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FOUNDATIONS OF ORGANIZATION DESIGN

Ms. Raku made pottery in her basement. That involved a number of distinct tasks—wedging clay, forming pots, tooling them when semidry, preparing and then applying the glazes, and firing the pots in the kiln. But the coordination of all these tasks presented no problem; she did them all herself.

The problem was her ambition and the attractiveness of her pots: the orders exceeded her production capacity. So she hired Miss Bisque, who was eager to learn pottery making. But this meant Ms. Raku had to divide up the work. Since the craft shops wanted pottery made by Ms. Raku, it was decided that Miss Bisque would wedge the clay and prepare the glazes, and Ms. Raku would do the rest. And this required coordination of the work—a small problem, in fact, with two people in a pottery studio: they simply communicated informally.

The arrangement worked well, so well that before long, Ms. Raku was again swamped with orders. More assistants were needed. But this time, foreseeing the day when they would be forming pots themselves, Ms. Raku decided to hire them right out of the local pottery school. So whereas it had taken some time to train Miss Bisque, the three new assistants knew exactly what to do at the outset and blended right in; even with five people, coordination presented no problem.

As two more assistants were added, however, coordination problems did arise. One day Miss Bisque tripped over a pail of glaze and broke five pots; another day, Ms. Raku opened the kiln to find that the hanging planters had all been glazed fuchsia by mistake. At this point, she realized that seven people in a small pottery studio could not coordinate all their work through the simple mechanism of informal communication. Making matters worse was the fact that Ms. Raku, now calling herself president of Ceramics Inc., was forced to spend more and more time with customers; indeed, these days she was more apt to be found in a Marimekko dress than a pair of jeans. So she named Miss Bisque studio manager; she was to

occupy herself full-time with supervising and coordinating the work of the five producers of the pottery.

The firm continued to grow. Major changes again took place when a work-study analyst was hired. He recommended changes whereby each person performed only one task for one of the product lines (pots, ashtrays, hanging planters, and ceramic animals)—the first wedged, the second formed, the third tooled, and so on. Thus, production took the form of four assembly lines. Each person followed a set of standard instructions, worked out in advance to ensure the coordination of all their work. Of course, Ceramics Inc. no longer sold to craft shops; Ms. Raku would only accept orders by the gross, most of which came from chains of discount stores.

Ms. Raku's ambition was limitless, and when the chance came to diversify, she did. First ceramic tiles, then bathroom fixtures, finally clay bricks. The firm was subsequently partitioned into three divisions—consumer products, building products, and industrial products. From her office on the fifty-fifth story of the Pottery Tower, she coordinated the activities of the divisions by reviewing their performance each quarter of the year and taking personal action when their profit and growth figures dipped below those budgeted. It was while sitting at her desk one day going over these budgets that Ms. Raku gazed out at the surrounding skyscrapers and decided to rename her company "Ceramico."

Every organized human activity—from the making of pots to the placing of a man on the moon—gives rise to two fundamental and opposing requirements: the *division of labor* into various tasks to be performed, and the *coordination* of these tasks to accomplish the activity. **The structure of an organization can be defined simply as the sum total of the ways in which its labor is divided into distinct tasks and then its coordination is achieved among these tasks.**

How should that structure be designed? Is there one best way to design it? Or should its various elements—the several means to divide its labor and coordinate its tasks—be picked and chosen independently, the way a shopper selects vegetables at the market or a diner dishes at a buffet table?

For years the literature of management favored an affirmative answer to the first question. A good structure was one based on rules and a rigid hierarchy of authority with spans of control no greater than six. More recently, that literature has implicitly come to favor an affirmative answer to the second question. The organization designer has been expected to mix good doses of long-range planning, job enrichment, and matrix structure, among many other things.

This book rejects both these approaches in favor of a third. **The ele-**

ments of structure should be selected to achieve an internal consistency or harmony, as well as a basic consistency with the organization's situation—its size, its age, the kind of environment in which it functions, the technical systems it uses, and so on. Indeed, these situational factors are often "chosen" no less than are the elements of structure themselves. The organization's niche in its environment, how large it grows, the methods it uses to produce its products or services—all these are selected too. This leads us to the conclusion that both the design parameters and the situational factors should be clustered to create what we shall call *configurations.*

Depending on how the various choices are made, different configurations can, of course, be designed—in principle, a great number of them. But in practice, as we shall see, the number of them that are effective for most organizations may be far smaller. **The central theme of this book is that a limited number of these configurations explain most of the tendencies that drive effective organizations to structure themselves as they do. In other words, the design of an effective organizational structure—in fact, even the diagnosis of problems in many ineffective ones—seems to involve the consideration of only a few basic configurations.**

This is a book in fives. In this first chapter, we introduce a set of basic mechanisms used to achieve coordination among divided tasks. They number five. Later in this chapter, we develop a visual representation of the organization to help guide us through the book. This has five parts. As we move into the body of the book, we describe the various parameters of structural design. Among the most important of these is decentralization. We shall see that this can take five basic forms. Then, after discussing the situational factors, we introduce our basic configurations of structure and situation. These too number five. In fact, we shall discover that all these fives are not independent at all. They exist in fundamental interrelationships. Specifically, each of the configurations favors one of the forms of decentralization, and in each, one of the coordinating mechanisms and one of the parts of the organization tend to dominate. Does that mean that five is the magic number in the design of effective organizations?

Let us set aside the most interesting questions and get on with the more pragmatic ones. To set the underlying framework for this book, we need to introduce two concepts in this chapter. The first describes the basic mechanisms by which organizations achieve coordination. The second describes the organization itself, in terms of a set of interrelated parts.

Coordination in Fives

Recall that structure involves two fundamental requirements—the division of labor into distinct tasks, and the achievement of coordination among these tasks. In Ms. Raku's Ceramico, the division of labor—wedging, form-

ing, tooling, glazing, firing—was dictated largely by the job to be done and the technical system available to do it. Coordination, however, proved to be a more complicated affair, involving various means. These can be referred to as *coordinating mechanisms,* although it should be noted that they are as much concerned with control and communication as with coordination.

Five coordinating mechanisms seem to explain the fundamental ways in which organization coordinate their work: mutual adjustment, direct supervision, standardization of work processes, standardization of work outputs, and standardization of worker skills. These should be considered the most basic elements of structure, the glue that holds organizations together. Let us look at each of them briefly.

• *Mutual adjustment* **achieves the coordination of work by the simple process of informal communication.** Under mutual adjustment, control of the work rests in the hands of the doers, as shown in Figure l-l(a). Because it is such a simple coordinating mechanism, mutual adjustment is naturally used in the very simplest of organizations—for example, by two people in a canoe or a few in a pottery studio. Paradoxically, it is also used in the most complicated. Consider the organization charged with putting a man on the moon for the first time. Such an activity requires an incredibly elaborate division of labor, with thousands of specialists doing all kinds of specific jobs. But at the outset, no one can be sure exactly what needs to be done. That knowledge develops as the work unfolds. So in the final analysis, despite the use of other coordinating mechanisms, the success of the undertaking depends primarily on the ability of the specialists to adapt to each other along their uncharted route, not altogether unlike the two people in the canoe.

• As an organization outgrows its simplest state—more than five or six people at work in a pottery studio, fifteen people paddling a war canoe—it tends to turn to a second coordinating mechanism. *(Direct supervision* **achieves coordination by having one person take responsibility for" the work of others, issuing instructions to them and monitoring their actions,** as indicated in Figure l-l(b). In effect, one brain coordinates several hands, as in the case of the supervisor of the pottery studio or the caller of the stroke in the war canoe. Consider the structure of an American football team. Here the division of labor is quite sharp: eleven players are distinguished by the work they do, its location on the field, and even its physical requirements. The slim halfback stands behind the line of scrimmage and carries the ball; the squat tackle stands on the line and blocks. Mutual adjustments do not suffice to coordinate their work, so a field leader, called the quarterback, is named, and he coordinates their work by calling the plays.

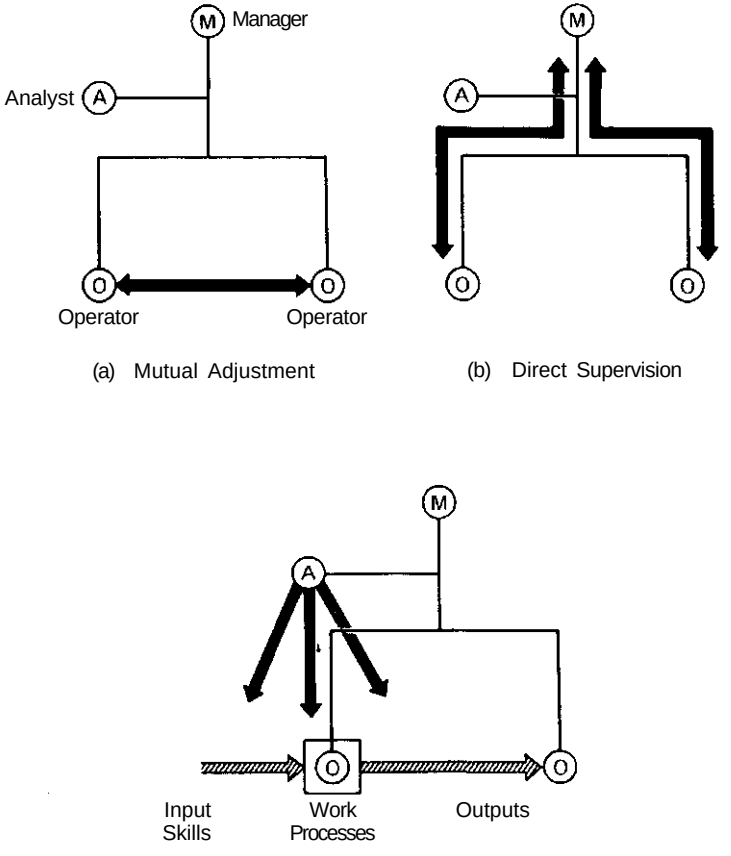


Figure 1-1. *The five coordinating mechanisms*

Work can also be coordinated without mutual adjustment or direct supervision. It can be *standardized.* Coordination is achieved on the drawing board, so to speak, before the work is undertaken. The workers on the automobile assembly line and the surgeons in the hospital operating room need not worry about coordinating with their colleagues under ordinary circumstances—they know exactly what to expect of them and proceed accordingly. Figure l-l(c) shows three basic ways to achieve standardization in organizations. The work processes themselves, the outputs of the work, or the inputs to the work—the skills (and knowledge) of the people who do the work—can be designed to meet predetermined standards.

• *Work processes* **are** *standardized* **when the contents of the work are specified, or programmed.** An example that comes to mind involves the assembly instructions provided with a child's toy. Here, the manufacturer

in effect standardizes the work process of the parent. ("Take the two-inch round-head Phillips screw and insert it into hole BX, attaching this to part XB with the lock washer and hexagonal nut, at the same time holding. . . .") Standardization can be carried to great lengths in organizations, as in the four assembly lines in Ceramics Limited, or the pie filler I once observed in a bakery who dipped a ladle into a vat of pie filling literally thousands of times every day—cherry, blueberry, or apple, it made no difference to him—and emptied the contents into a pie crust that came around on a turntable. Coordination of his work was accomplished by whoever designed that turntable. Of course, other work standards leave more room to maneuver: the purchasing agent may be required to get at least three bids on all orders over $10,000 but is otherwise left free to do his work as he sees fit.

• ***Outputs* are *standardized* when the results of the work—for example, the dimensions of the product or the performance—are specified.** Taxi drivers are not told how to drive or what route to take; they are merely informed where to deliver their fares. The wedger is not told how to prepare the clay, only to do so in four-pound lumps; the thrower on the wheel knows that those lumps will produce pots of a certain size (his own output standard). With outputs standardized, the coordination among tasks is predetermined, as in the book bindery that knows that the pages it receives from one place will fit perfectly into the covers it receives from another. Similarly, all the chiefs of the Ceramico divisions coordinated with headquarters in terms of performance standards. They were expected to produce certain profit and growth levels every quarter; how they did this was their own business.

• Sometimes neither the work nor its outputs can be standardized, yet coordination by standardization may still be required. The solution—used by Ms. Raku to hire assistants in the pottery studio—is to standardize the worker who comes to the work, if not the work itself or its outputs. ***Skills (and knowledge)* are *standardized* when the kind of training required to perform the work is specified.** Commonly, the worker is trained even before joining the organization. Ms. Raku hired potters from school, just as hospitals engage doctors. These institutions build right into the workers-to-be the work programs, as well as the bases of coordination. On the job, the workers appear to be acting autonomously, just as the good actor on the stage seems to be speaking extemporaneously. But in fact both have learned their lines well. So standardization of skills achieves indirectly what standardization of work processes or of work outputs does directly: it controls and coordinates the work. When an anesthesiologist and a surgeon meet in the operating room to remove an appendix, they need hardly communicate; by virtue of their training, they know exactly what to expect

of each other. Their standardized skills take care of most of the coordination.[1]

These are our five coordinating mechanisms, and they seem to fall into a rough order. **As organizational work becomes more complicated, the favored means of coordination seems to shift from mutual adjustment to direct supervision to standardization, preferably of work processes, otherwise of outputs, or else of skills, finally reverting back to mutual adjustment.**

A person working alone has no great need for any of the mechanisms—coordination takes place simply, in one brain. Add a second person, however, and the situation changes significantly. Now coordination must be achieved across brains. Generally, people working side by side in small groups adapt to each other informally; mutual adjustment becomes the favored means of coordination. As the group gets larger, however, it becomes less able to coordinate informally. A need for leadership arises. Control of the work of the group passes to a single individual—in effect, back to a single brain that now regulates others; direct supervision becomes the favored coordinating mechanism.

As the work becomes more involved, another major transition tends to occur—toward standardization.'When the tasks are simple and routine, the organization is tempted to rely on the standardization of the work processes themselves. But more complex work may preclude this, forcing the organization to turn to standardization of the outputs—specifying the results of the work but leaving the choice of process to the worker. In very complex work, on the other hand, the outputs often cannot be standardized either, and so the organization must settle for standardizing the skills of the worker, if possible. Should, however, the divided tasks of the organization prove impossible to standardize, it may be forced to return full cycle, to favor the simplest yet most adaptable coordinating mechanism—mutual adjustment. As noted earlier, sophisticated problem solvers facing extremely complicated situations must communicate informally if they are to accomplish their work.

Our discussion up to this point implies that under specific conditions, an organization will favor one coordinating mechanism over the others. It also suggests that the five are somewhat substitutable; the organization can replace one with another. These suggestions should not, however, be taken to mean that any organization can rely on a single coordinating mechanism. Most, in fact, mix all five. At the very least, a certain amount of direct supervision and mutual adjustment is always required, no matter

[1] The same can apparently be said about much more complex operations. Observation of one three-hour open-heart surgical procedure indicated that there was almost no informal communication between the cardiovascular surgeons and the anesthesiologist (Gosselin, 1978).

what the reliance on standardization. Contemporary organizations simply cannot exist without leadership and informal communication, even if only to override the rigidities of standardization. In the most automated (that is, fully standardized) factory, machines break down, employees fail to show up for work, schedules must be changed at the last minute. Supervisors must intervene, and workers must be free to deal with unexpected problems.

This favoring and mixing of the coordinating mechanisms is also reflected in the literature of management across this century. The early literature focused on *formal structure,* the documented, official relationship among members of the organization. Two schools of thought dominated the literature until the 1950s, one preoccupied with direct supervision, the other with standardization.

The "principles of management" school, fathered by Henri Fayol, who first recorded his ideas in 1916, and popularized in the English-speaking world by Luther Gulick and Lyndall Urwick, was concerned primarily with formal authority—in effect, with the role of direct supervision in the organization. These writers popularized such terms as *unity of command* (the notion that a "subordinate" should have only a single "superior"), *scalar chain* (the direct line of this command from chief executive through successive superiors and subordinates to the workers), and *span of control* (the number of subordinates reporting to a single superior).

The second school really includes two groups that, from our point of view, promoted the same issue—the standardization of work throughout the organization. Both groups were established at the turn of the century by outstanding researchers, one on either side of the Atlantic Ocean. In America, Frederick Taylor led the "Scientific Management" movement, whose main preoccupation was the programming of the contents of operating work—that of pig-iron handlers, coal shovelers, and the like. In Germany, Max Weber wrote of machinelike, or "bureaucratic" structures where activities were formalized by rules, job descriptions, and training.

And so for about half this century, organization structure meant a set of official, standardized work relationships built around a tight system of formal authority.

With the publication in 1939 of Roethlisberger and Dickson's interpretation of a series of experiments carried out on workers at the Western Electric Hawthorne plant came the realization that other things were going on in organizational structures. Specifically, their observations about the presence of *informal structure*—unofficial relationships within the work group—constituted the simple realization that mutual adjustment serves as an important coordinating mechanism in all organizations. This led to the establishment of a third school of thought in the 1950s and 1960s, originally called "human relations," whose proponents sought to demonstrate by empirical research that reliance on formal structure—specifically,

on the mechanisms of direct supervision and standardization—was at best misguided, at worst dangerous to the psychological health of the worker.

More recent research has shifted away from these two extreme positions. In the last decade, there has been a tendency to look at structure more comprehensively; to study, for example, the relationships between the formal and informal, between direct supervision and standardization on the one hand and mutual adjustment on the other. These studies have demonstrated that **formal and informal structures are intertwined and often indistinguishable.** Some have shown, for example, how direct supervision and standardization have sometimes been used as *informal* devices to gain power, and conversely, how devices to enhance mutual adjustment have been designed into the *formal* structure. They have also conveyed the important message that formal structure often reflects official recognition of naturally occurring behavior patterns. Formal structures evolve in organizations much as roads do in forests—along well-trodden paths.

The Organization in Five Parts

Organizations are structured to capture and direct systems of flows and to define interrelationships among different parts. These flows and interrelationships are hardly linear in form, with one element following neatly after another. Yet words must take such a linear form. Hence, it sometimes becomes very difficult to describe the structuring of organizations exclusively in words. These must be supplemented with images. Thus we rely heavily on diagrams in this book. In fact, we require a basic diagram to represent the organization itself, a diagram that can be played with in various ways to show the different things that can happen in organizations and the different forms that organizations themselves can take.

We can develop such a diagram by considering the different component parts of the organization and the people contained in each. At the base of the organization can be found its *operators,* those people who perform the basic work of producing the products and rendering the services. They form the *operating core.* As we noted earlier, in the simplest of organizations, the operators are largely self-sufficient, coordinating through mutual adjustment. The organization needs little more than an operating core.

But as the organization grows and adopts a more complex division of labor among its operators, the need for direct supervision increases. It becomes mandatory to have a full-time manager who sits at what we shall *call* the *strategic apex.* And as the organization is further elaborated, more managers are needed—not only managers of operators but also managers of managers. A *middle line* is created, a hierarchy of authority between operating core and strategic apex. Note that the introduction of managers

gives rise to a new form of division of labor, of the *administrative* type—between those who do the basic work and those who administer it in one form or another.

As the process of elaboration continues, the organization may turn increasingly to standardization as a means of coordinating its work. The responsibility for much of this standardization falls on another group of people, whom we shall call the analysts. They too perform administrative duties, but of a different nature—often called "staff." These analysts form what we shall call the *technostructure,* outside the hierarchy of line authority. Here, then we have a second administrative division of labor—between those who do (or supervise) the work and those who standardize it. In fact, by substituting standardization for direct supervision—a process known as the "institutionalization" of the manager's job—the analysts weaken the control that managers are able to exercise over the operators' work, much as the earlier substitution of direct supervision for mutual adjustment weakened the operators' control over their own work.

Finally, as it grows, the organization tends to add staff units of a different nature, not to effect standardization but to provide indirect services to itself, anything from a cafeteria or mailroom to a legal counsel or public relations department. We call these people and the part of the organization they form the *support staff.*

This gives us five parts of the organization. As shown in Figure 1-2, we have the operating core at the base joined to the strategic apex on top by the middle line, with the technostructure and support staff off to either side. This figure will serve as the theme diagram of this book, its "logo," if you like. We shall use this figure repeatedly to make our points about structure, sometimes overlaying flows on it, sometimes distorting it to show distinctive characteristics of particular kinds of organizations.

Our logo shows a small strategic apex connected by a flaring middle line to a large, flat operating core. These three parts of the organization are shown in one uninterrupted sequence to indicate that they are typically connected through a single line of formal authority. The technostructure and the support staff are shown off to either side to indicate that they are separate from this main line of authority and influence the operating core only indirectly.

It might be useful at this point to relate this scheme to some terms commonly used in organizations. The term *middle management,* although seldom carefully defined, generally seems to include all members of the organization not at the strategic apex or in the operating core. In our scheme, therefore, "middle management" would comprise three distinct groups—the middle-line managers, the analysts, and the support staff. To avoid confusion, however, the term *middle level* will be used here to describe these three groups together, the term *management* being reserved for the managers of the strategic apex and the middle line.

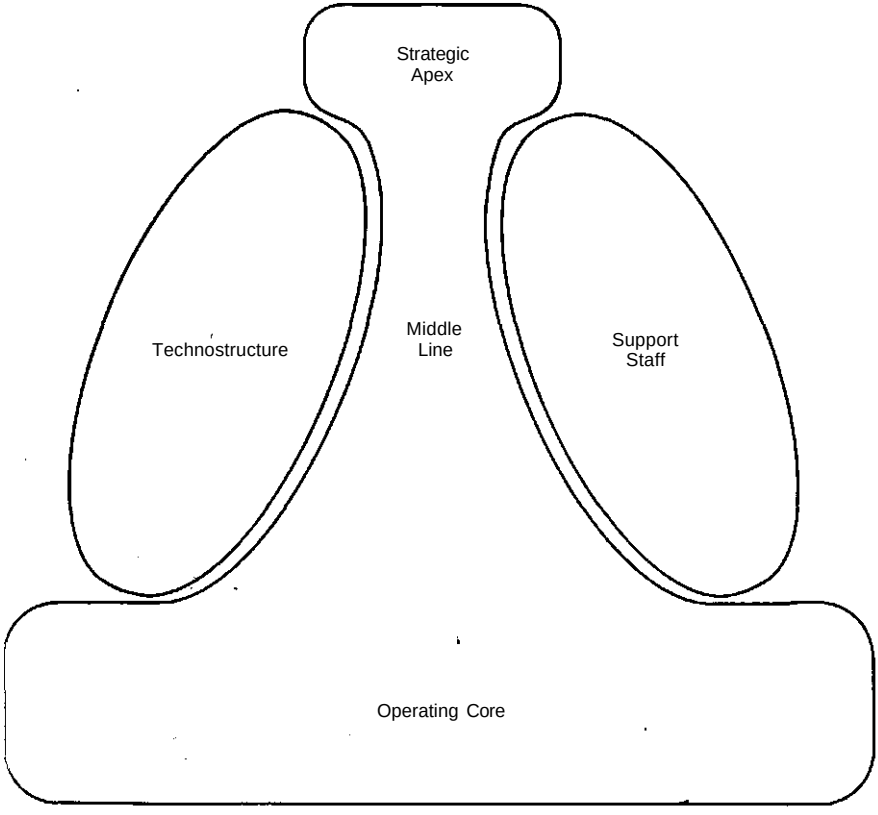


Figure 1-2. *The five basic parts of the organization*

The word *staff* should also be put into this context. In the early literature, the term was used in contrast to *line;* in principle, line positions had formal authority to make decisions, staff positions did not; they merely advised those who did. As we shall see later, this distinction between line and staff holds up in some kinds of structures (at least for the analytic staff, not the support staff) and breaks down in others. Nevertheless, the distinction between line and staff is of some use to us, and we shall retain the terms here though in somewhat modified form. *Staff will* be used to refer to the technostructure *and* the support staff, those groups shown on either side of our theme diagram. *Line* will refer to the central part of the diagram, those managers in the flow of formal authority from the strategic apex to the operating core. Note that this definition does not mention the power to decide or advise. As we shall see, the support staff does not primarily advise; it has distinct functions to perform and decisions to make, although these relate only indirectly to the functions of the operating core. The chef in the plant cafeteria may be engaged in a production process, but it has

nothing to do with the basic manufacturing process. Similarly, the technostructure's power to advice sometimes amounts to the power to decide, but that is outside the flow of formal authority that oversees the operating core.[2]

Let us now take a closer look at each of the five parts of the organization.

The operating core

The operating core of the organization encompasses those members—the operators—who perform the basic work related directly to the production of products and services. The operators perform four prime functions: (1) They *secure the inputs* for production. For example, in a manufacturing firm, the purchasing department buys the raw materials, and the receiving department takes them in the door. (2) They *transform the inputs into outputs.* Some organizations transform raw materials—for example, by chopping down trees and converting them to pulp and then paper. Others transform individual parts into complete units—for example, by assembling typewriters—and still others transform information or people, by writing consulting reports, educating students, cutting hair, or curing illness. (3) They *distribute the outputs*—for example, by selling and physically distributing what comes out of the transformation process. (4) They *provide direct support* to the input, transformation, and output functions—for example, by performing maintenance on the operating machines and inventorying the raw materials.

Standardization is generally carried the furthest in the operating core, in order to protect the operations from external disturbance. How far, of course, depends on the work being done. Assemblers in automobile factories and professors in universities are both operators, although the work of the former is far more standardized than that of the latter.

The operating core is the heart of every organization, the part that produces the essential outputs that keep it alive. But except for the very smallest ones, organizations need *administrative* components too. The ad-

[2]There are other, completely different uses of the term *staff* that we are avoiding here. The military "chiefs of staff" are really managers of the strategic apex; the hospital "staff" physicians are really operators. Also, the introduction of the line/staff distinction here is not meant to sweep all its problems under the rug, only to distinguish those involved directly from those involved peripherally with the operating work of organizations. By our definition, the production and sales functions in the typical manufacturing firm are clearly line activities, marketing research and public relations clearly staff. To debate whether engineering is line or staff—does it serve the operating core indirectly, or is it an integral part of it?—depends on the importance one imputes to engineering in a particular firm. There is a gray area between line and staff: Where it is narrow, for many organizations, we retain the distinction; where it is wide, later we shall explicitly discard it.

ministrative component comprises the strategic apex, middle line, and technostructure.

The strategic apex

At the other end of the organization lies the strategic apex. Here are found those people charged with *overall* responsibility for the organization—the chief executive officer (whether called president, superintendent, or pope), and any other top-level managers whose concerns are global. Included here as well are those who provide direct support to the top managers—their secretaries, assistants, and so on.[3] In some organizations, the strategic apex includes the executive committee (because its mandate is global even if its members represent specific interests); in others, it includes what is known as the chief executive office—two or three people who share the job of chief executive. **The strategic apex is charged with ensuring that the organization serve its mission in an effective way, and also that it serve the needs of those who control or otherwise have power over the organization** (such as its owners, government agencies, unions of the employees, pressure groups).

This entails three sets of duties. One already discussed is that of direct supervision. To the extent that the organization relies on this mechanism of coordination, it is the managers of the strategic apex (as well as the middle line) who effect it. They allocate resources, issue work orders, authorize major decisions, resolve conflicts, design and staff the organization, monitor employee performance, and motivate and reward employees.

Second is the management of the organization's boundary conditions—its relations with its environment. The managers of the strategic apex must spend a good deal of their time informing influential people in the environment about the organization's activities, developing high-level contacts for the organization and tapping these for information, negotiating major agreements with outside parties, and sometimes serving as figureheads as well, carrying out ceremonial duties such as greeting important customers. (Someone once defined the manager, only half in jest, as that person who sees the visitors so that everyone else can get their work done.)

The third set of duties relates to the development of the organization's strategy. Strategy may be viewed as a mediating force between the organization and its environment. Strategy formulation therefore involves the interpretation of the environment and the development of consistent patterns in streams of organizational decisions ("strategies") to deal with

[3] Our subsequent discussion will focus only on the managers of the strategic apex, the work of :r.e latter group being considered an integral part of their own.

it. Thus, in managing the boundary conditions of the organization, the managers of the strategic apex develop an understanding of its environment; and in carrying out the duties of direct supervision, they seek to tailor strategy to its strengths and its needs, trying to maintain a pace of change that is responsive to the environment without being disruptive to the organization. Of course, as we shall see later, the process of strategy formulation is not as cut and dried as all that. For one thing, the other parts of the organization—in certain cases, even the operating core—can play an active role in formulating strategy. For another, strategies sometimes form themselves, almost inadvertently, as managers respond to the pressures of the environment, decision by decision. But one point should be stressed—the *strategic* apex, among the five parts of the organization, typically plays the most important role in the formulation of its strategies.

In general, the strategic apex takes the widest, and as a result the most abstract, perspective of the organization. Work at this level is generally characterized by a minimum of repetition and standardization, considerable discretion, and relatively long decision-making cycles. Mutual adjustment is the favored mechanism for coordination among the managers of the strategic apex itself.

The middle line

The strategic apex is joined to the operating core by the chain of middle-line managers with formal authority. This chain runs from the senior managers to the *first-line supervisors* (such as shop foremen), who have direct authority over the operators, and embodies the coordinating mechanism that we have called direct supervision. Most such chains are scalar—that is, run in a single line from top to bottom. But as we shall see later, not all: some divide and rejoin, a "subordinate" having more than one "superior."

The organization needs this whole chain of middle-line managers to the extent that it is large and reliant on direct supervision for coordination. In theory, one manager—the chief executive at the strategic apex—can supervise all the operators. In practice, direct supervision requires close personal contact between manager and operator, with the result that there is some limit to the number of operators any one manager can supervise—his so-called span of control. Small organizations can get along with one manager (at the strategic apex); bigger ones require more (in the middle line). Thus, an organizational *hierarchy* is built, as a first-line supervisor is put in charge of a number of operators to form a basic organizational unit, another manager is put in charge of a number of these units to form a higher level unit, and so on until all the remaining units can come under a single manager at the strategic apex—designated the "chief executive officer"—to form the whole organization.

In this hierarchy, the middle-line manager performs a number of tasks in the flow of direct supervision above and below him. He collects "feedback" information on the performance of his own unit and passes some of this up to the managers above him, often aggregating it in the process. He also intervenes in the flow of decisions. Flowing up are disturbances in the unit, proposals for change, decisions requiring authorization. Some the middle-line manager handles himself, others he passes up for action at a higher level in the hierarchy. Flowing down are resources that he must allocate in his unit, rules and plans that he must elaborate, and projects that he must implement there. But like the top manager, the middle manager is required to do more than simply engage in direct supervision. He, too, has boundary conditions to manage. Each middle-line manager must maintain liaison contacts with other managers, analysts, support staffers, and outsiders whose work is interdependent with that of his own unit. Furthermore, the middle-line manager, like the top manager, is concerned with formulating the strategy for his unit, although this strategy is, of course, significantly affected by the strategy of the overall organization. But managerial jobs shift in orientation as they descend in the chain of authority. They become more detailed and elaborated, less abstract and aggregated, more focused on the work flow itself.

The technostructure

In the technostructure we find the analysts (and their supporting clerical staff) who serve the organization by affecting the work of others. These analysts are removed from the operating work flow—they may design it, plan it, change, it, or train the people who do it, but they do not do it themselves. Thus, the technostructure is effective only when it can use its analytical techniques to make the work of others more effective.

Who makes up the technostructure? There are the analysts concerned with adaptation, with changing the organization to meet environmental change, and those concerned with control, with stabilizing and standardizing patterns of activity in the organization. In this book we are concerned largely with the control analysts, those who focus their attention directly on the design and functioning of structure. **The control analysts of the technostructure serve to effect certain forms of standardization in the organization.** This is not to say that operators cannot standardize their own work—just as everyone establishes his or her own procedure for getting dressed in the morning—or that managers cannot do it for them. But in general, the more standardization an organization uses, the more it relies on its technostructure. Such standardization reduces the need for direct supervision, sometimes enabling clerks to do what managers once did.

We can distinguish three types of control analysts, to correspond to the three forms of standardization: work-study analysts (such as industrial

engineers), who standardize work processes; planning and control analysts (such as long-range planners, quality control engineers, production schedulers, and accountants), who standardize outputs; and personnel analysts (including trainers and recruiters), who standardize skills (although most of this standardization takes place outside the organization, before the workers are hired).

In a fully developed organization, the technostructure may perform at all levels of the hierarchy. At the lowest levels of the manufacturing firm, analysts standardize the operating work flow by scheduling production, carrying out time-and-method studies of the operators' work, and instituting systems of quality control. At middle levels, they seek to standardize the intellectual work of the organization (for instance, by training middle managers) and carry out operations research studies of informational tasks. And on behalf of the strategic apex, they design strategic planning systems and develop financial systems to control the goals of major units.

Although the analysts exist to standardize the work of others, their own work would appear to be coordinated with others largely through mutual adjustment. (Standardization of skills does play a part in this coordination, however, because analysts are typically highly trained specialists.) Thus, analysts spend a good deal of their time in informal communication.

Thesupportstaff

A glance at the chart of almost any large contemporary organization reveals a great number of units, all specialized, that exist to provide support to the organization outside its operating work flow. Those make up the *support staff.* For example, in a university, we find the alma mater fund, university press, bookstore, printing service, payroll department, janitorial service, mailroom, security department, switchboard, athletics department, student residence, faculty club, and so on. Xone is a part of the operating core; that is, none engages in teaching or research, or even supports it directly (as does, say, the computing center or the library). Yet each exists to provide indirect support to these basic missions. In the manufacturing firm, these units run the gamut from legal counsel to plant cafeteria.

The surprising thing is that these support units have been all but totally ignored in the literature on organizational structuring. Most often they are lumped together with the technostructure and labeled the "staff" that provides advice to management. But these support units are most decidedly different from the technostructure—they are not preoccupied with standardization and they cannot be looked upon primarily as advice givers (although they may do some of that, too). Rather, they have distinct functions to perform. The university press publishes books, the faculty

club provides a social setting for the professors, the alma mater fund brings in money.

Why do large organizations provide so many of their own support services, instead of purchasing them from outside suppliers? The answer seems to lie in control, the large organization wishing to exercise close control over these services, perhaps to reduce the uncertainty of having to buy them on the open market. By publishing its own books, the university avoids some of the uncertainties associated with the commercial houses; by fighting its own court cases, the manufacturing corporation maintains close control over the lawyers it uses; and by feeding its own employees in the plant cafeteria, it shortens the lunch period and, perhaps, even helps to determine the nutritiousness of the food.

Many support units are self-contained; they are mini-organizations, many with their own equivalent of an operating core, as in the case of the printing service in a university. These units take resources from the larger organization and, in turn, provide specific services to it. But they function independently of the main operating core. Compare, for example, the maintenance department with the cafeteria in a factory, the first a *direct* service and an integral part of the operating core, the second quite separate from it.

The support units can be found at various levels of the hierarchy, depending on the receivers of their service. In most manufacturing firms, public relations and legal counsel are located near the top, since they tend to serve the strategic apex directly. At middle levels are found the units that support the decisions made there, such as industrial relations, pricing, and research and development. And at the lower levels are found the units with more standardized work, akin to the work of the operating core—cafeteria, mailroom, reception, payroll. Figure 1-3 shows all these support groups overlaid on our logo, together with typical groups from the other four parts of the organization, again using the manufacturing firm as our example.

Because of the wide variations in the types of support units, we cannot draw a single definitive conclusion about the favored coordinating mechanism for all of them. Each unit relies on whatever mechanism is most appropriate for itself—standardization of skills in the office of legal council, mutual adjustment in the research laboratory, standardization of work processes in the cafeteria. However, because many of the support units are highly specialized and rely on professional staff, standardization of skills may be the single most important coordinating mechanism.

Do the staff groups of the organization—technocratic as well as support—tend to cluster at any special level of the hierarchy? One study of twenty-five organizations (Kaufman and Seidman, 1970) suggested that whereas the middle lines of organizations tend to form into pyramids, the staff does not. Its form is "extremely irregular"—if anything, inversely

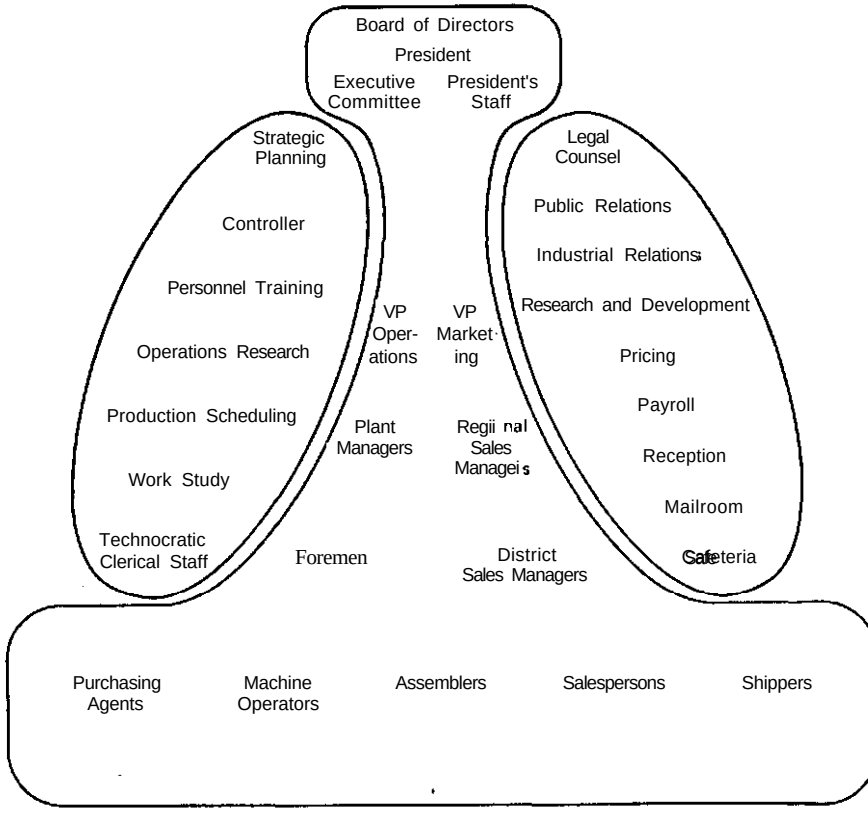


Figure 1-3. *Some members and units of the parts of the manufacturing firm*

pyramidal (p. 446). Hence, while our logo shows the middle line as flaring out toward the bottom, it depicts both the technostructure and the support staff as forming ellipses. Later we shall see that, in fact, the specific shape varies according to the type of structure used by the organization.

Organizations have always had operators and top managers, people to do the basic work and people to hold the whole system together. As they grew, typically they first elaborated their middle-line component, to effect coordination by direct supervision. But as standardization became an accepted coordinating mechanism, the technostructure began to emerge. The work of Frederick Taylor gave rise to the "scientific management" movement of the 1920s, which saw the hiring of many work-study analysts. Just after World War II, the establishment of operations research and the advent of the computer pushed the influence of the technostructure well into the middle levels of many organizations, and with the more recent popularity of techniques such as strategic planning and sophisti-

cated financial controls, the technostructure has entrenched itself firmly at the highest levels of organizations as well. And the more recent growth of the support staff has perhaps been even more dramatic, as all kinds of specialization developed—scientific research in a wide number of fields, industrial relations, public relations, and many more. Organizations have sought increasingly to bring these as well as the more traditional support functions such as maintenance and cafeteria within their boundaries. Thus, the ellipses to the left and right in our logo have become great bulges in many organizations. Indeed, one researcher found that firms in the modern process industries (such as oil refining) averaged one staff member for fewer than three operators, and in some cases, the staff people actually outnumbered the operators by wide margins (Woodward, 1965:60).

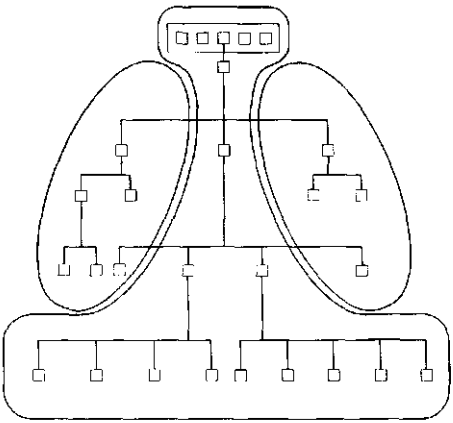
The Functioning of the Organization

Here then we have our representation of the organization in five parts. As noted, we can and shall use this diagram in various ways. One way is to overlay the diagram with various types of flows to depict how the organization functions, at least as has been characterized in the literature of management. Figure 1-4 shows five of these flows. Each represents, in a sense, a distinct theory of organizational functioning.

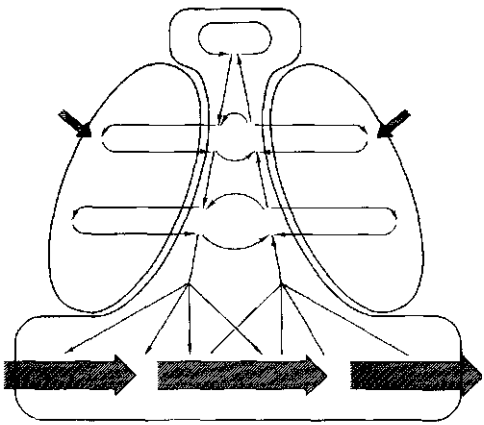
Figure 1-4a represents the organization as a system of *formal authority*—the flow of formal power down the hierarchy. What we have here is an organization chart (I prefer the term *organigram,* borrowed from the French) overlaid on our logo. The organigram is a controversial picture of the structure, for although most organizations continue to find it indispensable (the organigram is inevitably the first thing handed to anyone inquiring about structure), many organizational theorists reject it as an inadequate description of what really takes place inside the organization. Clearly, every organization has important power and communication relationships that are not put down on paper.

However, the organigram should not be rejected, but rather placed in context. It is somewhat like a map. A map is invaluable for finding towns and their connecting roads, but it tells us nothing about the economic or social relationships of the regions. Similarly, **even though the organigram does not show informal relationships, it can represent an accurate picture of the division of labor, showing at a glance (1) what positions exist in the organization, (2) how these are grouped into units, and (3) how formal authority flows among them** (in effect, describing the use of direct supervision).

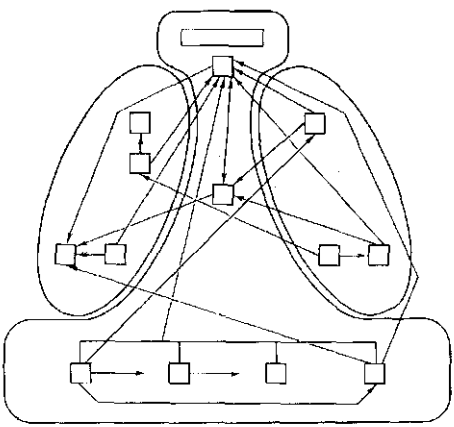
Figure 1-4b depicts the organization as a network of *regulated flows* of production work through the operating core, of commands and instructions down the administrative hierarchy to control the operating core, of



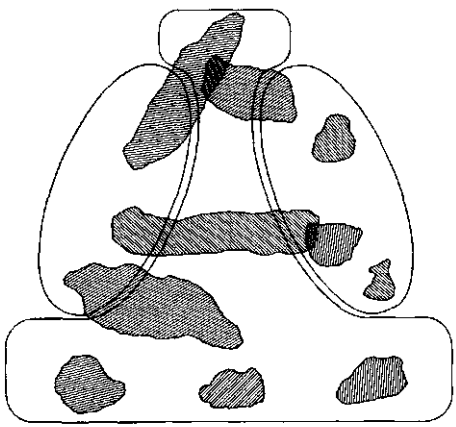
(a): the flow of formal authority



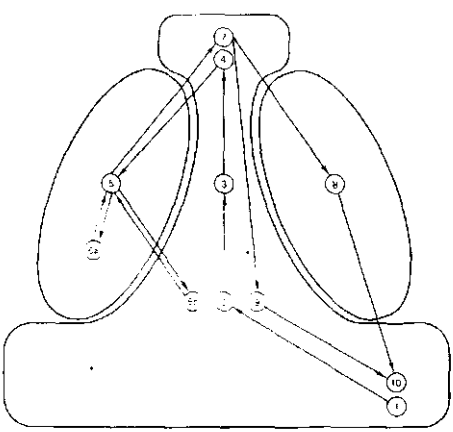
(b): the flow of regulated activity



(c): the flow of informal communication
(adapted from Pfeffner and Sherwood, 1960: 291)



(d): the set of work constellations



(e): the flow of an ad hoc decision process

Figure 1-4. *Five views (or theories) of how the organization functions*

feedback information on results (in a management information system, or MIS) back up, and of staff information and advice feeding into decision making from the sides. This is a view of the organization consistent with traditional notions of authority and hierarchy, but, unlike the first view, one that places greater emphasis on standardization than on direct supervision.

Figure 1-4c describes the organization as a system of *informal communication,* emphasizing the role of mutual adjustment in coordination. What we have here, in fact, is a "sociogram"—a map of who actually communicated with whom in a study of one municipal government (drawn from the work of Pfiffner and Sherwood, 1960). What this view of the organization indicates is that unofficial centers of power exist in organizations and that rich networks of informal communication supplement and sometimes circumvent the channels of authority and regulation. The neatness of the first two views disappears in this third one.

Figure 1-4d depicts the organization as a system of *work constellations.* The underlying view here is that people in the organization cluster into peer groups (not related to the hierarchy or even necessarily to our five parts) to get their work done. Each cluster or constellation deals with distinct decisions appropriate to its own level in the hierarchy, and is only loosely coupled to the others. Here,' then, in contrast to the organization as a kind of orderly spiral spring of the first two views, and as a confusing marble cake of the third, we see it as a kind of semiorderly layer cake. In Figure 1-4d, in terms of a typical manufacturing firm, we have three work constellations in the operating core—one concerned with fabrication, a second with assembly, a third with distribution. Above them is an administrative production constellation, comprising analysts and first-line supervisors, concerned with production scheduling and general plant administration. Above that is a new-product constellation, including analysts, line managers, and support staffers (such as researchers). Exclusively within the support staff are three constellations, concerned with the plant cafeteria, research and development (overlapping the new-product constellation), and public relations. Finally, at the top, the finance constellation connects senior managers with the financial support staff, and the long-range-planning constellation joins senior managers with senior analysts of the technostructure.

Last is Figure 1-4e, which depicts the organization as a system of *ad hoc decision processes.* What we have in this overlay is the flow of one strategic decision, from beginning to end (but, like all the other overlays, vastly simplified). At point 1, a salesman meets a customer, who suggests a modification in a product. The suggestion is taken up at successively higher levels in the hierarchy (2, 3, 4), until a decision is made at the top (4) to create a task force of analysts and line managers to investigate it and make recommendations (5, 6). Senior management approves the subsequent rec-

ommendations to introduce a new product (7), and implementation proceeds (8, 9). The salesman eventually returns to the customer with the new product (10).

We now have five views or theories of how the organization functions. Which is correct? Clearly, by itself, none is. Each is a gross simplification of organizational reality. Yet each contains a grain of truth. Only by combining them, as we have done in Figure 1-5, do we begin to get a sense of the true complexity of the functioning of the organization. It is this complexity with which we must now deal.

With this foundation laid—our five coordination mechanisms as the glue of structure, our five parts making up our logo or theme diagram, and our point just made about the complexity of the functioning of the organization—we can begin our story of the structuring of organizations. We start with the design parameters, those levers that can be pulled and knobs that can be turned to affect the division of labor and the coordination of

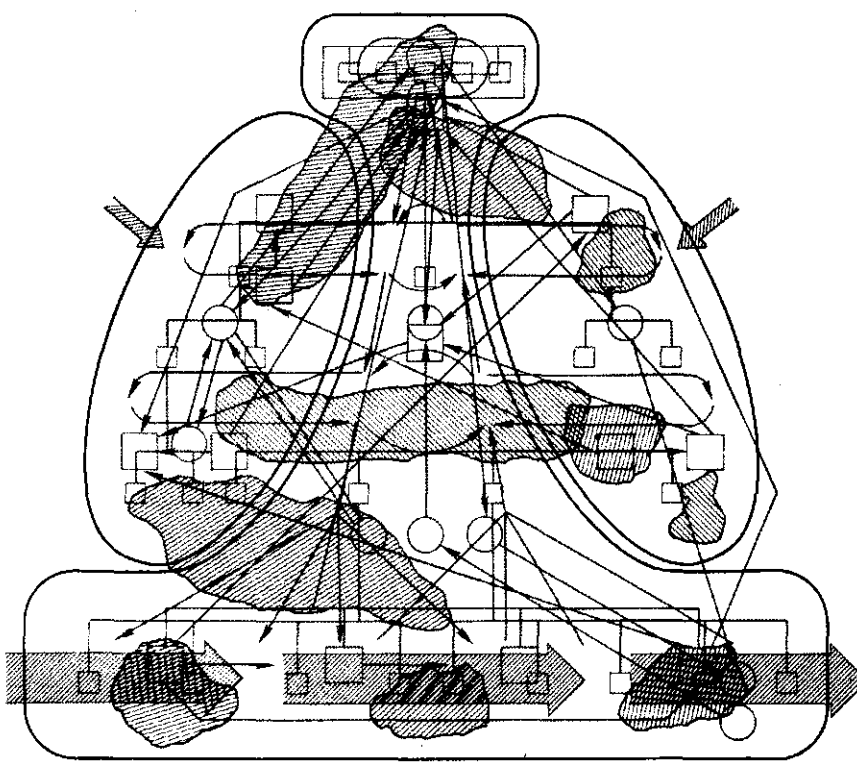


Figure 1-5. *A combined overlay: the functioning of the organization*

tasks in the organization. We discuss these in four chapters, the first on parameters that can be used to design individual positions in the organization, the second on parameters to design the organization's whole superstructure, the third on parameters used to flesh out that superstructure, and the fourth on parameters used to design the decision-making system of the organization (that is, related to its "decentralization").

Then we devote a chapter to the situational factors, in an attempt to put the parameters of design into context. Here we consider how the various design parameters should be influenced by the age and size of the organization, the technical system it uses, the environment in which it operates, and the power relationships that surround and infuse it.

This brings us to the meat of the book, our synthesis of the preceding materials—the configurations. In Chapter 7, we introduce our basic five:

- *Simple Structure,* based on direct supervision, in which the strategic apex is the key part
- *Machine Bureaucracy,* based on standardization of work processes, in which the technostructure is the key part
- *Professional Bureaucracy,* based on standardization of skills, in which the operating core is the key part
- *Divisionalized Form,* based on standardization of outputs, in which the middle line is the key part
- *Adhocracy,* based on mutual adjustment, in which the support staff (sometimes with the operating core) is the key part

Five subsequent chapters discuss each of these configurations at length—its basic combination of design parameters, how it functions, the conditions under which it is appropriately found, and various issues, social as well as managerial, associated with its functioning. The final chapter of the book, titled "Beyond Five," takes up the one unanswered question of this chapter: Is five the magic number in the design of effective organizations?