in advance of their execution in the form of rules or programs.[1] In order to make effective use of programs, the organization's employees are taught the job-related situations with which they will be faced and the behaviors appropriate to those situations. Then as situations arise daily, the employees act out the behaviors appropriate to the situations. If everyone adopts the appropriate behavior the resultant aggregate response is an integrated or coordinated pattern of behavior.

The primary virtue of rules is that they eliminate the need for further communication among the subunits. If an organization has hundreds of employees, they cannot all communicate with each other in order to guarantee coordinated action. To the extent that the job-related situations can be anticipated in advance and rules derived for them, integrated activity is guaranteed without communication. These rules and programs perform the same functions for organizations that habits perform for individuals. They eliminate the need for treating each situation as new. The amount of communication and decision making is reduced each time a situation is repeatedly encountered. In addition, rules provide a stability to the organization's operations. As people come and go through an organization, the rules provide a memory for handling routine situations.

The best example of a programmed task is the automobile assembly operation. Each employee learns a specific set of behaviors for each possible situation he will face, e.g., station wagon, convertible, deluxe sedan, standard sedan, etc. For assembly operations the programs and procedures are created by engineers. In other situations individuals simply program themselves. That is, after confronting the same situation many times, individuals coordinate their behavior by following the same approach as in the past. Many standard operating procedures arise in this manner.

The use of rules and programs as coordination devices is limited, however. It is limited to those job-related situations which can be anticipated in advance and to which an appropriate response can be identified. As the organization faces new and different situations, the use of rules must be supplemented by other integrating devices.

Hierarchy

As the organization that depends on rules encounters situations it has not faced before, it has no ready-made response. When a response is developed for the new situation it must take into account all the subtasks that are affected. The information collection and problem solving activities may be substantial. To handle this task new roles are created, called managerial roles, and arranged in a hierarchy as shown in Figure 3.[2] The occupants of these roles handle the information collection and decision making tasks necessitated by uncertainty.

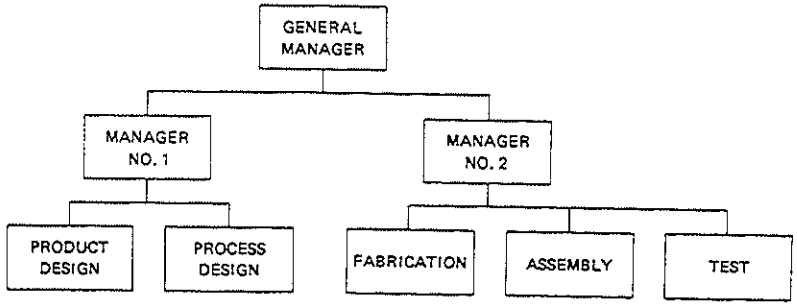

Fig. 3 Hierarchical organization structure.

Then as unanticipated events arise, the problem is referred to the manager who has the information to make a new decision. In addition, the hierarchy is also a hierarchy of authority and reward power, so that the decisions of the role occupants are effective determinants of the behavior of the task performers. In this manner the hierarchy of authority is employed on an exception basis. That is, the new situation, for which there is no preplanned response, is referred upward in the hierarchy to permit the creation of a new response. Since the process we are describing remains rather mechanical, the new situation is referred up-

ward in the hierarchy to that point where a shared superior exists for all subunits affected by the new situation. For example, in Figure 3, if a problem arises during testing which requires product design work, it is referred to the general manager. If a situation arises affecting assembly and fabrication, it is referred to manager No. 2.

It is important to point out that the hierarchy is employed *in addition to, not instead of,* the use of rules. That is, the rules achieve coordination for the uniform and repetitive situations, whereas the new and unique situations are referred upward. This combination guarantees an integrated coordinated organizational response to the situations which the organization faces.

The weakness of hierarchical communication systems is that each link has a finite capacity for handling information. As the organization's subtasks increase in uncertainty, more exceptions arise which must be referred upward in the hierarchy. As more exceptions are referred upward, the hierarchy becomes overloaded. Serious delays develop between the upward transmission of information about new situations and a response to that information downward. In this situation, the organization must develop new processes to supplement rules and hierarchy.

Targeting or Goal Setting

As task uncertainty increases, the volume of information from the points of action to points of decision making overload the hierarchy. In this situation it becomes more efficient to bring the points of decision down to the points of action where the information originates. This can be accomplished by increasing the amount of discretion exercised by employees at lower levels of the organization. However, as the amount of discretion exercised at lower levels of the organization is increased, the organization faces a potential behavior control problem. That is, how can the organization be sure that the employees will consistently choose the appropriate response to the job-related situations which they will face?

In order to increase the probability that employees will select the appropriate behavior, organizations make two responses to deal with the behavior control problem.[3] The first change involves the substitution of craft or professional training of the work force for the detailed centralized programming of the work processes.[4] This is illustrated by a comparison between manufacturing industries and construction industries. In mass production, the work processes that are planned in advance are:

1) the location at which a particular task will be performed
2) the movement of tools, of materials and of workers to this work place and the most efficient arrangement of these workplace characteristics
3) sometimes the particular movements to be performed in getting the task done
4) the schedules and time allotments for particular operations
5) inspection criteria for particular operations.

In construction all these characteristics of the work process are governed by the worker in accordance with the empirical lore that makes up craft principles.[5]

These two descriptions represent a shift from control based on supervision and surveillance to control based on selection of responsible workers. Workers who have the appropriate skills and attitudes are selected.

Professionalization by itself may not be sufficient to shift decision making to lower levels of the organization. The reason is that in the presence of interdependence, an alternative which is based on professional or craft standards may not be best for the whole organization. Thus alternatives which are preferred from a local or departmental perspective may not be preferred from a global perspective. The product design that is technically preferred may not be preferred by the customer, may be costly to produce, or may require a schedule which takes too long to complete. In order to deal with the problem, organizations undertake processes to set goals or targets to cover the primary interdependencies.

An example of the way goals are used can be demonstrated by considering the design group responsible for an aircraft wing structure. The group's interdependence with other design groups is handled by technical specifications elaborating the points of attachment of the wing to the body, forces transmitted at these points, centers of gravity, etc. The group also has a set of targets (not to be exceeded) for weight, design man-hours to be used, and a completion date. They are given minimum stress specifications below which they cannot design. The group then designs the structures and assemblies which combine to form the wing. They need not communicate with any other design group on work related matters if they and the interdependent groups are able to operate within the planned targets.

Thus goal setting helps coordinate interdependent subtasks and still allows discretion at the local subtask level. Instead of specifying specific behaviors through rules and programs, the organization specifies targets

to be achieved and allows the employees to select behaviors appropriate to the target.[6]

The ability of the design groups to operate within the planned targets, however, depends partly on the degree of task uncertainty. If the task is one that has been performed before, the estimates of man-hours, weight, due date, etc., will probably be realized. If it is a new design involving new materials, the estimates will probably be wrong. The targets will have to be set and reset throughout the design effort.

The violation of planned targets usually requires additional decision making and hence additional information processing. The additional information processing takes place through the hierarchy in the same way that rule exceptions were handled. Problems are handled on an exception basis. They are raised to higher levels of the hierarchy for resolution. The problem rises to the first level at which a shared superior exists for all affected subunits. A decision is made, and the new targets are communicated to the subunits. In this manner the behavior of the interdependent subunits remains integrated.

However, as the organization performs more uncertain tasks, such as designing and building a 747 jumbo jet, the hierarchical channels become overloaded once again. The organization does not have the information to estimate how many man-hours are needed to design the new titanium wings. How much weight will the wings require? Will it take 9 months, a year, or 18 months to complete the design? The information necessary to make these decisions can only be discovered during the actual design. The decisions must be made and remade each time new information is discovered. The volume of information processing can overwhelm an organization behaving in the mechanical fashion outlined in this chapter. The organization must adopt a strategy to either reduce the information necessary to coordinate its activities or increase its capacity to process more information. In the next section these strategies are identified and integrated into the framework. Subsequent chapters explain the strategies in detail.

DESIGN STRATEGIES

The ability of an organization to successfully coordinate its activities by goal setting, hierarchy, and rules depends on the combination of the frequency of exceptions and the capacity of the hierarchy to handle them.

As task uncertainty increases, the number of exceptions increases until the hierarchy is overloaded. Then the organization must employ new design strategies. Either it can act in two ways to reduce the amount of information that is processed, or it can act in two ways to increase its capacity to handle more information. An organization may choose to develop in both of these ways. The two methods for reducing the need for information and the two methods for increasing processing capacity are shown schematically in Figure 4. The effect of all these actions is to reduce the number of exceptional cases referred upward into the organization through hierarchical channels.

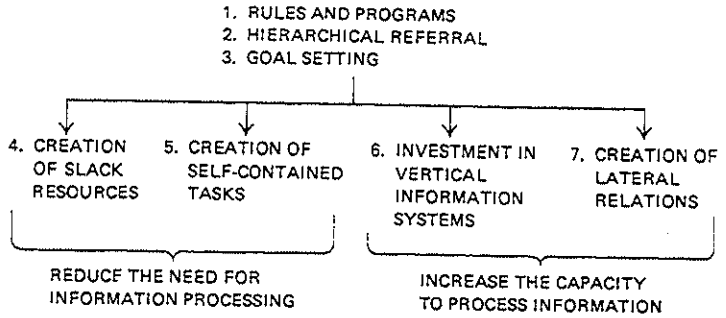

Fig. 4 Organization design strategies.

Creation of Slack Resources

An organization can reduce the number of exceptions that occur by simply reducing the required level of performance. In the example of the wing design, the scheduled time, weight allowance, or man-hours could be increased. In each case more resources could be consumed. These additional resources are called slack resources.[7]

Slack resources are an additional cost to the organization or the customer. However, the longer the scheduled time available, the lower the likelihood of a target being missed. The fewer the exceptions, the less the overload on the hierarchy. Thus the creation of slack resources, through reduced performance levels, reduces the amount of information that must be processed during task execution and prevents the overload-

ing of hierarchical channels. Whether the organization chooses this strategy depends on the relative costs of the other three strategies for handling the overload.

Creation of Self-Contained Tasks

The second method for reducing the amount of information processed is to change from the functional task design to one in which each group has all the resources it needs to perform its task. In the example of the 747, self-contained units could be created around major sections of the aircraft—wing, cabin, tail, body, etc. Each group would have its own product engineers, process engineers, fabricating and assembly operations, and test facilities. In other situations, groups can be created around product lines, geographical areas, projects, client groups, markets, etc., each of which would contain the input resources necessary for the task.

The strategy of self-containment shifts the basis of the authority structure from one based on input, resource, skill, or occupational categories, to one based on output or geographical categories. The shift reduces the amount of information processing through several mechanisms—two are described here.

First, it reduces the amount of output diversity faced by a single collection of resources. For example, a professional organization with multiple skill specialties that provides service to three different client groups must schedule the use of these specialties across three demands for their services and determine priorities when conflicts occur. But if the organization changes to three groups, one for each client category, each with its own full complement of specialties, the schedule conflicts across client groups disappears, and there is no need to process information to determine priorities.

The second source of information reduction occurs through a reduced division of labor. The functional or resource specialized structure pools the demand for skills across all output categories. In the example above, each client generates approximately one-third of the demand for each skill. Since the division of labor is determined by the extent of the market, the division of labor must decrease as the demand decreases. In the professional organization, each client group may have generated a need for one-third of a computer programmer. The functional organization would have hired one programmer and shared him across the groups. In the self-contained structure, there is insufficient demand in each group for a programmer, and so the professionals must do their own programming. Specialization is reduced but there is no problem of scheduling the programmer's time across the three possible uses for it.

Thus the first two strategies reduce overloads on the hierarchy by reducing the number of exceptions that occur. The reduction occurs by reducing the level of performance, diversity of output, or division of labor. According to the theory put forth earlier, reducing the level of performance, etc., reduces the amount of information required to coordinate resources in creating the organization's services or products. In this way, the amount of information to be acquired and processed during task execution, and as a consequence the amount of task uncertainty, is reduced.

In contrast, the other two strategies take the required level of information as given, and create processes and mechanisms to acquire and process information during task execution.

Investment in Vertical Information Systems

The organization can invest in mechanisms which allow it to process information acquired during task performance without overloading the hierarchical communication channels. The investment occurs according to the following logic. After the organization has created its plan or set of targets for weight, stress, budget, and schedule, unanticipated events occur which generate exceptions requiring adjustments to the original plan. At some point when the number of exceptions becomes substantial, it is preferable to generate a new plan rather than make incremental changes in the old one with each exception. The issue is then how frequently plans should be revised—yearly, quarterly, or monthly? The greater the uncertainty, the greater the frequency of replanning. The greater the frequency of replanning, the greater the resources, such as clerks, computer time, input-output devices, etc., required to process information about relevant factors.

Providing more information more often may simply overload the decision maker. Investment may be required to increase the capacity of the decision maker by employing computers, various man-machine combinations, assistants-to, etc. The cost of this strategy is the cost of information processing resources.

The investment strategy is to collect information at the points of origin and direct it, at appropriate times, to the appropriate places in the

hierarchy. The strategy increases the information processing at planning time while reducing the number of exceptions which have overloaded the hierarchy.

Creation of Lateral Relations

The last strategy is to selectively employ lateral decision processes which cut across lines of authority. The strategy moves the level of decision making down to where the information exists rather than bringing it up to the points of decision. It decentralizes decisions but without creating self-contained groups. Several mechanisms are employed. The number and types depend upon the level of uncertainty.

The simplest form of lateral relation is direct contact between two people who share a problem. If a problem arises in testing (see Figure 3), the manager of test may contact the manager of assembly and secure the necessary change. Direct contact avoids the upward referral to another manager and removes overloads from the hierarchy.

In some cases there is a large volume of contact between two subtasks such as process design and assembly. Under these circumstances a new role, a liaison role, may be created to handle the interdepartmental contacts.

As tasks of higher uncertainty are encountered, problems are detected in testing which require the joint efforts of product and process design, assembly, and testing. Rather than refer the problem upwards, managers of these areas form a task force or team to jointly resolve the issue. In this manner interdepartmental group problem solving becomes a mechanism to decentralize decisions and reduce hierarchical overloads.

As more decisions and more decisions of consequence are made at lower levels of the organization through interdepartmental groups, problems of leadership arise. The response is the creation of a new role, an integrating role.[8] The function of the role is to represent the general manager in the interdepartmental decisions for a particular brand, product line, project, country, or geographical unit. These roles are called product managers in commercial firms, project managers in aerospace, and unit managers in hospitals.

After the role is created the issue is, how much and what kind of influence does the role occupant need in order to achieve integration for the project, unit, or product. Mechanisms from supporting information and budget control all the way to dual reporting relations and the matrix design are employed under various circumstances described in later chapters.

In summary, lateral relations permit the moving of decisions to lower levels of the organization and yet guarantee that all information is included in the process. The cost of the strategy is the greater amounts of managerial time that must be spent in group processes and the overhead expense of liaison and integrating roles.

Choice of Strategy

Four strategies have been briefly presented. The organization can choose to follow one or some combination of several if it chooses. It will choose that strategy which is least expensive in its environmental context.

It is important to note that the four strategies are hypothesized to be an exhaustive set of alternatives. That is, if the organization is faced with greater uncertainty, due to technological change, higher performance standards, increased competition, or diversified product line to reduce dependence, the amount of information processing is increased. *The organization must adopt at least one of the four strategies when faced with greater uncertainty.* If it does not consciously choose one of the four, then the first, reduced performance standards, will happen automatically. The task information requirements and the capacity of the organization to process information are always matched. If the organization does not consciously match them, reduced performance through budget overruns or schedule overruns will occur in order to bring about equality. Thus the organization should be planned and designed simultaneously with the planning of the strategy and resource allocations. But if the strategy involves introducing new products, entering new markets etc., then some provision for increased information must be made. Not to decide is to decide, and it is to decide upon slack resources as the only strategy for removing hierarchical overload.

SUMMARY

This chapter has introduced the basic theory upon which the remainder of the book will build. Starting from the observation that uncertainty appears to make a difference in type of organization structure, it was postulated that uncertainty increased the amount of information that

must be processed during task execution. Therefore perceived variation in organization form was hypothesized to be variation in the capability of the organization to process information about events that could not be anticipated in advance.

Uncertainty was conceived as the relative difference in the amount of information required and the amount possessed by the organization. The amount required was a function of the output diversity, division of labor, and level of performance. In combination the task uncertainty, division of labor, diversity of output, and level of performance determine the amount of information that must be processed.

Next the basic, mechanistic, bureaucratic model was introduced along with explanations of its information processing capabilities. It was shown that hierarchical communication channels can coordinate large numbers of interdependent subtasks but have a limited capacity to remake decisions. In response four strategies were articulated which either reduced the amount of information or increased the capacity of the organization to process more information. The way to decrease information was to reduce the determinants of the amount of information: performance levels, diversity, and division of labor. The strategies to increase capacity were to invest in the formal, hierarchical information process and to introduce lateral decision processes. Each of these strategies has its effects and costs. Subsequent chapters will discuss each strategy in more detail. In addition, case studies will be presented which highlight the various choices.

NOTES

1. James G. March and Herbert A. Simon, *Organizations* (New York: John Wiley, 1958), pp. 142–150.
2. For a more detailed discussion of hierarchical arrangements, see James C. Emery, *Organizational Planning and Control Systems* (New York: Macmillan, 1969), pp. 11–12.
3. There are two aspects to this problem. First, individuals may choose behaviors which are ineffective because they do not have the information or knowledge to make a rational choice. This is the cognitive problem addressed here. The other aspect is that individuals may have goals which are different from organizational goals. Processes for dealing with this problem have been discussed already in this series. See Richard Beckhard, *Organization Development: Strategies and Models* (Reading, Mass.: Addison-Wesley, 1969), pp. 35–40.

4. Arthur Stinchcombe, "Bureaucratic and Craft Administration of Production: A Comparative Study," *Administrative Science Quarterly,* September 1959, pp. 168–187.
5. Ibid., p. 170.
6. Here again there are motivation questions. How difficult should the goals be? Should incentives be attached to them? Should the manager participate in setting them? See John Campbell, Marvin Dunette, Edward Lawler, III, and Karl Weick, Jr., *Managerial Behavior, Performance and Effectiveness* (New York: McGraw-Hill, 1970), Chapter 15.
7. James G. March and Herbert A. Simon, *Organizations* (New York: John Wiley, 1958); and Richard Cyert and James G. March, *A Behavioral Theory of the Firm* (Englewood Cliffs, N.J.: Prentice-Hall, 1963).
8. Paul Lawrence and Jay Lorsch, *Organization and Environment* (Boston: Division of Research, Harvard Business School, 1967), Chapter 3.