

need for mutual adjustment with the staff members. In fact, this is exactly what comes out of the Woodward study. Mass-production firms, which she found to have bureaucratic structures, followed this pattern. In contrast, firms in process industries, with organic structures and more extensive staff units, exhibited very narrow spans of control for both first-line supervisors and managers in the center of the middle line.

Finally, what about the size of the staff units themselves? How many staff members can a staff manager supervise? In those support units that do relatively unskilled work—the cafeteria and mailroom, for example—the structure would tend to be bureaucratic and the units therefore large. But what of the other units in the technostructure and support staff? **The factors we discussed earlier indicate small size for most of the professional-type staff units.** The work within these units is complex and, being of a project nature, typically creates interdependences among the professionals. In other words, these staff members are professionals of the second type discussed earlier—namely, those who must function in small interdependent units rather than as independent individuals attached to larger units. Furthermore, the managers of technocratic units must spend a good deal of their time “selling” the proposals of their units in the middle line. Likewise, the support specialists do not work in a vacuum but serve the rest of the organization, and so their managers must spend a good deal of time in liaison with it. In both cases, this reduces the number of people the staff managers can supervise, and so shrinks the average size of staff units.

To conclude, in general we would expect the operating core of the organization to assume a flat shape, the middle line to appear as a cone with progressively steepening sides, and the technostructure and more professional support units to be tall in shape. That is, in fact, the design of our logo, as a quick glance back at Figure 1-2 will illustrate.

## FLESHING OUT THE SUPERSTRUCTURE

Organizational design is not complete when the positions have been established and the superstructure built. At one time, the literature on organizational design stopped here. But contemporary research has made clear the need to flesh out the bones of the superstructure with linkages that are lateral, as opposed to strictly vertical. Two main groups of these linkages have received extensive treatment in the contemporary literature on organizational design—planning and control systems that standardize outputs, and liaison devices that grease the wheels of mutual adjustment. We discuss these in this chapter.

## Planning and Control Systems

The purpose of a plan is to specify a desired output—a standard—at some future time. And the purpose of control is to assess whether or not that standard has been achieved. Thus, planning and control go together like the proverbial horse and carriage: There can be no control without prior planning, and plans lose their influence without follow-up controls. Together, plans and controls regulate outputs and, indirectly, behavior as well.

Plans may specify (standardize) the quantity, quality, cost, and timing of outputs, as well as their specific characteristics (such as size and color). *Budgets* are plans that specify the costs of outputs for given periods of time; *schedules* are plans that establish time frames for outputs; *operating plans* are those that establish a variety of standards, generally the quantities and costs of outputs. Typically, planning systems, as well as the reporting systems that feed back the control information, are designed in the technostructure, by analysts with titles such as Planner, Budget Analyst, Controller, MIS Analyst, Production Scheduler, and Quality Control Analyst.

We can distinguish two fundamentally different kinds of planning and control systems, one that focuses on the regulation of overall performance and the other that seeks to regulate specific actions. Since the former is concerned primarily with *after-the-fact* monitoring of results, we shall call it *performance control*. The latter, oriented to specifying activities that will take place, is labeled *action planning*. In other words, as shown in Figure 4-1, the organization can regulate outputs in two ways. It can use performance control to measure the results of a whole series of actions, and use this information to make changes: "The profit rate should increase from 7 percent to 10 percent," or, "The drilling of holes should be increased from fifty to sixty per day." Alternatively, it can use action planning to determine in advance what specific decisions or actions are required: "Blue widgets should be sold to customers X, Y, and Z," or, "The hole should be drilled 1.108 centimeters wide." As we shall see, whereas performance control is a pure means of standardizing outputs, action planning—because it specifies particular actions—resembles in some ways the design parameter of formalization of behavior.

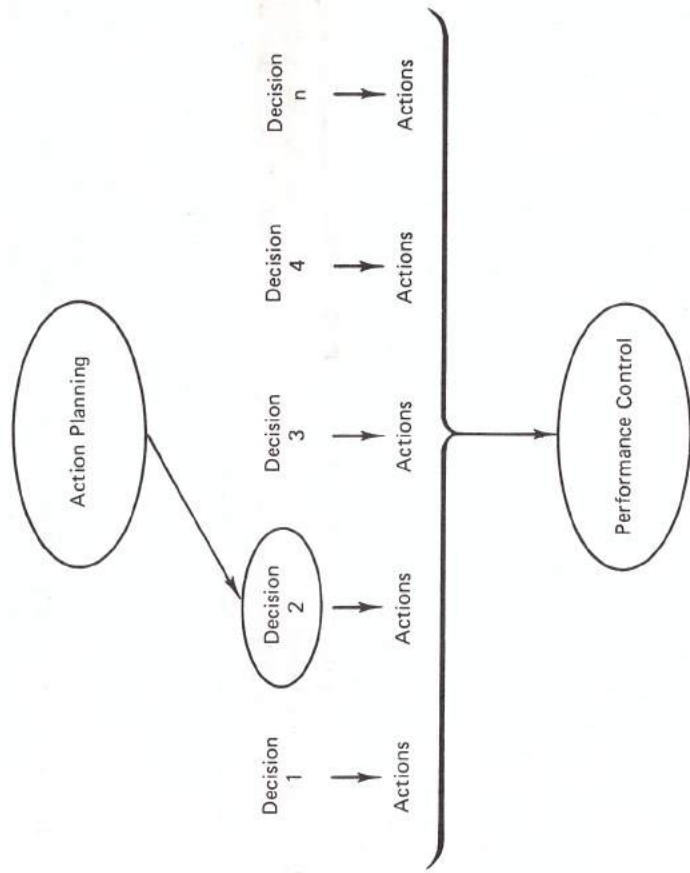


Figure 4-1. The relationships between decisions and action planning and performance control

Performance control

The purpose of performance control is to regulate the overall results of a given unit. Objectives, budgets, operating plans, and various other kinds of general standards are established for the unit, and its performance is later measured in terms of these standards and the results fed back up the hierarchy by the MIS. This suggests two important points: First, performance control systems map onto the bases for grouping in the organization. The planning system establishes output standards for each unit, and the control system assesses whether or not these have been met. Second, performance control is concerned with overall results for given periods of time, not with specific decisions or actions at specific points in time. For example, a performance plan may call for the production of 70,000 widgets in June, or the reduction of costs by 3 percent in July; it does not call for the shift from blue widgets to green ones or the achievement of cost reduction by the purchase of a more efficient machine. Thus, performance control influences decision making and action taking only indirectly, by establishing general targets that the decision maker must keep in the back of his mind as he makes specific decisions in the front.

Where is performance control used in the organization? To some extent, everywhere. Because cost control is always crucial and because costs—at least economic ones—are easily measured, virtually every organizational unit is given a budget—that is, a performance plan to standardize its expenditures. And where the unit's production is easily measured, its performance plan will typically specify this as well. The plant is expected to produce 400,000 widgets this month; marketing is expected to sell 375,000 of them.

But performance control systems are most relied upon where the interdependencies between units are primarily of a pooled nature—namely, where the units are grouped on the basis of market. Here, the major concern is that the unit perform adequately, that it make an appropriate contribution to the central organization without squandering its resources. In other words, because there is little interdependence between units, coordination requires the regulation of performance, not actions. And this is facilitated in the market-based structure by the fact that each unit has its own distinct outputs. Thus, its overall behavior is regulated by performance controls; otherwise, it is left alone to do its own action planning.

Indeed, such performance controls are typically crucial for market-based units. Because they are self-contained, they are generally given considerable freedom to act. Typically, as noted in the last chapter, a great many such units report to a single manager. Without a performance control system, the manager may be unable to catch serious problems, until it is much too late. A wayward Sears store or Bank of America branch could, for example, get lost for years, too small a part of the organization to be

otherwise noticed. And from the perspective of the market unit itself, the performance control system serves to preclude direct supervision and so to grant it the freedom it needs to determine its own decisions and actions. Thus, the conglomerate corporation sets up each of its market units (its "divisions") as a profit or investment center, and holds it responsible for its own financial performance.<sup>1</sup>

**Performance control systems can serve two purposes: to measure and to motivate.** On the one hand, they can be used simply to signal when the performance of a unit has deteriorated. Higher-level management can then step in and take corrective action. On the other hand, they can be used to elicit higher performance. The performance standards are the carrots that management places before the unit manager to motivate him to achieve better results. Whenever he manages a nibble, the carrot is moved a little farther out and the manager runs faster. Systems such as management by objectives (MBO) have been developed to give unit managers a say in the establishment of these standards, so that they will be committed to them and therefore, the theory goes, strive harder to achieve them.

But this motivational aspect introduces a variety of problems. For one thing, given the right to participate in the setting of performance standards, the unit manager has a strong incentive to set the standards low enough to ensure that they can easily be met. And he also has an incentive to distort the feedback information sent up the MIS to make it look as though his unit has met a standard that it, in fact, missed. Second is the problem of choosing the planning period. There is, as noted, no direct link between the performance standards and specific decisions taken; it is only hoped that the manager will bear the standards in mind when he makes decisions. Long planning periods loosen the connection, and short ones defeat a prime purpose of the system—to give the manager freedom of action. The "flash reports" on the tenth of every month used by some corporations certainly keep the manager hopping after short-term results. But do they let him think beyond thirty days? The third problem of motivation arises with standards that cannot be realized for reasons beyond the manager's control—say, the bankruptcy of a major customer. Should the organization insist on honoring the agreement to the letter, and penalize the manager, or should it overrule the performance control system, in which case the system loses a good deal of its motivational punch?

### Action planning

As we have seen, performance control is a key design parameter in market-based structures. But what happens in functional structures? Functional

<sup>1</sup>That is not to say, of course, that a performance control system can never be tight. It can specify so many detailed performance standards that the unit is left little room to maneuver. (We shall see examples of this later.) But, in general, performance controls are used in the market-based structure to maintain only the most general regulation of outputs.

work flows sequentially or reciprocally across them. This means that distinct organizational goals cannot easily be identified with any one unit. So aside from budgets and the like to control expenditures, performance control systems cannot really cope with the interdependencies of functional units. Other means must be found.

As we saw in Chapter 3, direct supervision effected through the superstructure and standardization of work processes effected through behavior formalization emerge as key mechanisms to coordinate the work in functional structures. These are preferred because they are the tightest available coordinating mechanisms. But sometimes they cannot contain all the interdependencies. And so the organization must turn to planning and control systems to standardize outputs, specifically, to action planning. Simon provides a dramatic example of what can happen when action planning fails to coordinate the remaining work-flow interdependencies:

In the first portion of the Waterloo campaign, Napoleon's army was divided in two parts. The right wing, commanded by the Emperor himself, faced Blucher at Ligny; the left wing, under Marshal Ney, faced Wellington at Quatre Bras. Both Ney and the Emperor prepared to attack, and both had prepared excellent plans for their respective operations. Unfortunately, both plans contemplated the use of Erlon's corps to deliver the final blow on the flank of the enemy. Because they failed to communicate these plans, and because orders were unclear on the day of the battle, Erlon's corps spent the day marching back and forth between the two fields without engaging in the action on either. Somewhat less brilliant tactical plans, coordinated, would have had greater success. (1957:193)

Two points should be noted about action planning. First, unlike performance control, action planning does not necessarily respect unit autonomy, nor does it necessarily map onto the system of grouping. Action plans specify decisions that call for specific actions—to market new products, build new factories, sell old machines. Some of the proposed actions may be taken within single units, but others can cut across unit boundaries.

Second, by its imposition of specific decisions, action planning turns out to be a less than pure form of standardizing outputs; more exactly, it falls between that and standardizing work processes. This point can be expressed in terms of a continuum of increasingly tight regulation, as follows:

- *Performance control* imposes general performance standards over a period of time, with no reference to specific actions.
- *Action planning* imposes specific decisions and actions to be carried out at specific points in time.

- *Behavior formalization* imposes the means by which decisions and actions are to be carried out.

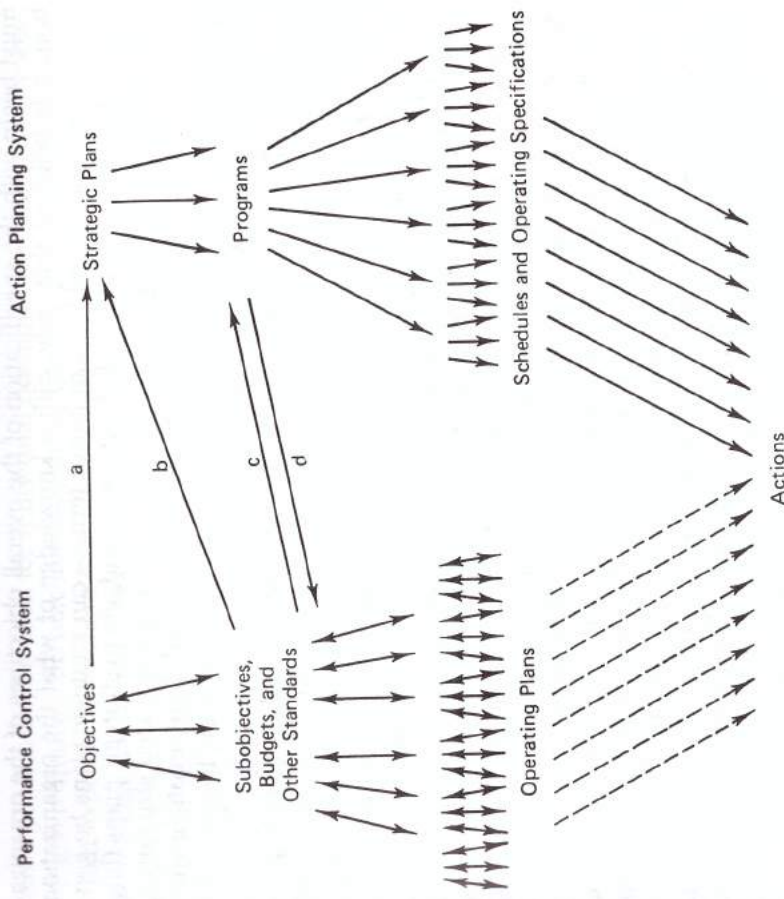
So whereas performance control says, "Increase sales by 10 percent this year [in any way you care to]," action planning says, "Do it by introducing blue widgets." It, too, specifies outputs, but in a way that constitutes the specification of means. At the limit, action planning becomes behavior formalization—namely, the specification of the work flow: ". . . the plan may control, down to minute details, a whole complex pattern of behavior. The completed plan of the battleship will specify the design of the ship down to the last rivet. The task of the construction crew is minutely specified by this design" (Simon, 1957:231).

**Action planning emerges as the means by which the nonroutine decisions and actions of an entire organization, typically structured on a functional basis, can be designed as an integrated system.** All this is accomplished in advance, on the drawing board so to speak. Behavior formalization designs the organization as an integrated system too, but only for its routine activities. Action planning is its counterpart for the nonroutine activities, for the changes. It specifies who will do what, when, and where, so that the change will take place as desired.

### *The hierarchy of action planning and performance control systems*

How do these two planning and control systems relate to the superstructure and to each other? Figure 4-2 shows performance control and action planning as two separate hierarchical systems, with certain "crossovers" between them. Performance control is shown as a system in which overall objectives at the top give rise to subobjectives, budgets, and other output standards, which in turn are elaborated into ever more detailed subobjectives, budgets, and standards until they emerge at the bottom of the structure as operating plans. The final outcome is, of course, organizational actions, but the connection between the plans and the actions is shown as a series of dotted lines to indicate that it is only indirect.

The arrows in the diagram are two-sided, to indicate that the performance control system may be not only top-down—where objectives decided at the strategic apex are elaborated into ever more detailed performance standards as they pass down the hierarchy—but also bottom-up, where the units at the bottom establish their own performance standards, and these are then aggregated up the hierarchy by unit, until they emerge at the strategic apex as composite standards—in effect, objectives for the whole organization. In actual practice, however, we would expect the performance control system to function most commonly, not in a purely top-down or bottom-up manner, but in a combination of the two. Some performance standards are elaborated down the hierarchy and others are aggregated up



**Figure 4-2.** *Hierarchy of planning and control systems*

it; at each level, managers seek to impose standards on their employees, who propose less stringent ones instead. Through this kind of bargaining, there emerges a set of performance standards at all levels, composite and detailed.

The action planning system is essentially top-down. In theory, it begins with strategic planning, wherein the organization systematically assesses its strengths and weaknesses in terms of trends in the environment, and then formulates an explicit, integrated set of strategies it intends to follow in the future. These strategies are then developed into "programs," that is, specific projects—such as introducing a new product line, building a new factory, reorganizing the structure. These programs are, in turn, elaborated and scheduled, and eventually emerge as a set of specific operating specifications—to call on a customer, pour concrete, print an organigram—which evoke specific actions directly.

As shown in Figure 4-2, these two systems can be linked. At the top (line *a*), there is a crossover from performance objectives to strategic plans. According to the conceptual literature, the whole action planning process

must begin with the specification of the overall objectives of the organization: it is believed that only with a knowledge of what the organization wants—operationalized in quantitative terms—can strategic plans be generated. The crossover from subobjectives or budgets to strategic plans (line *b*) is similar. Where there is unit autonomy, as in market-based structures, the strategic apex may develop overall objectives and then negotiate subobjectives and budgets with each of the units. These then become the objectives that initiate the action planning process in each unit.

A crossover also takes place from subobjectives and budgets to programs directly, shown by line *c*. This is more common in a functional structure, where a budget given to a department evokes specific programs rather than overall strategies. Thus, when the research department is told that its budget will be increased by \$300,000 next year, it proceeds with plans to build the new laboratory it has been wanting.

The last crossover (line *d*) runs from programs to budgets and eventually to operating plans. This reflects the fact that the unit must assess the effect of all its proposed actions—the products to be marketed, machines to be bought, and so on—on its flow of funds (its budgets), the subobjectives it can reach, the manpower it must hire, and so on. In other words, the effect of specific actions on overall results must be assessed, hence the crossover from action planning to performance control.

Another crossover—perhaps the most important one, but not shown because of the nature of our diagram—is the overall feedback from performance control to action planning. As the organization assesses its performance, it initiates new action plans to correct the problems that appear.

### *Planning and control systems by part of the organization*

Various forms of both action planning and performance control can be found at all levels of the hierarchy. In the case of the former, we have strategic planning and capital budgeting at the strategic apex and upper levels of the middle line, programming and PERT or CPM scheduling techniques at the middle levels, and production scheduling at the level of the operating core. In the case of performance control, we have already seen that objectives, budgets, and standards can be set for units and positions at any level, from the strategic apex to the operating core. At the top is the setting of overall organizational objectives; high up in the middle line are commonly found the financial reporting systems that treat major market units as profit or investment centers; elsewhere in the middle line are the standard costing systems to control aggregated performance and MBO systems to motivate line managers; and near the bottom, we find the operating plans and quality control systems.

However, our discussion also made clear that there are important differences by part of the organization. For example, although perfor-

mance control can be used for individual positions—as when salespeople are given quotas, or machine operators quality control standards—we would expect it to be more commonly applied to units (and, of course, to the managers who supervise those units). Not so for action planning. We would expect action planning to apply to individual operators, as when a machinist is given specifications for the products he is to make.

Higher up in the hierarchy, we would expect the situation to be reversed. **The more global the responsibilities of a unit, the greater the propensity to control its overall performance rather than its specific actions.** For market-based units, as noted earlier, the performance control system is a critical device for control, whereas action planning is not. And since, as noted in the last chapter, the market basis for grouping is more common at higher than at lower levels in the structure, we find another reason why performance control would be favored over action planning in the upper reaches of the middle line. Of course, action planning systems may also be used at these levels where the basis for grouping is functional. As for the strategic apex, should it be subject to outside control (say, by a single owner), it may also have to respond to a performance control system. And if the basis for grouping the highest-level units is functional, then action planning may very well start right in the strategic apex.

Even though the technostucture is largely responsible for the design of all these planning and control systems, that does not mean that its own work is regulated by them. In fact, owing to the difficulty of standardizing the outputs of analytic work—activity that is usually carried out on a project or ad hoc basis—we would expect little use of performance controls in the technostucture. As for action planning, again the technocratic units do a good deal of it but seem to be only marginally affected by it themselves.

We would expect the use of planning and control systems to vary considerably in the support staff. Only those units that act as relatively autonomous entities and that have easily measured outputs—such as the cafeteria in the plant or the bookstore in the university—can be controlled primarily by performance standards. Some staff units with important interdependencies with other parts of the organization—such as the research department in the corporation—may be subject to action planning, at least to the extent that the line departments they serve are so subjected. And others, such as legal council, may experience little in the way of any planning and control system.

## **Liaison Devices**

Often, neither direct supervision nor all three forms of standardization are sufficient to achieve the coordination an organization requires. In other words, important interdependencies remain after all the individual posi-

tions have been designed, the superstructure built, and the planning and control systems set in place. The organization must then turn to mutual adjustment for coordination. A customer complaint about poor service may, for example, require the sales and manufacturing managers to sit down together to work out new delivery arrangements.

Until recently, this kind of mutual adjustment was left largely to chance; at best, it took place informally, outside the formal organizational structure. But in recent years, **organizations have developed a whole set of devices to encourage liaison contacts between individuals, devices that can be incorporated into the formal structure.** In fact, these *liaison devices* represent the most significant contemporary development in organization design—indeed, the only serious one since the establishment of planning and control systems a decade or two earlier.

Since the 1960s, the popular literature of management has heralded each new liaison device as a major discovery. First it was “task forces,” then “matrix structure,” later the “integrators.” But the reader was left in confusion: Were these just different names for the same phenomenon, or was each, in fact, a distinctly new contribution? And if so, did each bear any relation to the others? The writings of Jay Galbraith (1973) have resolved many of these problems. Galbraith proposed a continuum of these liaison devices, from the simplest to the most elaborate: direct contact between managers, liaison roles, task forces, teams, integrating roles, managerial linking roles, and matrix organization. For purposes of our discussion, Galbraith’s scheme has been reduced to four basic types of liaison devices—liaison positions, task forces and standing committees, integrating managers, and matrix structure.

### *Liaison positions*

**When a considerable amount of contact is necessary to coordinate the work of two units, a “liaison” position may be established formally to route the communication directly, bypassing the vertical channels.** The position carries no formal authority, but because the incumbent serves at the crossroads of communication channels, he emerges as a nerve center of the organization with considerable power. Note that this power is informal, deriving from knowledge, not status. Some liaison positions serve between different line units—for example, the engineering liaison man who is a member of the engineering department but is physically located in the plant, the sales liaison person who mediates between the field sales force and the factory, or the purchase engineer who sits between purchasing and engineering. The latter are “instantly available to provide information to engineers whenever they need help in choosing components. They assist in writing specifications (thus making them more realistic and readable) and

help expedite delivery of laboratory supplies and material for prototype models” (Strauss, 1962-63:180-81). Other liaison positions join line and staff groups; for example, the personnel specialists and accountants who counsel line departments while remaining responsive to their technocratic homes.

### *Task forces and standing committees*

The meeting is the prime vehicle used in the organization to facilitate mutual adjustment. Some meetings are impromptu; people bump into each other in the hall and decide to have a “meeting.” Others are scheduled on an ad hoc basis, as required. When the organization reaches the point of institutionalizing the meeting—that is, formally designating its participants, perhaps also scheduling it on a regular basis—the meeting may be considered to have become part of the formal structure. This happens when extensive and fairly regular contact—at least for a period of time—is required between the members of various units to discuss common concerns. Two prime liaison devices are used to institutionalize the meeting. **The task force is a committee formed to accomplish a particular task and then disband. In contrast, the standing committee is a more permanent interdepartmental grouping, one that meets regularly to discuss issues of common interest.** Many standing committees exist at middle levels of the organization, and others are formed at the strategic apex, a common one being the executive committee.

### *Integrating managers*

**When more coordination by mutual adjustment is required than liaison positions, task forces, and standing committees can provide, the organization may designate an integrating manager—in effect, a liaison position with formal authority.** A new individual, sometimes with his own unit, is superimposed on the old departmental structure and given some of the power that formerly resided in the separate departments. Integrating managers can include brand managers in consumer-goods firms, responsible for the production and marketing of particular products; project managers in aerospace agencies, responsible for integrating certain functional activities; unit managers in hospitals, responsible for integrating the activities of doctors, nurses, and support staff in particular wards, and so on.

**The formal power of the integrating manager always includes some aspects of the decision processes that cut across the affected departments, but it never (by definition) extends to formal authority over the departmental personnel.** (That would make the person department manager instead of integrating manager.) To control their behavior, therefore, the

integrating manager must use his decisional authority and, more important, his powers of persuasion and negotiation. Galbraith lists three stages in the extension of the decisional power of the integrating manager. First, he can be given power to approve completed decisions—for example, to review the budgets of the departments. Second, he can enter the decision process at an earlier stage—for example, to draw up in the first place the budget that the departments must then approve. Third, he can be given control of the decision process, as when he determines the budget and pays the departments for the use of their resources.

Consider the brand manager in a consumer-goods firm. He is a kind of mini-general manager, responsible for the success of a single product. His performance is measured by how well it does in the marketplace. He must understand purchasing, manufacturing, packaging, pricing, distribution, sales, promotion, advertising, and marketing, and must develop plans for the brand, including sales forecasts, budgets, and production schedules. But the brand manager has no direct authority over the marketing or manufacturing departments. Rather, along with all the other brand managers of his firm, he negotiates with manufacturing to produce his brand and with marketing to sell it. If, however, he controls the budget for his brand, and has discretion in the use of it—for example, to contract its manufacture to different plants—he may have considerable power.

Whereas the brand manager is concerned with an existing or ongoing product, the project or program manager is concerned with bringing a new or embryonic undertaking to fruition—say, a new product or new facility. In both these cases, integrating managers with market orientations have been superimposed on functional structures to achieve work-flow coordination. But integrating managers with functional orientations can also be superimposed on market-based structures to encourage specialization, as when a manager concerned with the quality of programming is overlaid on a data-processing department formally organized on a project basis.

The job of integrating manager is not an easy one, the prime difficulty being to influence the behavior of people over whom he has no formal authority. The brand manager, for example, must persuade the manufacturing department to give priority to the production of his product and must encourage the sales department to promote his brand over the others, and the programming manager must encourage the programmers who report formally to project managers to increase the quality of their work. As Galbraith notes, what the integrating manager has at his command are contacts, information gained from serving at the crossroads of different channels, and the capacity to build up confidence and to encourage more effective decision making because of his broader perspective. The effective integrating manager appears to require a high need for affiliation and an ability to stand between conflicting groups and gain the acceptance of both without being absorbed into either.

### Matrix structures

No single basis for grouping can contain all the interdependencies. Functional ones pose work-flow problems, market-based ones impede contacts among specialists, and so on. Standardization achieved through formalization of behavior, training and indoctrination, or planning and control systems can sometimes alleviate the problem, but important interdependencies often remain.

In our discussion to this point, we have seen at least three ways in which organizations handle this problem. These are shown in Figure 4-3. The first is to contain the residual interdependencies at the next higher level in the hierarchy; the second is to deal with the residual interdependencies in staff units (a dual structure is built—one line with the formal authority to decide, that contains the main interdependencies, the other staff, which advises on the residual interdependencies, as when market researchers or financial analysts advise the different product managers to help them coordinate their activities functionally); the third is, of course, to use one of the liaison devices already discussed, the organization in effect

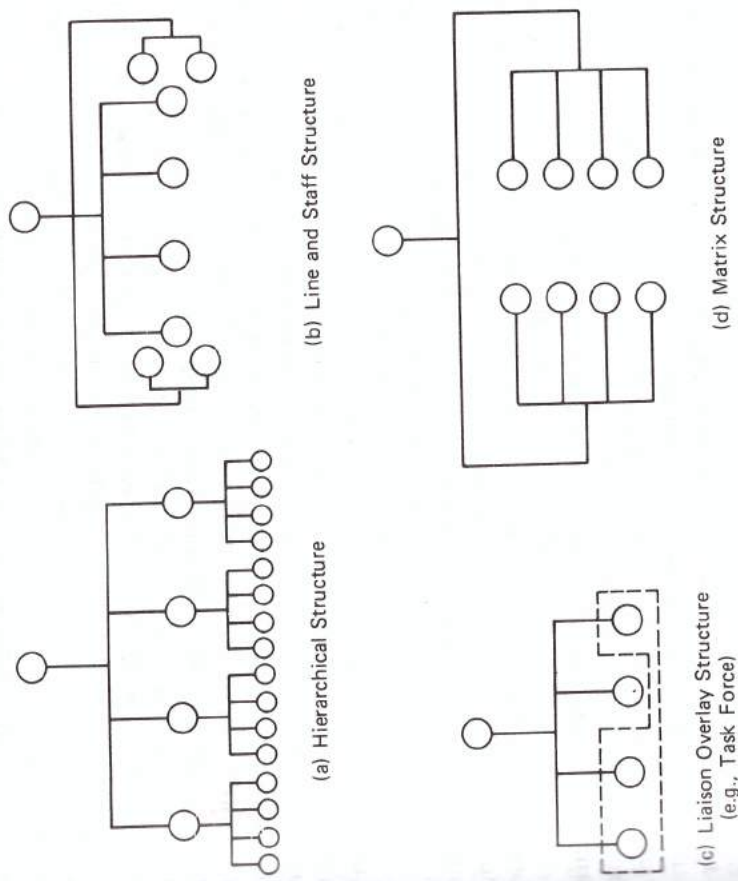


Figure 4-3. Structures to deal with residual interdependencies

preserving its traditional authority structure but superimposing, say, task forces to deal with the residual interdependencies.

Each one of these solutions favors one basis of grouping over another. Sometimes, however, the organization needs two (or even three) bases of grouping in equal balance. For example, an international firm may not wish to favor either a geographical or a product orientation in its structure, or a data-processing department or advertising agency may not wish to make a choice between a project orientation and an emphasis on specialization. Galbraith cites the case of the high-technology company whose products were undergoing continual change. Some managers argued for product divisions to deal with the complex problems of scheduling, replacing, and managing the new products, but others objected. The engineering manager felt that this would reduce the influence of his people just when he was experiencing morale and turnover problems. Management needed a product orientation as well as an improvement in the morale of the key specialists, both at the same hierarchical level. In these cases, organizations turn to the ultimate liaison device—*matrix structure*.

**By using matrix structure, the organization avoids choosing one basis of grouping over another; instead, it chooses both.** "In the simplest terms, matrix structure represents the effort, organizationally speaking, to 'have your cake and eat it, too'" (Sayles, 1976:5). But in so doing, the organization sets up a dual authority structure. As a result, **matrix structure sacrifices the principle of unity of command.** As shown in Figure 4-3(d), formal authority comes down the hierarchy and then splits, creating joint responsibilities and doing away with the notion of an unbroken chain of authority. To the classical writers, dual authority was anathema; it violated the principles and destroyed the neatness of the structure.<sup>2</sup> But as Galbraith notes, dual authority is hardly foreign to us: "Almost all of us were raised in the dual authority system of the family . . ." (1973:144). Similarly, in the matrix structure, different line managers are equally and jointly responsible for the same decisions and are therefore forced to reconcile between themselves the differences that arise. A delicate balance of power is created. To return to our example of the advertising agency, if the specialists need to be oriented to projects yet insist on being evaluated by their own kind, then matrix structure would have the evaluation decision made jointly by project and functional managers.

This balance of formal power is what distinguishes matrix structure from the other means of handling residual interdependencies, including the other liaison devices. It is one thing to have four product managers, each with a manufacturing, marketing, engineering, and personnel manager reporting to him, or four integrating managers, each seeking to coordinate

<sup>2</sup>Frederick Taylor was a notable exception. His calls for functional authority of staff personnel were in this sense prophetic.

minate the work of four functional managers with the line authority, or even to combine the latter into market-based task forces; it is quite another thing to force the product and functional managers to face each other, as in Figure 4-3(d), with equal formal power.

Nevertheless, Sayles (1976) notes in his review of matrix structure that in many contemporary organizations, the alternatives to it are simply too confusing:

There are just too many connections and interdependencies among all line and staff executives—involving diagonal, dotted, and other "informal" lines of control, communication, and cooperation—to accommodate the comfortable simplicity of the traditional hierarchy, be it flat or tall. . . .

Many companies, in fact, tie themselves in semantic knots trying to figure out which of their key groups are "line" and which "staff." (pp. 3, 15)

Sayles goes on to suggest that matrix structure is for organizations that are prepared to resolve their conflicts through informal negotiation among equals rather than recourse to formal authority, to the formal power of superiors over subordinates and line over staff. In effect, he seems to be telling us—picking up on Galbraith's point about the family—that matrix structure is for grown-up organizations. In fact, he believes that a great many organizations have already adopted some form of matrix structure, even if not in name.

**Two kinds of matrix structures can be distinguished: a permanent form, where the interdependencies remain more-or-less stable and so, as a result, do the units and the people in them; and a shifting form, geared to project work, where the interdependencies, the market units, and the people in them shift around frequently.** An example of *permanent matrix structure* can be found in the administration of some cities, where the functional citywide departments of parks, police, health, and so on, coordinate with the administrators of specific wards, and the two are jointly responsible for ensuring the quality of services to the city population. Some international companies have also moved toward this type of structure, typically putting the managers of geographical regions face to face with the managers of worldwide product lines. Reporting to both is a regional product manager, to whom in turn the functional managers report, as shown in Figure 4-4. A characteristic of the permanent matrix structure, evident in Figure 4-4, is that the chain of authority, once split, may reunite again, so that while one manager reports to two above him, his own subordinates report only to him.

The *shifting matrix structure* is used for project work, where the outputs change frequently, as in aerospace firms, research laboratories, and consulting think tanks. In these cases, the organization operates as a set of project teams (in effect, temporary market-based units) that draw their



demands that people have to spend far more time at meetings, discussing rather than doing work, than in a simpler authority structure. There simply is more communicating to be done, more information has to get to more people . . ." (Knight, 1976:126). Moreover, as we shall soon see, matrix structure requires many more managers than traditional structures do, thereby pushing up the administrative costs considerably.

#### A continuum of the liaison devices

Figure 4-5 summarizes our discussion of these four liaison devices—liaison positions, task forces and standing committees, integrating managers, and matrix structure. Again, the idea is borrowed from Galbraith and then modified. The figure forms a continuum, with pure functional structure at one end (that is, functional structure as the single chain of line authority) and pure market structure at the other. (Again, any other basis for grouping could be put at either end.) The first and most minor modification to either of the pure structures is the superimposition of liaison positions on it. Such positions generate a mild market orientation in the functional structure or a mild functional orientation in the market structure, thereby reducing slightly the informal power of the line managers (as shown by the diagonal line that cuts across the figure). A stronger modification is the superimposition of task forces or standing committees on either of the pure structures; the strongest modification, short of dispensing with the principle of unity of command, is the introduction of a set of integrating managers. As we have seen, such managers are given some formal decisional power—for example, control of important resources—and acquire considerable informal power. But the other managers, whether functional or market, retain their traditional line authority, including that over the personnel. Finally, standing midway between the two pure structures of Figure 4-5 is matrix structure, which represents an equal balance of power between the two. Dual authority replaces unity of command.

#### The liaison devices and the other design parameters

At a number of points, our discussion has hinted at the relationships between the liaison devices and the design parameters we have already discussed. Now let us focus on these relationships, looking first at the superstructure and then at the individual positions.

It is clear that the liaison devices can be used with any basis for grouping, since they are designed to override the limitations of using only a single one. Nevertheless, a review of the examples in the literature suggests that these devices are most often superimposed on functional groupings to introduce an orientation to markets.

As for unit size, as we saw earlier, liaison devices are the tools to

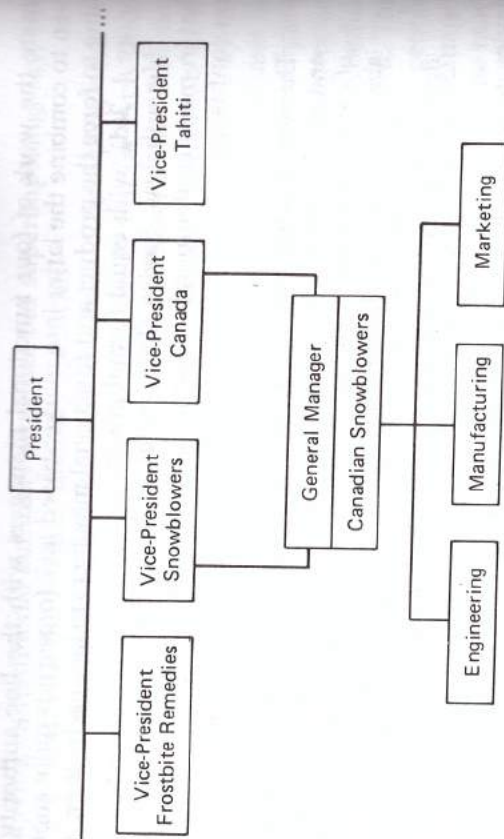


Figure 4-4. A permanent matrix structure in an international firm

members from the functional departments, which serve various "house-keeping" purposes. The National Aeronautics and Space Administration (NASA) has been a well-known user of such a structure. A fundamental characteristic of the teams used in the shifting matrix structure is that their leaders are full-fledged managers (of the market units), with formal authority (jointly shared with the managers of the functional units) over their members. That is what distinguishes them from the leaders of the task forces and the integrating managers described earlier. Those liaison devices were superimposed on a traditional line structure. This structure is matrix precisely because the task-force leaders take their place alongside the functional managers, sharing power equally with them.

Matrix structure has its share of problems. Although it seems to be a most effective device for developing new activities and for coordinating complex multiple interdependencies, it is no place for those in need of security and stability. Dispensing with the principle of unity of command creates considerable confusion, stress, and conflict, and requires from its participants highly developed interpersonal skills and considerable tolerance for ambiguity. There is also the problem of maintaining the delicate balance of power between the different sorts of managers. A tilt in one direction or the other amounts to a reversion to a traditional single-chain hierarchy, with the resulting loss of the benefits of matrix structure. However, a perfect balance without cooperation between the different managers can lead to so many disputes going up the hierarchy for arbitration that top management becomes overloaded. Then there is the problem of the cost of administration and communication in these structures. "The sys-

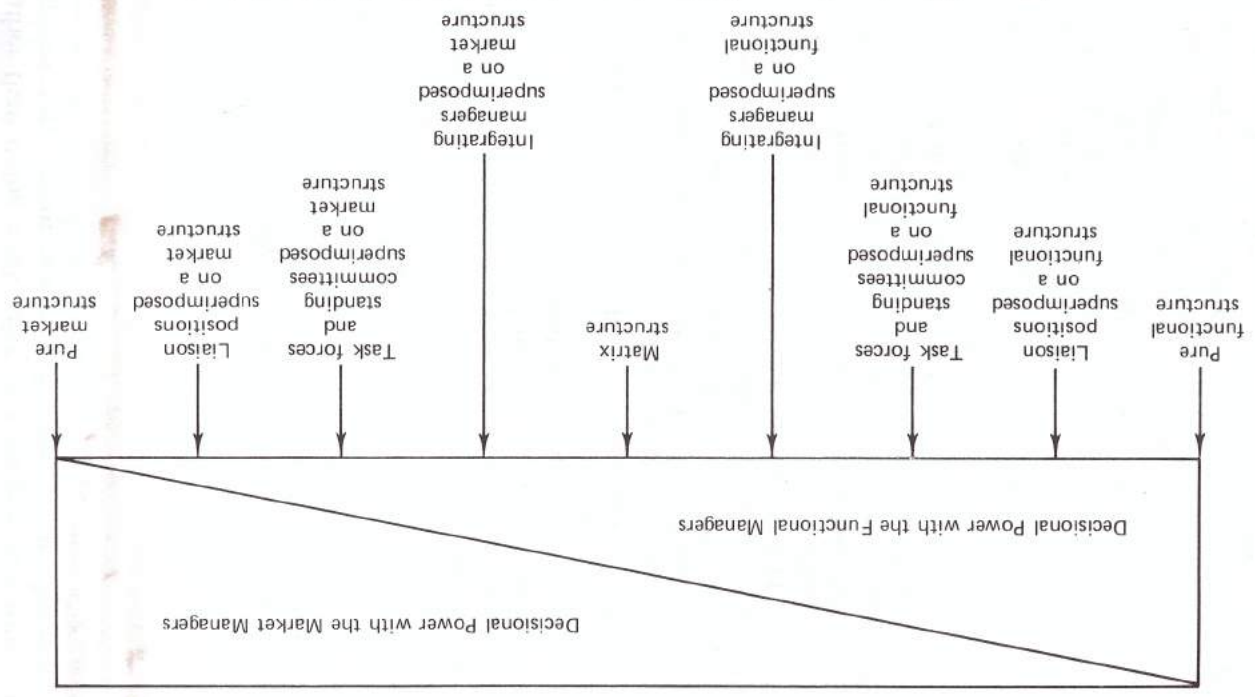
encourage mutual adjustment by informal communication, and as we noted in Chapter 3, such communication requires face-to-face work groups of small size. Hence, we would expect that **the greater the use of the liaison devices, the smaller the average size of organizational units.** This should be especially pronounced for task forces and standing committees, as well as for temporary matrix structures, where the essential work is carried out in groups. Were we to consider the number of managers in- stead of unit size, the effect of the liaison devices should be even more pronounced. The addition of integrating managers ups the proportion of managers to nonmanagers significantly; the switch to matrix structure means the doubling of managers, more or less,<sup>3</sup> since many employees now have two bosses. So **certain of the liaison devices, especially matrix structure, result in a proliferation of the managers in the organization.**

Turning to the design of the individual positions, we would expect the liaison devices to be used where the organization cannot standardize its behaviors but must instead rely on mutual adjustment to coordinate its activities. In other words, there is less need for informal communication in bureaucratic structure, which means that **the liaison devices are tools primarily of organic structures.** They are flexible mechanisms to encourage loose, informal relationships. No doubt the milder liaison devices—liaison positions, task forces, and standing committees, those near the ends of the Figure 4-5 continuum—are sometimes superimposed on bureaucratic structures to reduce their inflexibility in places. But the use of the stronger liaison devices—integrating managers and matrix structure—so upset the traditional patterns of formalized behavior that the resulting structure can no longer be thought of as bureaucratic.

**The liaison devices are generally used where work is, at the same time, (1) horizontally specialized, (2) complex, and (3) highly interdependent.** If the work were not both horizontally specialized and interdependent, close coordination would not be necessary and the liaison devices would not be used. And if the work were not complex, the necessary coordination could be achieved largely by direct supervision or the stan- dardization of work processes or outputs. Complex work can, of course, be coordinated by standardizing the skills used to do it—but only as long as the interdependencies are not great. Past some point of interdependence among specialized complex tasks, mutual adjustment is mandatory for coordination, and so the liaison devices are called upon to coordinate them.

<sup>3</sup>Assuming, that is, that nothing else changes. In the sense that those two managers must spend considerable time communicating with each other instead of supervising their em- ployees, we might expect more rather than less. But in the sense that two people share the supervisory duties, we might expect less. To confound the issue, we shall see below and in Chapter 12 that matrix structure is associated with work that needs little direct supervision but intimate managerial involvement.

Figure 4-5. A continuum of liaison devices (similar to Galbraith, 1973:114)



Of course, specialized complex tasks are professional ones, and so we should find a relation between professionalism (as well as training) and the use of the liaison devices. Indeed, many of our examples in this chapter have come from organizations that rely on professional expertise—air-space agencies, research laboratories, and the like. Earlier it was suggested that there could be two kinds of professional organizations, one where the professionals function independently as individuals, and the other where they work together in groups. Now we see that the liaison devices are key design parameters in this second type of professional organization.

As for the relation between liaison devices and planning and control systems, to some extent at least, the use of these two lateral linkages is apt to be mutually exclusive. Unable to contain task interdependencies by the design of both individual positions and the superstructure, the organization would rely either on the standardization of outputs or the use of the devices of mutual adjustment. Consider, for example, how Sayles describes the organization that uses matrix structure. Its introduction of multiple sources of authority presupposed that its decisions "cannot be made by a well-programmed computer or small, expert planning groups" (1976:15); its "goals are, at once, multiple and conflicting and changing" (p. 16); the nature of its work interdependencies are such that "no accounting model" (p. 15) can balance the range of forces present in it. Rather, "the matrix forces decision making to be a constant process of interchange and trade-off, not only between the overall system and its specialized components and interest groups, but also between and among the specialists in the interest groups themselves" (p. 17). Clearly, planning and control systems cannot flourish in such an organization. In particular, performance control systems inappropriately require stable goals and units with only pooled interdependencies. And although some action planning may be feasible to deal with unit interdependencies, it must be general enough to allow for considerable adaptation through mutual adjustment. NASA used action planning to lay out the general schedule of the Apollo project, but so much additional coordination and adaptation were required that the space agency emerged from the project as a leader in the use of the liaison devices.

*Liaison devices by part of the organization*

**The liaison devices appear to be best suited to the work carried out at the middle levels of the structure, involving many of the line managers as well as staff specialists.** A standing committee may meet weekly to bring together the plant superintendent, sales manager, and head of purchasing; an engineer may be designated to a liaison position between a staff group in research and the line marketing department; a task force may be created, drawing middle-level members from the accounting, manufacturing, en-

gineering, and purchasing departments, to investigate the feasibility of purchasing new equipment. And matrix structure, especially of the permanent kind, is commonly used where the power of middle-line managers representing two different bases for grouping must be balanced.

In general, given the nature of the work of middle managers—largely ad hoc but somewhat amenable to structure—we would often expect the set of liaison devices to be a most important design parameter of the middle line. At the very least, meetings abound in this part of the organization, many of them bringing together task forces and standing committees. Similarly, within staff units doing specialized, complex, and highly interdependent work—both in much of the technostucture and the upper levels of the support staff—we would expect the set of liaison devices to be a prime design parameter. Task forces and shifting matrix structure are especially well suited to the project work that often takes place in the technostucture. For example, a management science department may base its specialists in homogeneous groups (cost analysts, statisticians, economists, and so on) but deploy them in project teams to do their studies. And as we shall see later, organizations with many staff groups in close contact with middle-line units make such heavy use of the liaison devices that the staff/line distinction can break down and their three middle parts emerge as one amorphous mass of mutual-adjustment relationships.

As noted in earlier chapters, work in the operating core is coordinated primarily by standardization, with direct supervision as the backup coordinating mechanism. But in cases where the operating core is manned by professionals whose work interdependencies require them to function in teams—as in research centers and creative film companies—mutual adjustment is the key coordinating mechanism, and task forces and shifting matrix structures key design parameters.

Some use is also made of the liaison devices at the strategic apex. As we have seen, standing committees are common among senior managers; task forces are also used sometimes to bring them together with middle-line managers as well as senior staff personnel; likewise, liaison positions are sometimes designated to link the strategic apex to other parts of the organization, as when a presidential assistant is designated to maintain contact with a newly acquired subsidiary. But wider use of the liaison devices at the top of the organization is probably restricted by the very fluid and unprogrammed nature of the work there. Even the flexible liaison devices are simply too structured. As I have found in my own research, top managers often seem to prefer the informal telephone call or the impromptu meeting to the task force with its designated membership or the standing committee that meets on a regular basis.

CORBA BC  
STRUCTURE / TECH