Feature Article

Organizational Design: A Survey and an Approach

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The purpose of this paper is to review the major concepts underlying the proper design of an organizational structure for a business firm. It provides a review of the various managerial processes to support decision making in an organization. It discusses the major organizational archetypes (functional, divisional, and matrix organizational forms); presents a brief historical overview of various organizational theories; and finally concludes with recommendations of steps to be undertaken in the design of an organizational structure.

OPERATIONS RESEARCH has generally ignored issues of organizational structure. This is unsurprising since organizational theory today is "soft" and largely lacks a quantitative structure that would lend itself to mathematical models. Yet the omission is unfortunate since, as we shall argue later, a new strategic plan for an organization (as might come out of an Operations Research study) may, unbeknownst to its authors, require a major organizational change for successful execution. Even more fundamental, the scientific study of organizational behavior is bringing forth basic knowledge that has important normative implications. One can apply the Operations Research paradigm of theory, alternatives, criteria, evaluation, and choice to the question of organizational design and that is just what we shall do in this paper. The paper consists of a review of organizational theory and a suggested design methodology. The methodology is qualitative as befits the state-of-the-art but has a decision-making Operations Research orientation and provides a structure for analysis within which more traditional Operations Research models will often prove useful at the evaluative stage.

WHAT IS AN ORGANIZATION?

Organizations are formed whenever the pursuit of an objective requires the realization of a task that calls for the joint efforts of two or more individuals. We can identify the following major components in the definition of an organization (Galbraith [1977]):

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—Organizations are composed of individuals and groups of people
—Seeking the achievement of shared objectives,
—Through division of labor,
—Integrated by information-bound decision processes,
—Continuously through time.

Organizations are developed around the concept that a complex task can be subdivided into simpler components by means of division of labor. The design of a structure to attain the organizational goals requires addressing two primary issues: how to perform this division of labor, and how to coordinate the resulting tasks.

ORGANIZATIONAL DESIGN: DEFINING THE STRUCTURE OF FORMAL ORGANIZATIONS

The purpose of this paper is to suggest a methodology to design the structure of formal organizations. We will concentrate our attention on the design of formal organizations in business firms. However, the issues and methodologies presented appear to be extendable to other forms of organizations.

The central notion we adopt is derived from the contingency theory of organizational design, which states that there is no single set of principles to shape the structure of an organization. Rather, each organization should develop its structure in tune with its internal characteristics, and the relationships with its environment. Therefore, from the outset, we are forced to recognize that the question of organizational design does not admit a simple answer. There is no mechanistic "how to do" recipe. Instead, this paper outlines the basic concepts of design that can be translated into broad guidelines to support the task of structuring an organization.

WHAT IS THE ORGANIZATIONAL STRUCTURE? SCOPE OF THIS PAPER

The organizational structure may be defined as "the relatively enduring allocation of work roles and administrative mechanisms that creates a pattern of interrelated work activities, and allows the organization to conduct, coordinate, and control its work activities" (Jackson and Morgan [1978]). Thus, this structure is not only a hierarchical allocation of authorities and responsibilities. It encompasses all the managerial processes that concur in the realization of the tasks undertaken by the organization. Usually, these processes give rise to formal managerial systems among which we can cite: the strategic and operational planning systems, the communication and information system, the motivation and reward system, and the management control system. The nature of the interdependence between structure and processes is examined in Section 1.

The major organizational archetypes (functional, divisional, and matrix), are discussed in Section 2. Although in practice we seldom encounter actual organizations structured in accordance with these pure archetypes, it is useful to reflect on their advantages and disadvantages to gain some insights into the question of organizational design.

In Section 3, a brief historical overview is presented. The classical theory, the human relations theory, the organization decision-making theory, and the contingency theory are discussed. The notion of contingency is central in the formulation of a unitary concept of design that calls for *segmentation* of an organization into units, *differentiation* of units to adapt to unique environmental conditions, and *integration* of units to insure a coordinated pursuit of the organization objectives.

The primary recommendations for organizational design emerge in Section 4, which addresses both the *basic* and *detailed* organizational design tasks. The basic structure is heavily dependent upon the strategic positioning of the organization, while the detailed structure is more related with operational matters. The need to fit structure and managerial processes to the strategic and operational demands of the organization is also discussed in that section.

Finally, Section 5 briefly covers some of the symptoms that can be detected in firms which exhibit inadequate organizational structures.

1. AN OVERALL PERSPECTIVE FOR ORGANIZATIONAL DESIGN

The study of the organizational structure must give proper attention to the complex web of relationships and mutual conditioning between structure and all other elements of the organization. The purpose of this section is to identify and briefly describe the principal components of an organization, in order to position the notion of structure in its relation with other management support systems of the firm: the organizational structure, the planning system, the management control system, the information and communication system, and the evaluation and reward system (see Figure 1).

Changes exercised in any one of these systems call for an immediate adjustment on the other related systems to obtain a sound *balance* of the overall managerial process. For instance, the switch from a functional to a divisional organizational structure calls for a comprehensive review of the accounting process (which is the primary layer of the management control system), thorough change in the character of managerial accountabilities reflected in the reward system, a basic modification of the planning system, and a full review of the information system of the organization. Thus, we should give a word of caution. Though our major concern will be to deal with organizational structure problems, one should not fall into the trap of thinking that decisions aimed at changing a given structure can be conducted in isolation from the major decision support systems.

Our primary thesis, to be developed in detail throughout the paper, is that a proper organizational structure should recognize the strategic positioning of the firm, as well as facilitate its operational efficiency. It is not only the planning function that deals with strategic and operational matters, but also the control process has to follow up both strategic and operational goals. Moreover, managers should be rewarded by their abilities to attain both their strategic and operational commitments, and the information systems should report the annual realizations in both modes.

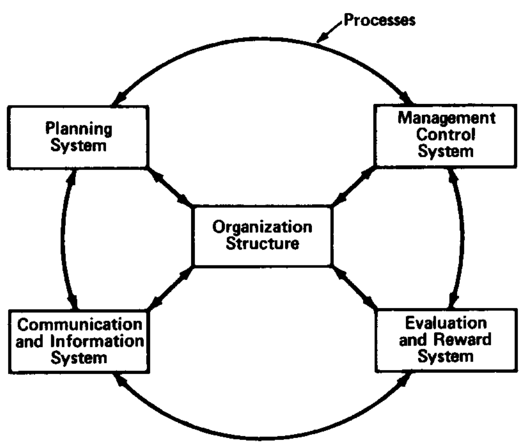


Figure 1. Management systems: structure and processes.

2. ORGANIZATIONAL ARCHETYPES

There are three archetypes that represent distinct forms of organizational structures: *functional, divisional,* and *matrix.* They are important design anchors, because these organizational structures have been extensively tested and studied, and their advantages and disadvantages are relatively well known. In practice most organizations present combinations of these three archetypes resulting in what we designate as a *hybrid* organization.

Functional and Divisional Organizations

Functional and divisional forms constitute the classical opposite archetypes for organizational design.

The functional form is structured around the *inputs* required to perform the tasks of the organization. Typically, these inputs are *functions* or specialities such as: finance, marketing, production, engineering, research and development, and personnel. Figure 2 presents the organizational chart of Admiral Corporation which is structured primarily around the functions of Finance and Administration, Operations, and Sales and Marketing.

The divisional form is structured according to the *outputs* generated by the organization. The most common distinction of the outputs is in terms of the *products* delivered. However, other types of outputs could serve as a basis for divisionalization, such as services, programs, and projects. Also, markets, clients, and geographical locations could serve as criteria for divisionalization.

Figure 3 presents the organizational chart of the Anaconda Company, which has five main product divisions: Primary Metals Division, Anaconda Aluminum Company, Anaconda Wire and Cable Company, Anaconda American Brass Company, and Forest Products Division. The functions of Administration and Finance are held at the corporate level. The detailed organization of the Primary Metals Division shows a typical functional structure with Operations, Industrial Relations, Sales, Mining Research, and Safety reporting to an Executive Vice President (see Figure 4).

Functional and Divisional Organizations: Centralization vs. Decentralization

The full spectrum of attributes of the functional and divisional forms is not totally displayed in the charts above. There is a pervasive character of these organizational structures that differentiates the resulting management style: the functional form is more *centralized*, the divisional form is more *decentralized*. A functional organization tends to develop highly qualified technical skills and a climate conducive to technical excellence and high efficiency. It provides a "*critical mass*" for the career advancement of its professionals. But its inherent stress on specialization pushes the decision-making process upwards, because only at the top do we find the confluence of all inputs required for a final decision.

A different situation exists in divisional organizations, where some functional specialization is lost in favor of added autonomy. Many decisions can be resolved at the divisional manager's level, preventing an overburdened top hierarchy. The middle layer of managers created in divisional organizations provides an effective training ground for general management skills. Though in charge of only one segment of the overall business, divisional managers are exposed to a full range of managerial problems. That experience gives them a decisive advantage over func-

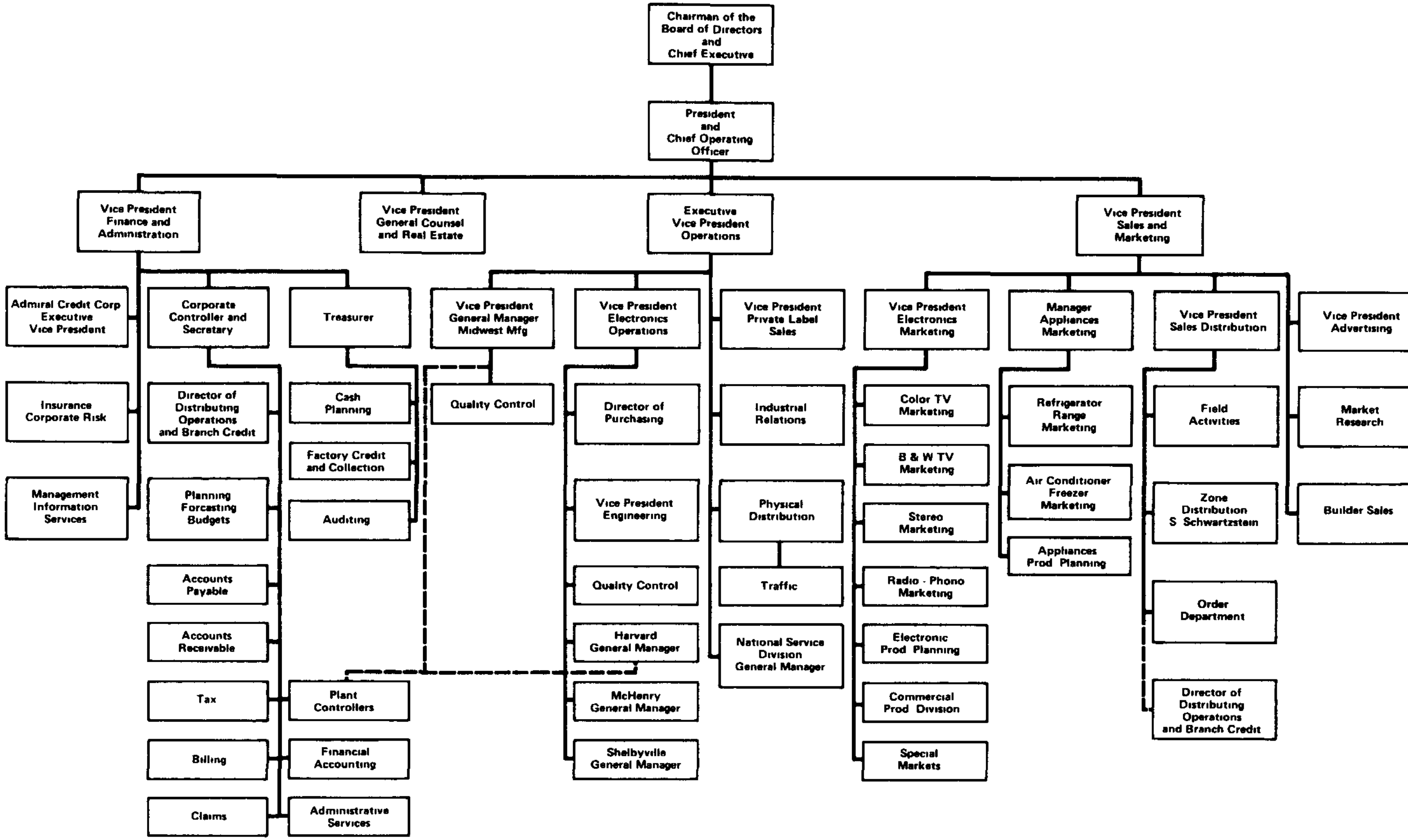


Figure 2. Example of a functional organization—Admiral Corporation (1971). Reprinted by permission of The Conference Board. Exhibit from *Corporate Organization Structures: Manufacturing* by A. R. Janger, The Conference Board, Inc., New York, 1973.

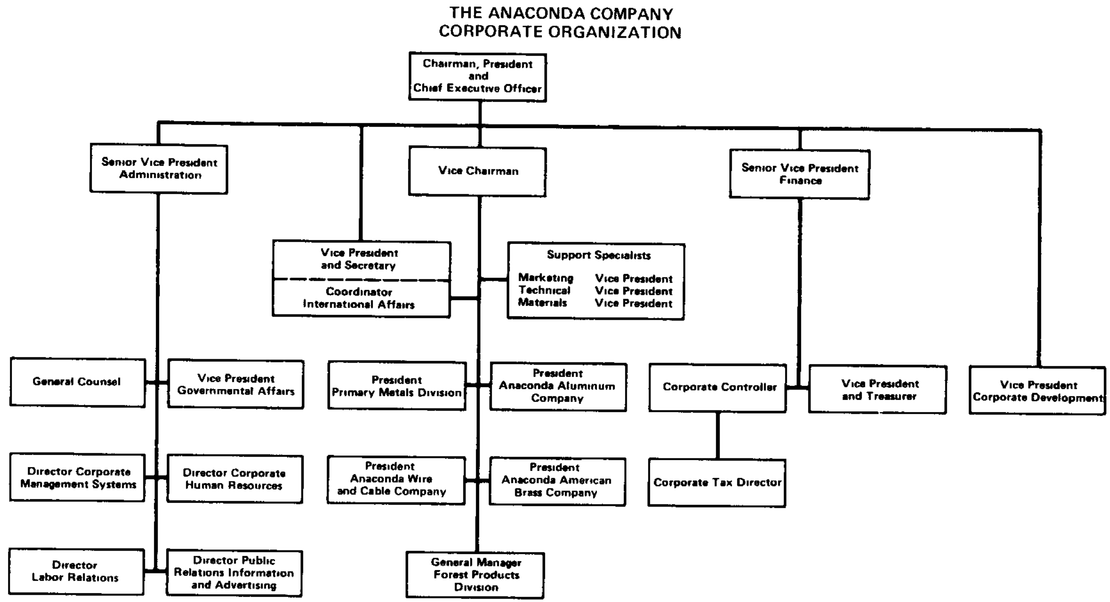


Figure 3. Example of a product division organization—The Anaconda Company (1972). Reprinted by permission of The Conference Board. Exhibit from *Corporate Organization Structures: Manufacturing* by A. R. Janger, The Conference Board, Inc., New York, 1973.

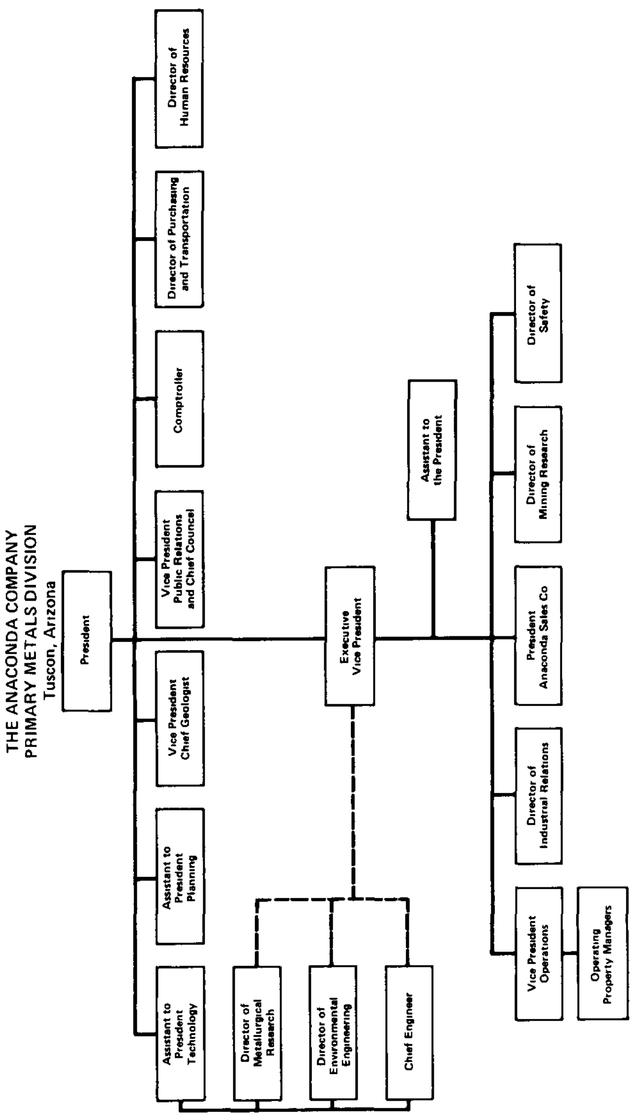


Figure 4. Example of a product division organization—The Anaconda Company (1972). (Notice the functional structure within this Division.) Reprinted by permission of The Conference Board. Exhibit from *Corporate Organization Structures: Manufacturing* by A. R. Janger, The Conference Board, Inc., New York, 1973.

tional managers, who are confronted with situations involving only their narrow field of specialty.

Functional vs. Divisional Organizations: Managerial Profiles

An excellent characterization of the distinct managerial profiles required under these two structures has been proposed by Vancil (1978) and reproduced in Figure 5. It is not surprising, therefore, that a traumatic adaptation in managerial style takes place whenever a functional organization changes its structure to a divisional form. The previous functional

	DIVISIONAL MANAGER	FUNCTIONAL MANAGER
Strategic		
Orientation	Entrepreneurial	Professional
Relevant Environment	External	Internal
Objective of Task	Adaptability	Efficiency
Operational		
Responsibility	Broad; Cross-functional	Narrow; Parochial
Authority	Less than responsibility	Equal to responsibility
Interdependence on others	May be high	Usually low
Personal		
Style	Proactive; Initiator	Reactive, Implementor
Ambiguity of Task	High	Low
Performance Evaluation		
Measurements	Profit; Growth; Return on Investment	Costs, compared to standards or budgets
Quality of Feedback	Slow; Garbled	Rapid; Accurate
Risks and Rewards		
Risk of Failure	Higher	Lower
Compensation Potential	Higher	Lower

Figure 5. Divisional managers and functional managers—dimensions of the tasks. Reprinted by permission of Financial Executives Research Foundation, Inc. Exhibit from *Decentralization: Managerial Ambiguity by Design* by R. F. Vancil, Dow-Jones-Irwin, Homewood, Ill., 1978.

managers, with their narrow concerns for professional specialization, have to develop a broad entrepreneurial spirit, which is not an easy transition.

Functional vs. Divisional Organizations: Authority and Responsibility

There is a certain alignment between authority and responsibility in functional organizations that is absent in divisional forms. An illustration may be useful to clarify this point. A manufacturing manager in a functional organization is fully responsible for the operation concerning plant facilities. His responsibilities completely match his authority. Turn now to a divisional organization with two divisional managers responsible for two different product lines. If these product lines are manufactured in a common plant, an unavoidable ambiguity results in the accountability of the plant operations. One or both divisional managers do not have total authority over the output of the plant. In this case, at least one divisional manager has more responsibility than authority.

Functional vs. Divisional Organizations: Resolution of Conflicts

The resolution of conflicts among managers is also different in functional and divisional organizations. The functional organization has a trouble-free functional line, but conflicts of interest among functional managers are usually handled at the top level. The general manager must act as the final decision-maker and arbitrate disputes among specialties, because he is the only one fully accountable for the performance of the organization. This situation could be aggravated by a tendency to develop parochial orientations in each functional group. Since in a divisional organization middle managers are accountable for the performance of their individual business, there are clear incentives for them to resolve conflicts of interest by direct negotiations among themselves. Normally, ground rules are instituted to facilitate this accommodation process, such as the development of negotiated transfer prices for goods flowing among divisions.

The direct profit accountability of each segment of a divisional organization creates a genuine business climate at the divisional level that has important motivational implications. In contrast, the principal motivator in functional organizations is technical excellence more than business prominence. This attitude may be considered a drawback in a highly competitive environment.

Requirements for a Successful Decentralization

Both functional and divisional forms are extensively used in structuring organizations. Functional forms are more predominant in organizations having single or dominant products, while divisional forms emerge as diversification increases. An empirical study conducted by Rumelt (1974), based on observations of Fortune 500 firms, reports a noteworthy shift from functional to divisional structure from 1950 to 1970. Figure 6 registers Rumelt's findings. Some arguments given to explain this shift are the increase in diversification by those firms in those elapsing years, the alleged higher efficiency of divisional forms, and the ability of divisional forms to deal with growth and cope with size and complexity. However, a conscious effort must be made to retain critical technical expertise when a divisional structure is adopted. In fact, most divisionalized corporations still retain a central research and development (R&D) function.

As complexity begins to grow in the context of the evolution of an organization, decentralization is a must. It becomes impossible for the top manager to retain his role as the sole coordinator of all the activities of the organization. Even more important, he is unable to understand intimately the variety of businesses in a diversified setting to provide the necessary strategic guidance. Therefore, in most complex organizations the valid question is not whether to decentralize, but what the degree of decentralization should be. Solomons (1965) suggests four thoughtful requirements for successful decentralization.

First, the divisions should be sufficiently independent in terms of production and marketing resources to facilitate separate accountability.

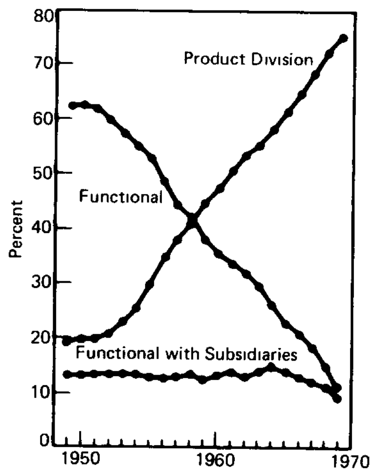


Figure 6. Estimated percentage of functional and divisional organizations, 1949–1969. Reprinted by permission of Harvard University Press. Exhibit from *Strategy, Structure and Economic Performance* by R. Rumelt, Division of Research, Graduate School of Business Administration, Harvard University, Boston, Mass., 1974.

Second, though substantial independence of divisions from each other is a necessary condition of successful divisionalization, if carried to extremes, it would destroy the very idea that such divisions are integral parts of a single firm. This suggests some degree of interdependence among divisions.

Third, no division, by seeking its own profit, should reduce that of the corporation. This can be accomplished by developing planning, budgeting, and monitoring systems designed to stimulate divisional initiatives, while preventing actions counterproductive to the overall corporate performance.

And fourth, corporate managers should exercise self constraints in issuing directives to divisional matters (Sloan [1963]). This is not an easy task to do since the final accountability for corporate performance still resides on the chief executive's shoulders. However, no successful decentralization can be accomplished without relinquishing part of the authority to the divisional managers. This creates a definite imbalance of responsibility and authority at that level.

A final comment is worth making on the second criterion for successful decentralization stated above. By requiring some degree of interdependence among divisions, Solomons seems to cast some doubt on totally unrelated diversifications as a successful strategy to pursue. This statement encounters some support in the findings of Rumelt, who detects the highest level of performance in those organizations seeking related diversification strategies.

Matrix Organizations

Functional and divisional organizations are structured around *one* central design concept. Inputs (functions or specialties) are the molding principle in functional organizations, and outputs (products, services, programs, markets, geographical locations) are the basic dimensions for divisional forms. This clear identification of a main guideline in the definition of a structure stems from the "unity of command" principle of classical writers, that ordinarily has been interpreted as the *one-boss* rule. Whenever a single focus is selected as the basis for organizational design, a single individual can be assigned responsibility for the management of an organizational unit in charge of performing that task. This leads to the one-boss concept. Matrix organizations are a fundamental departure from this unitary notion. They are structured around *two* or more central design concepts. Thus, under the matrix organizational form a person has *two* (or more) *bosses*. A classical example of a matrix organization is Dow Corning, reported by Goggins (1974), and illustrated in Figure 7, where the intersection of business units and functions determines the matrix responsibilities. Geographical locations and time dimensions are added components in the matrix structure of Dow Corning.

There is a large amount of inherent ambiguity in a matrix organization that may strike as counterproductive under a more traditional perspective. In fact, the implementation of a matrix structure requires properly designed managerial support systems, and people adequately sensitized to the matrix environment.

Galbraith and Nathanson (1978) identify some of the characteristics they judge important for successful development of a matrix climate: the adoption of a multidimensional profit reporting system consistent with the matrix design concepts; the establishment of a reward structure leaning toward total corporate profitability; the development of career paths based on multifunctional, multibusiness, and multicountry experiences, and most importantly, a basic change in the role of the top executive. He must balance the views emerging from different dimensions, act in a more participative manner, develop a judgment for priorities, and be prepared to act as an arbiter in conflicting situations.

Goggins, commenting about the matrix experience at Dow Corning, suggests the importance of complete communication and intelligent use of information as keys for matrix effectiveness. He also speaks of the

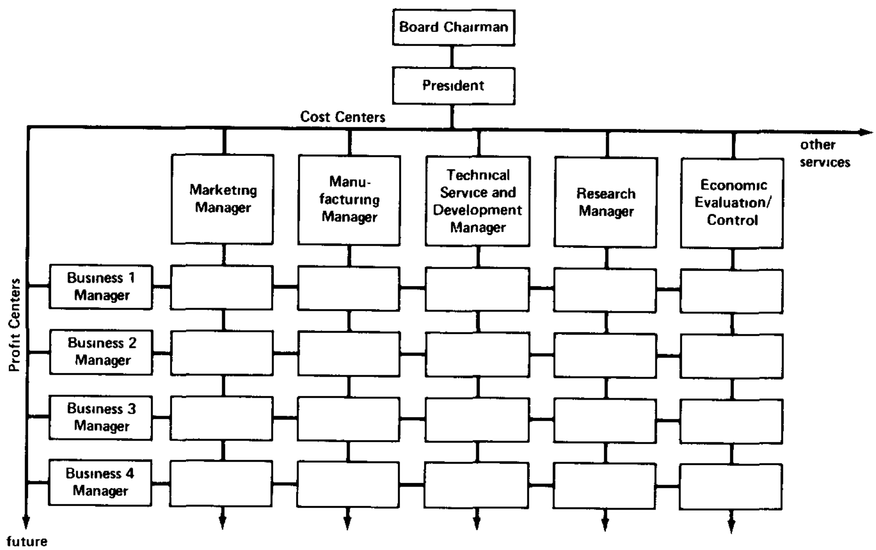


Figure 7. Example of matrix organization—Dow Corning (1974). Reprinted by permission of the *Harvard Business Review*. Exhibit from "How the Multi-Dimensional Structure Works at Dow Corning" by William C. Goggin, *Harvard Business Review*, Vol. 52, No. 1, January–February 1974. Copyright © 1974 by the President and Fellows of Harvard College; all rights reserved.

establishment of an environment of trust and confidence to make the two-boss system work, and mentions the importance of having a set of managerial support systems, like: management by objectives, personnel reviews, planning processes, economic evaluation, profit reporting, and new business staging.

Despite the belief expressed by these authors in the possibility of a matrix organization to work effectively, serious doubts have been cast on its successful implementation. A natural tendency exists to depart from the two-boss conflict inherent in the ideal matrix. An argument can be made for the emergence of only one *real* boss, who is the one physically closer, controls the budget, assigns tasks, determines performance and rewards, or is central to the future career development of the subordinate.

An empirical study performed by Kahn et al. (1964) concludes that the ambiguity in the unity of command principle generates frustration, low productivity, and high absenteeism. Moreover, matrix organizations tend to generate multiple and conflicting loyalties, require people with high tolerance for ambiguity, create conflict of roles, confusion around the actual authority, difficulties with the reward system, and problems of power inversion (the subordinate may reject a demand from a boss, arguing instructions from "the other boss").

Conditions That Have to Be Met to Consider a Matrix

Davis and Lawrence (1977) define three preconditions that have to be met before the organization considers the matrix as a potential structural form. Otherwise, there are alternative managerial systems that can reinforce more traditional organizational forms without having to resort to the full implementation of a matrix. Those preconditions are:

1. Outside pressure for dual focus: As already noted, the first necessary requirement for the development of a matrix organization is the coexistence of more than one fundamental focus of managerial concern.

2. Pressures for high information-processing capacity: A second necessary requirement for the adoption of a matrix organization is the existence of a need for processing massive amounts of information at key managerial levels. This need could result from: changing and unpredictable environmental demands, increased task complexity due to diversification of both products and markets, and strong interdependence among managers for the execution of a given task. The absorption of this voluminous information is facilitated through the intimate coordination assured by the two-boss system.

3. Pressures for shared resources: The final necessary condition for developing a matrix organization occurs whenever great pressures for high efficiency force the sharing of critical resources, such as physical facilities, capital and human resources, and professional experience. Matrix organizations guarantee great efficiency in the utilization of these resources by sharing them among all products or projects, while maintaining a functional centralized control.

Furthermore, Davis and Lawrence suggest that a matrix does not result from the mere adoption of a matrix structure, but also requires the establishment of a *matrix system*, a *matrix culture*, and a *matrix behavior*.

The path from a traditional organization to this highly demanding matrix form is facilitated by a gradual implementation of the concept via integrating mechanisms of increased sophistication that enhance lateral relations. These mechanisms will be discussed in Section 3. Only a gradual approach to the complex and ambiguous operation of a matrix organization gives the people involved the time needed to adapt their behavior to the demands of this organizational form.

The Hybrid Organization

The basic organizational forms presented previously are abstractions of a more complex reality. In general, the structure of organizations stems from more than one of these pure models, though the dominant pattern can be traced back to one of them. In fact, most divisional organizations have a number of functional specialties centralized at the corporate level.

Functional Decentralization in Divisional Corporations

Vancil (1978) sampled around 300 divisionalized corporations and reported the following percentages of firms having decentralized functions:

Administration	54%
R & D	65%
Manufacturing	70%
Distribution	79%
Sales	82%

He concluded from these empirical results that there is a stronger tendency to decentralization for functions closer to the final consumer.

The structure of United States Gypsum Company provided in Figure 8 illustrates a hybrid organization. There are three main product divisions: Construction Products, Industrial Products, and Specialty Products. There is an international division for all Mexico companies. Some functional activities are centralized under an Executive Vice President. Corporate Development, Administration, and Finance functions are at the corporate level.

Consequently, an organizational structure in a real case is usually a *hybrid* of the basic archetypes, and the challenge of organizational design is to seek a proper balance among these three alternatives to respond more effectively to the performance of the organizational tasks.

We have observed that most divisional organizations retain some centralized functions. Likewise, most large functional organizations tend to create an independent subsidiary or a divisional business operation to add autonomy to secondary segments of its business. Similarly, organizations often adopt partial matrix structures to link selected products with related functions.

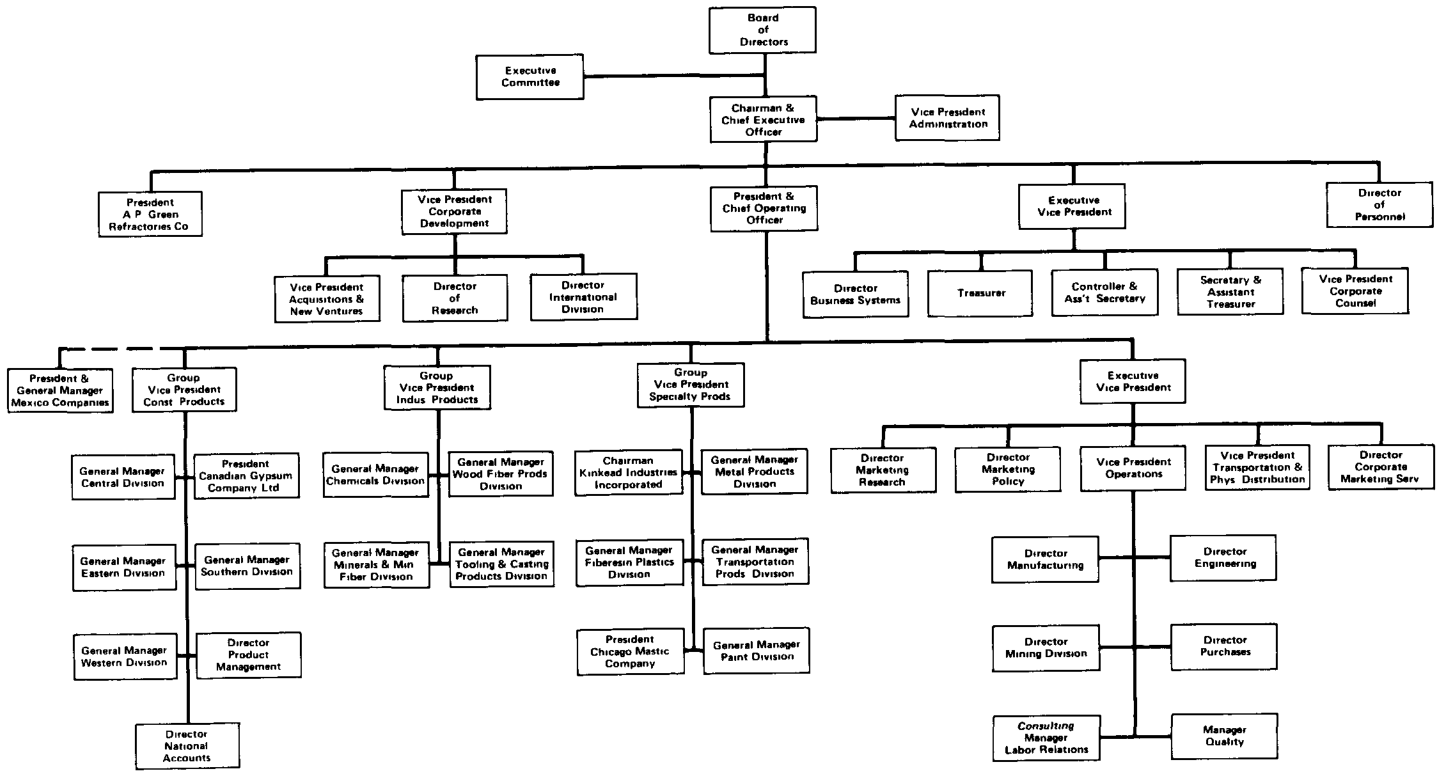


Figure 8. Example of a hybrid organization—United States Gypsum Company (1972). Reprinted by permission of The Conference Board. Exhibit from *Corporate Organization Structures: Manufacturing* by A. R. Janger, The Conference Board, Inc., New York, 1973.

3. ORGANIZATIONAL DESIGN THEORIES

Organizational design is not a field sufficiently developed to offer a mature set of theoretical principles, proved in practice, and applicable to a wide variety of situations. At least four important design theories have been proposed in the literature, and each one of them offers some valuable insights. They are: the *classical theory*, the *human relations theory*, the *decision-making theory*, and the *contingency theory*. This section presents an overview of these approaches to organizational design.

Our discussion of the various organizational theories will be brief. More detailed presentations can be found in many good texts on management

1. Division of Labor—to allow high levels of specialization
2. Authority and Responsibility—both should be equal for an individual manager
3. Discipline—resulting from good leadership, fair agreements, and judiciously enforced penalties
4. Unity of Command—each person has one and only one boss
5. Unity of Direction—activities with the same objective should be directed by only one manager
6. Subordination of the individual interest to the common good
7. Remuneration—based on fairness
8. Centralization—the proper balance between centralization and decentralization should be chosen
9. Scalar Chain—a clear and graded scale of authority from the top should exist
10. Order—materials and people should be in the right place at the right time
11. Equity—management should be both friendly and fair to their subordinates
12. Stability—high personnel turnover should be avoided
13. Initiative—should be stimulated
14. Esprit de corps—workers should have a sense of attachment to the organization

Figure 9. Principles of management of Henri Fayol.

and organizations, such as: Dessler (1976), Galbraith (1977), Gannon (1977), Gibson et al. (1976), Jackson and Morgan (1978), Mouzelis (1968), and Stoner (1978).

The Classical Theory

The central idea of the classical theory is that, regardless of the nature of the organization, there are certain universal principles that should be followed to obtain a successful performance. The most significant exponents of this theory are the *bureaucratic model* of Weber (1947), the *principles of management* of Fayol (1949), and the *scientific management* school of Taylor (1911). In Figure 9 we summarize some of the most widely known ideas of the classical school of organizational design. Without going into a detailed analysis of these ideas, it is important to stress that they have had a lasting impact, particularly among practicing managers. Many modern organizations still adhere strongly to principles such as equality of authority and responsibility, unity of command, limited span of control, and unit of direction. In fact, many managers still think that the classicist principles constitute the fundamental foundations in which a sound organizational structure should be based.

The Human Relations Theory

Mainly as a reaction to the null role played by the individual in the classical design theories, the human relations school proposed that the performance of an organization depends *exclusively* on the human characteristics and behavior in an organizational setting. Important subjects are individual needs, motivation, perceptions, attitudes, values, leadership, information group behavior, communications, etc. This approach is rooted in the now classical Hawthorne studies (Mayo [1933], Roethlisberger and Dickson [1939], but it is better expressed for organizational purposes in the work of Likert [1967a, b]).

The Organizational Decision-Making Theory

The most valid commentaries on the propositions of the human relations school come from the organizational decision-making theories (Simon [1976], March and Simon [1968], Cyert and March [1963]). They claim that individual behavior must be analyzed within the decision-making framework provided by the organization in the rational pursuit of its objectives. Mouzelis suggests that "division of labor; standard procedures, authority, communications, and training are important organizational features setting limits to and shaping the decisional environment of the individual." Under this perspective, the organizational structure is seen as a set of decision-making units in a communication network, and the emphasis is on the actual decision-making process, the resolution of conflict, the coordination among units, and the information flow.

The Contingency Theory

The contingency theory approach also reacts against the extreme positions of both the classical and human relations schools, and advances a more intuitively appealing conclusion which integrates those two opposing views: the best organizational design is contingent upon the environmental conditions that the organization faces. There are situations in which a more formal organization performs better, and others in which a more participate one is more appropriate.

Lawrence and Lorsch (1967) consolidate emerging contingency notions in the concepts of *differentiation* and *integration.* This is one of the most important modern works in organizational design, and provides the most widely accepted platform for the analysis of this problem.

Lawrence and Lorsch observe that

> . . .the act of segmenting the organization into departments would influence the behavior of organizational members in several ways. The members of each unit would become specialists in dealing with the particular tasks. Both because of their prior education and experience and because of the nature of their task, they would develop specialized working styles and mental processes.

As indicated before, organizations are based on the subdivisions of a complex endeavor into simpler tasks. Only when a complex objective can be expressed in terms of simpler goals, the joint effort of a multitude of people can lead to the pursuit of a common aim. The division of work, of effort, of responsibility, and of authority is translated by the *segmentation* of the organizational structure into a set of units ordered in a hierarchical tree.

This is the concept of *differentiation* that they formally define as "the difference in cognitive and emotional orientation among managers in different functional departments."

The tendency of units in the organization to develop specialized behavior to deal with their particular subenvironment poses a strain in the final achievement of common organizational objectives. "The members of each department develop different interests and differing points of view, (and) they often find it difficult to reach agreement on integrated programs of action." *Integration* is the key to overcome this problem. Lawrence and Lorsch define integration as: ". . . the quality of the state of collaboration that exists among departments that are required to achieve unity of effort by the demands of the environment."

How to Integrate Different Units of an Organization

Classical integration mechanisms are the hierarchy, standard rules and procedures, and planning and information systems. But the demands posed by the complexity of the modern environment call for enhanced possibilities of coordination and interactions. This is achieved through *lateral relations*, which may be implemented at very different levels of intensity. The lateral integrating mechanisms, in order of increasing complexity, are listed by Galbraith (1973):

—Direct informal contacts among managers in lateral positions;
—Creation of a liaison role between two independent groups;
—Creation of a task force;
—Use of permanent coordinating teams;

—Creation of a temporary coordinating manager;
—Creation of a permanent coordinating manager;
—Establishment of the matrix organization form.

Major integrative devices found in a study of four conglomerate firms conducted by Lorsch and Allen (1973) are direct managerial contacts, coordinating group vice presidents, the budgeting system (which coordinates tactical programs), approval for major capital investments (which coordinates strategic implementation actions), and incentive compensation systems (which provide a common group for managerial motivation).

The ordered application of segmentation, differentiation, and integration provides a formal mechanism to support the strategy of a firm with a harmonious structural framework. Failing to develop the appropriate structure will have a negative impact on the development of the firm's strategy.

4. STEPS IN THE DESIGN OF THE ORGANIZATIONAL STRUCTURE

Defining the Organizational Strategy: A Prerequisite for Organizational Design

The basic principle for organizational design is that *structure follows strategy* (Chandler [1962]). Under this premise organizational design must be viewed as an integral part of the strategic positioning of the firm. The selected structure should facilitate the development and implementation of the long term directions of the businesses of the organization. Certainly, the structure should also permit the efficient execution of short term operational tasks; but at the beginning of the design process, the attention should be focused on the policies for growth and diversification, which are the paramount concerns of strategic planning.

As we have indicated elsewhere (Hax and Majluf [1981]), the main strategic decisions are the selection of the portfolio of businesses of the firm, and the long term development of each individual business. Therefore, an organizational structure should facilitate the allocation of resources among its various businesses, support the implementation of the preferred strategy for each individual business, and permit the adaptation of existing businesses to a changing environment. We now comment briefly on the implications that these three issues have on organizational design.

First, the *allocation of resources* primarily deals with the distribution of cash among the various business units of the organization. Some of these units might generate cash to be transferred to other units which need a cash injection to realize their future potential. Obviously, the process of resource allocation is not restricted to financial matters, but also addresses the assignment of human, physical, and technological assets. This resource allocation process has as a major implication the need to recognize the business units of the firm, and the managers who are responsible for their full development.

Second, the *strategy of an individual business* could focus on a number of alternatives, such as geographical expansion, product and process innovation, external acquisitions, internal growth, horizontal and vertical integration, and international reach. Each of these alternatives creates a fundamentally different set of requirements that managers have to recognize in the selection of an appropriate organizational structure.

Third, the organization should *allow for enough flexibility to permit appropriate reactions towards external conditions.* This is not an easy criterion to fulfill, since there is a tendency for an organization to lock itself into a form that favors the most efficient exploitation of its current set of businesses.

Steps in Organizational Design

We have found that two distinct steps should be recognized in the organizational design process. The first step is the definition of a *basic organizational structure.* This basic structure represents the major segmentation of the businesses the firm is engaged in through a hierarchical order which reveals the priorities managers assign to the firm's central activities. Only the primary echelons of the organizational chart, which are intimately linked to the strategic positioning of the firm, are recognized in this step.

A second step in the organizational design process is the definition of a *detailed organizational structure.* At this stage, the basic organizational structure is fleshed out with the numerous specific details that pertain to the operational domain of the firm.

Normally, a number of basic alternatives might emerge as competitors for a final design, each one originating different combinations at the detail level. The process of selecting a final structure implies a soul searching effort, of a fairly subjective nature, where key top executives engage in a time consuming activity of proposing, defining, testing, and selecting alternative configurations.

The design of an organizational structure is completed with the specification of a *balance* between the organizational structure chosen and the managerial processes that go with it: planning, management control, communication and information, and evaluation and reward.

The steps in the organizational design process are now more extensively discussed.

Design of a Basic Organizational Structure

The fundamental objective of this step is to translate the strategic positioning of the firm in terms of a set of distinctive units ordered in the highest hierarchical levels of the organizational structure. Since the focus of strategy is business development, this step requires the full recognition of the businesses the firm is engaged in, and its further segmentation into manageable units.

First: Identify and List Your Critical Dimensions

A simple way to begin the search for business segmentation is to prepare a list of the *critical dimensions* for the business activities. Normally, this list includes:

—Products
—Markets: Industrial, Commercial, Government, Original Equipment Manufacturing (OEM), etc.
—Functions: Production, Sales, Marketing, Finance, Administration, Personnel, R&D, Engineering, etc.
—Technologies
—Geographic Locations: of markets, production and distribution facilities.

A business segment is composed of an orderly assignment of some or all of the above dimensions. At the bare minimum, a business encompasses a combination of products, markets, and some autonomous capacity for product change.

Second: Focus Alternatively on Different Critical Dimensions

Some companies decide to organize their basic structure in accordance with their primary business segmentation. This is normally the case in divisionalized firms, where each division has production and marketing responsibilities, as well as some decentralized functional support. Under these conditions, there is a clear alignment between the strategic and operational objectives of the organization.

However, a basic segmentation following business categories is not always desirable or possible. A company might choose a functional focus as the primary dimension for its basic structure. This selection reflects operational efficiency and technical excellence as its fundamental concern for organizational design. Similarly, market location as a primary dimension stresses the importance of a good customer service; and the choice of clients or markets attempts to emphasize the need for a special coverage of a market segment.

Third: Rank Critical Dimensions in Order of Decreasing Importance

In any event, this step of the organizational design process calls for a hierarchical recognition of the critical dimensions identified above, with the purpose of obtaining a focus for the basic segmentation. Unfortunately, it is rarely the case that the basic structure can be simply expressed in terms of a unique dimension. In the process of designing this structure, managers are confronted with a complex choice among competing focuses that must be subjected to a thoughtful tradeoff.

Fourth: Define One or More Primary Structures

A careful weighing of the advantages and disadvantages will most likely lead to a primary structure which is not homogeneous. For example, in Figure 10, some primary units correspond to products, some to functions, some to clients, and some to geographical regions (international vs. domestic focus).

The absence of a homogeneous criterion of segmentation and the lack of symmetry are not the exception but the rule in the formulation of a basic organizational structure. More than one organizational level is usually required to capture the implications of the choice made by

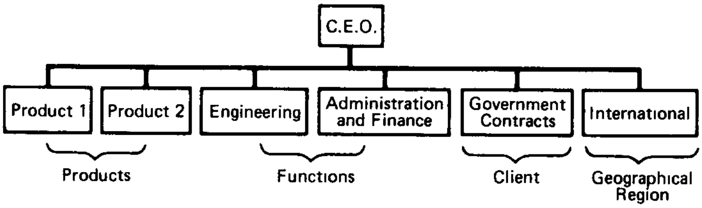


Figure 10. Example showing the multiplicity of criteria used in the definition of a strategic focus.

managers. One could say that it is possible "to read" the strategy of the organization from the arrangement of its basic structure.

A good example to illustrate this point is provided by the Du Pont organization in 1956 depicted in Figure 11. Notice that there are four major dimensions exhibited in that chart: functions (manufacturing, controller, industrial relations, sales, and research), products (nylon, orlon, dacron, and rayon), markets (home furnishing, industrial markets, men's wear, women's wear), and geographical areas (Regions I, II, III, and IV). It is clear from the organizational chart that a first priority is assigned to the functional concern, with products receiving a secondary priority, while marketing and regional coverage are assigned a third priority.

When a corporation decides not to organize in accordance with its business segments, a special effort should be made to provide a managerial focus superimposed upon the basic organizational structure.

A Word of Caution

The definition of a basic structure is the central point in the organizational design process, because it provides the frame in which the organization is going to develop its strategic and operational activities. In other words, the performance of the organization is largely determined by the choice of a basic structure.

Most likely, at the end of this step the managerial team will not be able to make a final selection. More than one basic segmentation may fit well with the needs of the firm under the premises of this broad analysis. Consequently, the result from this initial effort may be more than one basic organizational structure, whose characteristics need to be further analyzed to come out with a final decision.

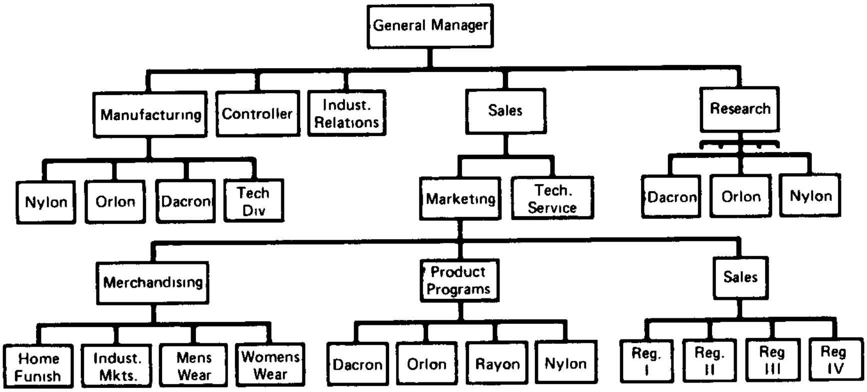


Figure 11. Du Pont Fibers Organization (1956). Reprinted by permission of West Publishing Company. Exhibit from *Strategic Implementation: The Role of Structure and Process* by Jay R. Galbraith and Daniel A. Nathanson, West Publishing Co., St. Paul. Minn., © 1978. All rights reserved.

Detailed Organizational Design

The objective sought in the detailed organizational design phase is twofold: to identify all the operational tasks the organization should undertake in the pursuit of its daily activities, and to assign those tasks to the major organizational segments identified in the basic structure previously defined. The basic structure brings the selected strategy into the design process, while the detailed analysis comes to recognize the operational functional activities (such as marketing or distribution).

Simulate the Operation of the Firm with the New Structure: Ask "What if" Questions

Many questions surge naturally from people familiar with the organization to test the responsiveness of its structure against a multitude of situations that are important to consider. For example, one might ask how a request from an individual customer located in a remote area for a specific product or service would be handled under the proposed structure. If, when answering that question, one detects ambiguities, lack of efficiency, or undesirable splitting of responsibilities, some structural overhauling would have to be performed.

More Specifically: Some Questions to Be Addressed Are:

If the organization is mainly functional,

—How to insure that products are given their share of attention? Are integrating managers necessary in the role of product directors?
—Should the marketing function be subdivided by product? By client? By region? Should sales be centralized or regionalized?
—How should the production be subdivided? By plants? By production stages? By products? By geographical regions?
—How is R&D going to interact with the engineering, the production, and marketing functions?
—How would distribution be responsive to local requests for delivery of products manufactured in several plants?
—How to provide an effective training ground for general managers? How to evaluate managerial performance in a strategic mode?
—If the firm engages in a strategy of growth via acquisition, how to integrate the newly acquired firms into the functional structure?
—If the firm expands its business to cover international markets, how to deal with the different business needs in each country?
—What integrative mechanisms should be in place to coordinate functional activities at a level other than that of the Chief Executive Officer (CEO)?
—How to prevent an overloaded CEO principally concerned with operational matters?
—How to prevent excessive "parochialism" among functional managers?

If the organization is mainly divisionalized around product lines,

—Which functions should be centralized and which decentralized?
—For centralized functions, should they report to the CEO or to a lower hierarchical level?
—If plants, distribution facilities, warehouses, and resources in general are shared by more than one product line, who is in charge of them? How to insure that each division obtains a fair treatment?
—How to deal with regional affairs?
—Are there special clients that require preferential attention? How to handle these situations?

—For decentralized functions, how to assure the preservation of economies of scale and operational efficiency?
—Should divisionalization be conducted by major product lines, by geographical areas, by type of technologies?
—How to deal with international activities?
—How much autonomy each division should have, both in operational and strategic modes? What coordination mechanisms should be enforced among divisions?

Along the more detailed analysis performed for each one of the alternative structural designs, some of the options will be discarded from further consideration, because of undesirable characteristics surfaced by this more careful inquiry. In the end, only two or three alternatives should be competing. For the final selection, the detailed analysis performed in this step provides a visceral understanding of the strategic and operational implications for each design under scrutiny.

Balance between Organizational Structure and Managerial Processes

The positioning of units and subunits of the organization in an ordered hierarchical network must be completed with the definition of all complementary managerial systems. The full-fledged operations of these systems provides a background of integrative relationships that the simple organizational structure fails to represent. Moreover, these systems must be designed both to reinforce the primary focus chosen by the organization, and to support those activities relegated to a secondary level in the definition of the organizational structure. For example, a planning system in a functional organization must be specially sharp in the definition of strategic business units, because the primary structure does not give sufficient weight to the identification of businesses the firm is engaged in, and this may weaken the long term strategic positioning of the firm. On the other hand, the segments defined in divisional organizations are more long term oriented, but the operational efficiency is enhanced by giving ample autonomy to the divisional manager and by linking his rewards with the divisional performance. In this way, some balance and some alignment is established between the long and short term concerns.

Balanced Profiles for an Organization

Galbraith and Nathanson (1978) provide a complete description of the characteristics that all managerial systems are supposed to have for some of the organizational types they define: simple functional, centralized functional, multidivisional, holding, global multidivisional (see Figure 12).

The point to notice is that the need exists to adjust the characteristics given to the structure and the managerial processes.

A similar point has been made by firms like the Boston Consulting Group and Arthur D. Little. They suggest that the characteristics of a business are largely dictated by life cycle considerations. The most

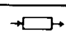
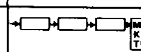
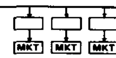
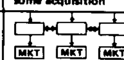
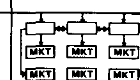
TYPE / CHARACTERISTIC	Ⓢ Simple	Ⓕ Functional	Ⓗ Holding	Ⓜ Multi-Divisional	Ⓖ Global– Ⓜ
Strategy	Single Product	Single Product and Vertical integration	Growth by Acquisition unrelated diversity	Related diversity of product lines—internal growth some acquisition	Multiple products in multiple countries
Inter-unit and Market Relations					
Organization Structure	Simple functional	Central functional	Decentralized Profit Centers around product divisions Small Headquarters	Decentralized Product or area division profit centers	Decentralized profit centers around World wide product or area divisions
Research and Development	Not institutionalized Random search	Increasingly institutionalized around product and process improvements	Institutionalized search for new products and improvements—Decentralized to divisions	Institutionalized search for new products and improvements—Centralized guidance	Institutionalized search for new products which is centralized and decentralized in centers of expertise
Performance Measurement	By personal contact subjective	Increasingly impersonal based on cost, productivity but still subjective	Impersonal based on return on investment and profitability	Impersonal, based on return on investment profitability with some subjective contribution to whole	Impersonal with multiple goals like ROI, profit tailored to product and country
Rewards	Unsystematic paternalistic based on loyalty	Increasingly related to performance around productivity and volume	Formula based bonus on ROI or profitability Equity rewards	Bonus based on profit performance but more subjective than holding—Cash rewards	Bonus based on multiple planned goals More discretion Cash rewards
Careers	Single function specialist	Functional specialists with some generalist interfunctional moves	Cross function but intra-divisional	Cross functional interdivisional and corporate-divisional moves	Interdivisional Intersubsidiary Subsidiary/Corporate moves
Leader Style and Control	Personal Control of strategic and operating decisions by top management	Top control of Strategic decisions Some delegation of operations through plans, procedures	Almost complete delegation of operations and strategy within existing businesses Indirect control through results and selection of management and capital funding	Delegation of operations with indirect control through results Some decentralization of strategy within existing business	Delegation of operations with indirect control through results according to plan Some delegation of strategy within countries and existing businesses Some political delegation
Strategic Choices	Need of owner vs needs of firm	Degree of integration Market share Breadth of Product line	Degree of diversity Types of business Acquisition targets Entry and Exit from businesses	Allocation of resources by business Exit and Entry from businesses Rate of Growth	Allocation of resources across businesses and countries Exit and entry into businesses and countries Degree of ownership and type of country Involvement

Figure 12. Managerial characteristics of each type of organizational structure. Reprinted by permission of West Publishing Company. Exhibit from *Strategic Implementation: The Role of Structure and Process* by Jay R. Galbraith and Daniel A. Nathanson, West Publishing Co., St. Paul, Minn. © 1978. All rights reserved.

natural strategies are: aggressive investment aimed at increasing market share in an embryonic stage; consolidation of a strong position in the growth stage; cost reduction and increased efficiency in the mature stage; and harvest and eventual withdrawal in the aging stage. The notion is that a different strategy is needed for each stage in the life cycle; and, consequently, a special organizational structure, managerial style, and set of skills are required to manage a business through its economic life. Figure 13 presents what Arthur D. Little (1974) suggests is a balanced set of requirements in each stage of the product life.

To conclude, we can say that the design of all managerial support systems, the actual selection of a managerial leadership, and the degree of formality in each organizational unit must be *fitted* to the basic and detailed structures selected, and to the strategic and operational considerations which suggested that organizational structure in the first place.

Management Activity or Function	Embryonic Stage	Growth Stage	Mature Stage	Aging Stage
Managerial Role	Entrepreneur	Sophisticated market manager	Critical administrator	"Opportunistic milker"
Planning Time Frame	Long enough to draw tentative life cycle (10)	Long-range investment payout (7)	Intermediate (3)	Short-range (1)
Planning Content	By product/customer	By product and program	By produce/market/ function	By plant
Planning Style	Flexible	Less flexible	Fixed	Fixed
Organization Structure	Free-form or task force	Semi-permanent task force, product or market division	Business division plus task force for renewal	Pared-down division
Managerial Compensation	High variable/low fixed, fluctuating with performance	Balanced variable and fixed, individual and group rewards	Low variable-high fixed group rewards	Fixed only
Policies	Few	More	Many	Many
Procedures	None	Few	Many	Many
Communication System	Informal/tailor made	Formal/tailor made	Formal/uniform	Little or none, by direction
Managerial Style	Participation	Leadership	Guidance/loyalty	Loyalty
Content of Reporting System	Qualitative, marketing, unwritten	Qualitative and quantitative, early warning system, all functions	Quantitative, written, production oriented	Numerical, oriented to written balance sheet
Measures Used	Few fixed	Multiple/adjustable	Multiple/adjustable	Few/fixed
Frequency of Measuring	Often	Relatively often	Traditionally periodic	Less often
Detail of Measurement	Less	More	Great	Less
Corporate Departmental Emphasis	Market research, new product development	Operations research, organization development	Value analysis Data processing Taxes and insurance	Purchasing

Figure 13. Managerial characteristics by stage of product-life cycle source. Arthur D. Little, Inc., *A System for Managing Diversity*, Cambridge, Mass., December 1974.

5. SYMPTOMS OF AN INADEQUATE ORGANIZATIONAL STRUCTURE

As shown in this paper, the organizational structure is a framework with two primary roles: support the full fledged implementation of strategic programs, and permit the normal conduction of the firm's operating activities.

External and internal changes call for a continuous adjustment of the organizational structure, in order to insure an optimum handling of strategic and operating activities. However, practice has shown that despite these adjustments organizations need, from time to time, a more comprehensive overhaul. As a structure grows older, it usually lacks the flexibility to accommodate new strategic and operational demands. The managerial team should maintain an eye on signs of stress that evidence an inadequate structure, because keeping it longer than necessary may impair the normal growth and development of a firm.

Some of the most common symptoms that can be traced back to an inadequate organizational structure are:

(a) Lack of opportunities for general manager development: This is usually the case of functionally oriented organizations.
(b) Insufficient time devoted to strategic thinking due to: too much concentration on operational issues; excessive decision making at the top; or overworked key personnel.
(c) Intensive antagonistic working climate: The motivational and reward system should be in tune with the given structure. An antagonistic climate may be signaling a problem of balance between structure and processes.
(d) Lack of definition in portfolio business planning, neglect of special markets, and inappropriate setting for maximizing growth and profit. These are among the clearest evidence of an organizational structure which cannot accommodate the new strategic positioning of the firm.
(e) Lack of coordination among divisions: This points to a failure of integrating mechanisms.
(f) Excessive duplication of functions in different units of the firm: The differentiation among units is not well established. Some redefinition of tasks or the fusion of some units might be advantageous.
(g) Excessive dispersion of functions in one unit of the firm: Determine if the differentiation of tasks warrants the segmentation of this unit.
(h) Poor profit performance and low return expectations: The organizational structure cannot escape a major revision in a situation like this. The firm should examine its strategy and adopt an organizational structure suitable for the implementation of the agreed strategy.

6. CONCLUSION

We have attempted to provide a normative approach for organizational design which, we hope, could be of value in assessing an existing organizational structure or in designing a new one. As we had indicated in our preliminary remarks, we were somehow disappointed by the lack of attention given in the Operations Research literature to this important subject. William Pierskalla provided an important list of research issues which we would like to share with you:

1. How does the choice of strategy affect the types of Operations Research models used in marketing, financial planning, manpower planning, facilities, location-production-distribution, etc. and vice versa? It seems that the nature of the product line, competitive position, market share, technologies available and forthcoming, and such strategic choices would influence the choice of models (simple or complex) in analyzing these strategies.
2. How does the choice of structure affect the types of Operations Research models used in planning and operations for determining market and product locations, intra-company transfer prices, facilities location, personnel levels at locations, etc., and vice versa? It seems that a functionally organized firm would need different types of Operations Research models at the corporate level than a divisional firm with matrix or hybrid management activities.
3. How can Operations Research models be used in evaluating different strategies and/or structures?
4. Where are Operations Research models lacking in their ability to be useful in strategic planning and/or structural design? And can these modeling drawbacks be overcome through more research in Operations Research?

This is an imposing list of questions demanding a concentrated effort on the part of operations researchers.

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