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IMPROVEMENT OF THE
INTRAORGANIZATIONAL MANAGEMENT OF
INNOVATION: REVIEW OF A
CRITICAL PROBLEM

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by

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ABSTRACT

This paper is basically a two-part analysis of the management of new products within the firm. One part deals with identification of organizational factors found through empirical research to be critical for effective new-product development. Since much of the literature would indicate that mismanagement of potential innovations rather than a lack of quality ideas is currently the most significant problem, much of this analysis is devoted to management variables such as decision-making processes, communication links, and coordination. However, structural and environmental variables which have been found to affect the ability of management to carry out these tasks have also been considered.

The second part considers the possibilities and problems associated with using executive education programs as a methodology for dealing with new-product management problems that may exist. Emphasis is placed on the necessity for a thorough analysis of the organization and its needs if any development or training program is to be effective.

BACKGROUND

This paper is the initial output of a continuing study of ways to encourage product innovation within the firm. The purpose of this first effort is to review the literature, gain some understanding of the process of innovation, and from all this suggest possible means of improving new-product management. At subsequent stages the author hopes to empirically validate a factor model of innovation and later to test the applicability of management education as a technique for enhancing intraorganizational innovation. This project has been supported by the Division of Research as part of a research program on the management of new-product ideas.

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Introduction

Business firms today are faced with a rapidly accelerating rate of change in their relevant economic and technological environments. In this new context, few companies have remained successful without operational modifications. One area of impact recognized by several researchers, among them Pessemier, and Lorsch and Lawrence,^{1/} has been the increased need for new and different product ideas. As Lorsch states, "...new and improved products are the key to corporate success, and in the long run, corporate survival."^{2/}

This additional demand on the organization has not been without its problems. The attrition rate for new-product ideas is high in most organizations. Only the best ideas can be pursued given the limited resources of the firm. One study shows that 90 percent of all ideas are discarded before the developmental stage and that only a little more than 1 percent ever reach commercial sale.^{3/} Even then nearly 50 percent fail after release.

^{1/} Edgar A. Pessemier, "New-Product Ventures," Business Horizons, Vol. II, No. 4 (August, 1968), pp. 5-19; and J. W. Lorsch and P. R. Lawrence, "Organizing for Product Innovation," Harvard Business Review, Vol. 43, No. 1 (January, 1965), pp. 109-122.

^{2/} "Organizing for Product Innovation," p. 109.

^{3/} Phillip Kotler, Marketing Management: Analysis Planning and Control (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1967), p. 316.

Key Problems

Many researchers have claimed that these failures are due in large part to poor management of innovations within the firm; Bradenburg, for example, concluded that "Most new product venture failures are people-related problems."^{4/} There is a great deal of evidence of management ineffectiveness where new-product programs are concerned. Johnson and Jones have indicated three basic management-related problem areas in the movement of innovative ideas from initial proposal to implementation:^{5/}

Classification--to determine the type of handling each new-product proposal ought to receive.

Coordination--to assure continuity and cooperation in the evaluation of each new product from idea to market introduction.

New knowledge--to provide information for decisions on products with which the company has had no direct experience.

Many of the difficulties identified in current research on new-product management will fit easily into one or more of these categories. Regarding the first category, Pessemier points out that many proposals are not handled at all either because management does not recognize the idea for what it is or is not able to "remove the critical barriers to its development."^{6/} Such

^{4/} Bradenburg, "Going Down the Rathole with New Product Research," Business Management, Vol.40 (June, 1971), p. 18.

^{5/} Samuel C. Johnson and Conrad Jones, "How to Organize for New Products," Harvard Business Review, Vol. 35, No. 3 (May, 1957), p. 51.

^{6/} "New-Product Ventures," p. 7.

omissions may be due to lack of interest or lack of knowledge, but in either case the problem must be resolved if the firm is to keep from losing many potentially profitable ideas.

The need for coordination among the various departments and decision centers concerned with new-product management has been widely recognized as critical to success. This point has been emphasized by Utterback, Knight, Lorsch and Lawrence,^{7/} and others. Coordination of the variety of organizational functions--marketing, production, R & D, and management--dealing with innovations is seen as essential in order to keep a broad perspective on potential problems in the project.

Several theorists, such as Gee, Moore, and Roberts,^{8/} have presented empirical evidence concerning the problems that can arise in coordination efforts. Gee has found that in many cases coordination suffers because of the lack of general agreement on the relationship of new products to the goals of the corporation. His results indicate that firms with the highest proportion

^{7/} James M. Utterback, "The Process of Technological Innovation Within the Firm," Academy of Management Journal, Vol. 14 (March, 1971), pp. 75-88; Kenneth E. Knight, "A Descriptive Model of the Intra-Firm Innovation Process," The Journal of Business, Vol. 40, No. 4 (October, 1967), pp. 478-96; and Lorsch and Lawrence, "Organizing for Product Innovation."

^{8/} Robert E. Gee, "How Often Do Research Objectives Meet Corporate Goals," Research Management, Vol. 13 (November, 1970), pp. 451-9; R. F. Moore, "Five Ways to Bridge the Gap Between R&D and Production," Research Management, Vol. 13 (September, 1970), pp. 367-73; and George A. Roberts, "Communication Imperative Between Management and R&D," Research Management, Vol. 15 (March, 1972), pp. 67-72.

of shared goals among their departments had the fewest coordination problems and the best record in new-product development. Gee extends his argument to suggest that many problems in goal congruence result from a lack of understanding among functional areas about the roles performed by the other departments. He concludes that many of these misconceptions could be removed by better communication among the groups.

The study by Roberts substantiates many of the hypotheses proposed by Gee. In studying the communication links which he identified as important to innovation management, Roberts found that where communication is lacking or ineffective, there is conflict among departments. Roberts concludes that in many cases ineffective communication results from distortions brought about by "long lines" of communication. He sees that many of the managers in crucial communications centers (Thompson calls them "boundary-spanning units"^{9/}) do not know enough about the nature of the project to communicate in meaningful ways with other relevant groups. Roberts points out, "It is often those on the project alone who possess the knowledge and information necessary to make new product decisions."^{10/} Thus Roberts sees a need either to improve the knowledge and understanding of the communicators or to find more direct means of communication.

^{9/} James D. Thompson, Organizations in Action, (New York: McGraw-Hill Book Company, 1967), p. 110.

^{10/} "Communication Imperative," p. 69.

Another problem which Roberts identifies relates to a language barrier between functions. Often communicators are unable to understand each other because neither party to the communication is able to translate necessary information into a common language. Moore gives an example in his discussion of the "translation gap" between R & D and production.^{11/} He found that problems arose in moving projects from R & D into production because those in production were not able to understand the technical language used by R & D managers in explaining details of the specific projects. Moore sees a need for a method of teaching both sides to recognize this problem of communication and to agree on a more understandable level of information transfer. The problem of communication also relates to the third critical area in new-product management, that of knowledge utilization.

Many researchers, among them Aharoni, Bower, and Root,^{12/} have

^{11/} "Five Ways to Bridge the Gap," p. 367.

^{12/} Yair Aharoni, The Foreign Investment Decision Process (Boston: Harvard University Graduate School of Business Administration, Division of Research, 1966); J.L. Bower, Managing the Resource Allocation Process: A Study of Corporate Planning and Investment (Boston: Harvard University, Graduate School of Business Administration, Division of Research, 1970); and H. Paul Root, "The Use of Subjective Probability Estimates in the Analysis of New Products," Marketing Involvement in Society and the Economy, P.R. McDonald, ed. (Chicago: American Marketing Association, 1970), pp. 200-07.

recognized that new-product decisions are shaped primarily by the form in which relevant knowledge is communicated to the decision makers. Any break down in communication, either accidental or intentional, can severely impede the ability of the decision maker to make an accurate assessment of the value of a given project. It is therefore imperative that those responsible for this type of communication be made aware of the consequences of mistakes and be trained to be as efficient as possible in assembling the necessary information. These precautions, however, will not necessarily solve the problem of knowledge utilization in the firm.

Diehl points out that even the correct transfer of information to the pertinent positions in the organization does not guarantee correct decisions. He identifies three "errors of emotion" which may still lead to problems in new-product management.^{13/} First he suggests that just because information is transmitted correctly does not mean the information itself is correct. Decision makers must be prepared to test information for inaccuracy and bias. Another problem Diehl identifies is best described by Churchman: "There is a big difference between having good information and using it."^{14/} Diehl sees that the personal feelings of those involved in the project could lead them to inflate its advantages and ignore or withhold its disadvantages. The

^{13/} Rick W. Diehl, "Achieving Successful Innovation," Michigan Business Review, Vol. 24, No. 2 (March, 1972), pp. 6-10.

^{14/} C. West Churchman, "Managerial Acceptance of Scientific Recommendations," in Information for Decision-Making, Alfred Rappaport, ed. (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1970), p. 435.

decision maker should avoid emotional involvement in the project in order to assess objectively the information provided him. A final problem Diehl suggests is that top management may promote a particular project. This situation puts undue pressure on the decision maker to pass the project despite any unfavorable information about it. All these problems and those in the other classifications relate more or less to human-behavioral variables.

Management Development and Training

In looking for ways to combat behavioral problems within the organization, corporations have been turning increasingly to the use of management-development and management-training programs to teach executives and supervisors better techniques of management and to propose top-management ideas and gain acceptance of them throughout the organization. In the past, management-development and management-training programs have dealt successfully with many problems, such as communication, decision-making techniques, and goal congruence, that have been discussed above. The remainder of this paper will consider the possibilities and problems of using management development and/or training to improve the intraorganizational management of innovation.

In discussing management development and training it should be recognized that these terms are used here in their broadest context to mean all the various forms of management education. The author, therefore, does not wish to imply that this paper will be limited to the analysis of T-Group training or any of the other more specific change methodologies that have,

for some, become synonymous with management development. With these definitions in mind, the reader should have a better understanding of the scope of management education techniques which are analyzed below.

As a beginning point, it must be noted that in spite of certain successes, past management-development and training programs have not had a high success ratio in terms of changing behavior on the job and in some cases (Fleishman and Sykes^{15/}) have been detrimental to the operation of the firm. This fact should dictate a careful consideration of the type of program to be undertaken. Studies in this area have pointed out many common failures in the design or implementation of unsuccessful management-training operations. One such problem is stated in a study by Eugene Schmuckler: "The important consideration for success of a management development program is that it satisfy a recognized need."^{16/} All too often such programs have had no operational objectives and no identifiable problem toward which to direct the efforts of the participants. Carrol concludes from a study of managers that management education will be most likely to succeed "when they see the training as being related to the problems that they themselves are concerned

^{15/} E.A. Fleishman, E.F. Harris, and H.E. Burtt, Leadership and Supervision in Industry: An Evaluation of Supervisory Training Programs (Columbus: The Ohio State University Press, 1955); and A.J.M. Sykes, "The Effects of a Supervisory Training Course in Changing Supervisors' Perceptions and Expectations of the Role of Management," Human Relations, Vol. 15, No. 2 (August, 1963), pp. 177-243.

^{16/} Eugene Schmuckler, "Problems Involved in the Establishment of a Management Development Program," Personnel Journal, Vol. 50 (October, 1971), pp. 790-95.

with.^{17/} Thus it is clear that there is a need for giving direction and specific purpose to any program.

Another major problem is that the organizational "climate" may not be conducive to change. Management education is designed to bring about change; however, a participant "frequently finds that organizational rigidities, attitudes of his superiors, and pressures of the job restrict new modes of behavior or the use of new management tools and approaches that have been learned."^{18/} This lack of management support causes frustration and confusion, making the training program totally ineffective.

The problem of intraorganizational environment or climate arises because most significant problems in organizations are subject to numerous interdependencies within the context of the firm. For example, March and Simon point out that organizational structure and policy systems act to limit alternatives in the behavior of organization members in order to avoid chaos.^{19/} These same limitations may, however, also act as a barrier to change, thus impeding attainment of the objectives of a management-development program.

^{17/} Stephen J. Carrol and Allan N. Nash, "Some Personal and Situational Correlates of Reactions to Management Development Training," Academy of Management Journal, Vol. 13 (June, 1970), pp. 187-96.

^{18/} P.R. Cone and R.N. McKinney, "Management Development Can Be More Effective," California Management Review, Vol. 14 (Spring, 1972), p. 14.

^{19/} James G. March and Herbert Simon, Organizations (New York: John Wiley and Sons, Inc., 1958), pp. 169-71.

In order to understand the relationship of such factors to the success of a management education program designed to improve innovative management, one must first understand the relation of these factors to the innovative process itself. Richard Normann, in a study of organizational innovativeness, recognized three important organizational subsystems which have a bearing on the success of firms in managing new-product operations:^{20/}

- (1) The Cognitive System represents most of what has been considered under the term "people problems." It includes the communications and internal information-handling processes. Also included are decision-making and problem-solving activities and the personal perceptions of the individual participants in the organization.

This first system is one that is generally subject to modification using a management-development, management-training program. Normann has found, however, two other relevant systems which affect the management effort but cannot be dealt with in the program.

- (2) The Task System includes the formal structure of the organization, work-group composition, and types of specialization in knowledge or competence inherent in that structure.

The members of the organization exist within this structure and are limited by it. Normann sees that new-product introduction results in strains on the stability of this structure--the more innovative the product, the more strain is involved. If the structure does not change to accommodate these

^{20/} Richard Normann, "Organizational Innovativeness: Product Variation and Orientation," Administrative Science Quarterly, Vol. 16, No. 2 (June, 1971), pp. 203-15.

new products, the new products are not likely to be developed. Changes in structure must be initiated by top management, and any hesitation in applying necessary changes can work to reduce the effectiveness of any changes brought on by a management-education program. The third system is also closely related to top management and will need revision if change is to occur.

- (3) The Political System includes the goals of the system, the existing power and policy structures, and the vested-interest groups which maintain the status quo.

Normann has found that strong, stable political systems reduce the possibility for innovation because innovations generally demand changes in the existing power structure. Such changes are usually resisted by those in power. Only the force of top-management's commitment to change, Normann concludes, will insure innovation within the firm. Thus no management-education program is likely to improve the success of the innovative process unless and until these other systems are also subjected to meaningful change. The question then arises, Is there any means of integrating the efforts to change so that all relevant aspects are considered? This author would answer in the affirmative.

The Organizational Audit

Research in the area of organizational analysis has already been conducted by Robert House as a step toward improving management-education programs.^{21/} He made a survey of over 400 empirical studies of management-

^{21/} Robert J. House, A Predictive Theory Of Management Development (Ann Arbor: The University of Michigan Bureau of Industrial Relations, 1966).

development and management-training programs and drew several conclusions as to the steps necessary in designing a viable training procedure. Of particular interest is his suggestion that there must be a systematic analysis or audit of the organization--its objectives, structure, environment, and personnel--previous to implementation of the development program.

The analysis procedure begins with a determination of developmental objectives which are stated in operational terms so that specific organizational changes may be inferred. Next, the organization (policies, structure, and management attitude) is studied to determine its readiness for change of the kind implied by the stated objectives. Top management is then consulted concerning problems identified by the analysis, and commitment is obtained from management to take the responsibility for making the necessary organizational changes. Finally there is an analysis of specific problems in the organization and a decision on the content of the management-education program. House sees several advantages in this process.

The first advantage is that "This approach provides for a method of checking the validity of implied assumptions in advance of the design of the program."^{22/} This is an important factor since any question on objectives or content should be answered before the program begins. Another advantage, and perhaps the critical one, is the opportunity for gaining commitment to the program by top management through its participation in the structuring of the program. House sees this as the necessary prerequisite if managers

22/ Ibid.

are to be motivated to accept change and use it in the job situation. Several other advantages, such as identifying structural problems and generating objective measures of management performance, also lead to an acceptance of this method.

The conditions and suggestions so far considered have applied to management programs in general; they should be equally applicable, however, to a program designed to encourage more effective management of innovation. Although specific tools of analysis may be different and particular aspects of the organization may be looked at somewhat differently, the basic reasons behind the use of an organizational audit such as this remain valid.

As a summary of the organizational context outlined above, the model in Figure 1 describes both the position of the individual in the organization and his relation to the various subsystems specified previously. From the model, this author will show how an organizational audit may be used both to identify barriers to behavioral change in the firm and to direct the organization toward a more integrated approach to management development and training.

The model suggests that the component system most directly related to the effectiveness of management-education programs in influencing job-oriented behavior is the relationship of the individual participant to the program (See Figure 1, Relevant Personal Context.). The importance of this relationship is confirmed by many studies of management-development programs. In one study, the researcher concludes, "benefit from management development can be predicted, in part, by participants' expectations

prior to exposure to the program."^{23/} He also points out that a perceived need for change is critical in order for the participant to expect a positive benefit from the program. As the model explains, top management can affect these individual expectations through appropriate changes in the intraorganizational environment. The natural conclusion, given this causal chain, is that for best results in management education, top management must lay substantial groundwork prior to the initiation of the program.

Participant motivation is also related to expectations concerning the program. There is some agreement among researchers as to what is necessary for motivation. "It appears that, by far, the most effective form of motivation consists of successfully convincing the trainee that the content of the training will be of value to him by assisting him to discharge his duties when he is on the job."^{24/} Other motivating factors which have been identified are desire for promotion (a personal goal) and perception of a relationship between job performance and the individual's relevant reward system. Many of these factors may be favorably altered by top management through modifying the employees' job environment.

^{23/} Leopold W. Gruenfeld, "Personality Needs and Expected Benefits From A Management Development Program," Occupational Psychology, Vol. 40 (January-April, 1966), p. 77.

^{24/} Krishna S. Dhir, "Problem of Motivation in Management Development," Personnel Journal, Vol. 49 (October, 1970), p. 839.

The question may be asked, What role will the organizational audit play in facilitating the process just described? The audit is seen by this author as the necessary first step if top management is to make the correct changes in the intraorganizational environment. The purpose of the audit is to assess existing conditions in this environment with specific emphasis on how these conditions affect the ability of the organization to efficiently manage innovation. One consideration in appraising the viability of the existing internal climate as an environment for enhancing innovation must be the interaction of that environment with the personal characteristics of individuals in the firm.

If the audit is to be most useful, appropriate operational variables relating to important problems in the management of innovation must be identified, and accurate measurement tools must be constructed to allow the gathering of objective data. The following sections will deal with the question of what constitutes the process of innovation in the firm and what individual and organizational characteristics enhance or inhibit this process.

A Process Model of Innovation

Several researchers have proposed process models of innovation, among them Knight, Normann, and O'Connell. For our purposes, however, the model suggested by J. M. Utterback in Figure 2 would seem best suited.^{25/}

^{25/} Knight, "A Descriptive Model," p. 438; Normann, "Organizational Innovativeness," pp. 204-08; Michael J. O'Connell, "Organizational Innovation: A Conceptual Framework." (Unpublished working paper, University of Wisconsin, Madison, 1972), pp. 3-4; and Utterback, "The Process of Technological Innovation," p. 78.

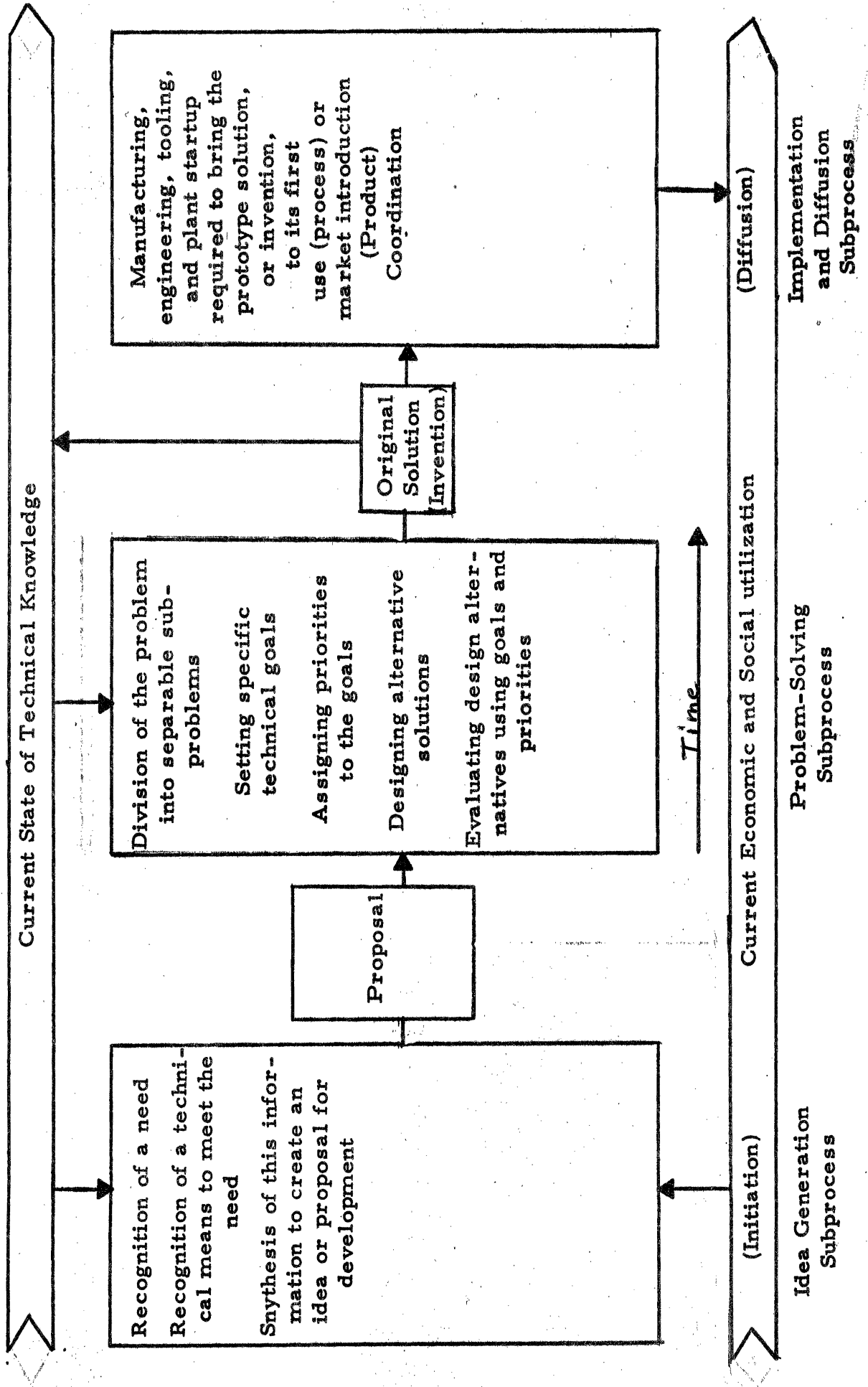


Fig. 2. The process of technical innovation.

In this conceptualization, Utterback emphasizes a critical point that must be considered before any attempt to improve the innovative process in organizations, namely, that innovation is not a simple, one-step operation; it involves several related but not similar activities. Donald Marquis lends agreement in this warning:

Keep in mind that innovation is not really a single action, but a total process of related subprocesses. It is not just the conceptualization of a new idea, nor the invention of a new device, nor the development of a new market. The process is all of these things acting in an integrated way toward a common objective--which is technological change.^{26/}

This division into subactions becomes important when one realizes that efficiency in these various activities requires a variety of different and sometimes contradictory conditions within the organization. The nature of some of the tradeoffs suggested here will be discussed later.

Proposal phase

Utterback identifies three distinct phases of the innovative process: (1) the proposal or initiation stage, (2) the evaluation or problem-solving stage, and (3) the implementation or adoption stage.^{27/} In the proposal

^{26/} Donald G. Marquis, "The Anatomy of Successful Innovations," Innovation, Vol. 1, No. 2 (November, 1969), p. 29.

^{27/} "The Process of Technological Innovation."

stage, organizational and environmental needs are recognized and reconciled, and ideas for problem solution are explored. This phase ends with an individual or group in the organization making a proposal for a new product to fill the observed need.

Several researchers have explored this process and suggested ways to encourage "search and solve" activity in the firm. Many of these studies have dealt with the stifling effect on innovative proposals of structural rigidities which limit employee interaction and individual behavior. Shephard proposes that the innovative organization provide a "climate in which members can view one another as resources rather than competitive threats: a climate of openness and mutual support."^{28/} The rationale for such an environment is the belief that ideas are better generated when they are open to discussion and criticism in the formative stage.

A related concept identified as encouraging innovation is that of role diversity of employees, i. e., employees with a wide range of responsibilities and contacts both inside and outside the firm. James Wilson states, "The greater the diversity within the organization the greater the probability that members will conceive and propose major innovation." Donald Peters also provides empirical evidence of the advantages of variety in the organizational

^{28/} Herbert A. Shephard, "Innovation Resisting And Innovation Producing Organization," Journal of Business, Vol. 40, No. 4 (October, 1967), p. 476.

setting.^{29/} Such diversity allows the employee a wider view of the organization and its problems, a definite advantage in generating ideas which must meet a number of constraints present in any complex system. Role diversity also provides a means for greater access to the human resources of the firm through freer, more direct communication channels.

Gordon and Morse, Knight, and O'Connell,^{30/} among others, have determined that free communication among critical individuals and groups in the firm tends to greatly accelerate the innovative process. Utterback goes a step further in suggesting that communication channels outside the firm should be encouraged to aid in the search process for new environmental demands and for new technical solutions to existing needs. He concludes that "impediments to these information flows would certainly be expected to reduce the effectiveness of the innovative process within the firm."^{31/}

^{29/} James Q. Wilson, "Innovation in Organizations: Notes Toward a Theory," in Approaches to Organizational Design ed. by James D. Thompson (Pittsburgh: University of Pittsburgh, 1966), p. 200; and Donald H. Peters, "Commercial Innovations From University Faculty: A Study of the Invention and Exploitation of Ideas," Sloan School of Management Working Paper No. 406-69 (Cambridge, Mass.: M.I.T., July, 1969).

^{30/} Gerald Gordon and Edward V. Morse, "Creative Potential and Organizational Structure," Proceedings of the Academy of Management (1968); Knight, "A Descriptive Model"; and O'Connell, "Organizational Innovation."

^{31/} "The Process of Technological Innovation," p. 83.

Although these suggestions may be beneficial in stimulating proposals for innovation, such activity would undoubtedly put a strain on the traditional management hierarchy present in most of today's organizations. Thus a commitment to greater innovation by a firm may necessitate a shift in the overall control structure of the organization. Hage and Aiken have indicated that the innovative organization tends to be "lower in centralization, formalization, and stratification."^{32/} Such structural alterations are sometimes hard to make, especially for large organizations; for this reason, alternatives to an overall shift have been proposed. The most popular method has been to separate the proposal-generating function from the other functions of the firm. Westfall, for example, suggests the formation of "venture teams," small groups of entrepreneurial types who search for promising new-product possibilities.^{33/} The advantage of these groups is that they can get close to the source of ideas and information with few outside distractions and with sensitivity and flexibility in their approach. Care must be taken, however, in the composition of these groups to be sure that they have the necessary knowledge of and contact with the line functions in the firm. Problems that arise if this integration does not take place will be discussed later.

^{32/} Jerald Hage and Michael Aiken, Social Change in Complex Organizations (New York: Random House, 1970).

^{33/} Steven L. Westfall, "Stimulating Corporate Entrepreneurship in U.S. Industry," Academy of Management Journal, Vol. 12, No. 6 (June, 1967).

Regardless of the type of structural adjustments made, however, it must be kept in mind that more than these adjustments are needed to make a firm innovative. The proposals already discussed have one common characteristic: there is some cost, either explicit or implicit, involved in their implementation. A case in point are the venture teams, which would take resources that could be used on the line or for a greater profit margin. For such changes to be effective, therefore, management must show a commitment to innovation to the extent of being willing to provide the resources for the search and research necessary to generate innovation proposals. March and Simon have used the term "organizational slack" to designate the financial and human assets available at the discretion of management for projects other than daily operation.^{34/} There is a fair body of research which indicates that such slack and a willingness to use it are necessary prerequisites to new-product innovation. Martin Rosner, in explaining the necessity of such resources, concludes, "The existence of organizational slack means that the organization can afford to (1) bear the cost of instituting the innovation, (2) absorb failures, and (3) explore new ideas in advance of actual need." Further proof comes from W.R. MacClaurin in his study of the rise of the radio industry.^{35/} His findings emphasize that the availability of speculative

^{34/} Organizations, p. 126.

^{35/} Martin M. Rosner, "Economic Determinants of Organizational Innovation," Administrative Science Quarterly, Vol. 12, No. 6 (March, 1968), p. 615; and W. Rupert MacClaurin, "The Process of Technological Innovation," American Economic Review, Vol. 40 (March, 1950), pp. 90-112.

funds (slack) had much to do with the rapid pace of innovations in this industry in the 1920s. This evidence indicates that management commitment in the form of funds for the search process acts to prime the innovative pump and to move the organization toward change.

Another important facet of management commitment to innovation is the direction of explicit organizational goals toward innovation. Such open commitment by management puts employees on notice to expect changes and to work for them. Karl Tietjen, in a study of characteristics of effective product planning, found that "there are distinct advantages to a conscious tangible expression of policies and objectives," in enhancing the innovative ability of the firm.^{36/} Explicit goals may also have the advantage of directing the search for new products away from areas the organization is either unable or unwilling to enter. Finally, clear statements of objectives can help the firm deal with the human factors present in any organizational activity.

The propensity of individuals and groups to generate new-product proposals may be greatly affected by existing group norms and individual attitudes toward the organization. Explicit goals will help the organization to focus group attention on the wishes of the management. Such goals can be extremely important since, as Knight says, groups have been shown to have great influence through "having strong norms that either support or discourage creativity and innovation."^{37/} The resistance of individuals must also be

^{36/} Karl Tietjen, Organizing the Product Planning Function (New York: American Management Association, 1963), p. 60.

^{37/} "A Descriptive Model," p. 481.

contended with, as personal considerations tend to override those of the organization. Zalesnik recounts a situation in which a manager discouraged all efforts at idea generation because he feared he would look inadequate in comparison to his subordinates.^{38/} Such problems have been dealt with by the use of management-training and management-development techniques. Here again it is evident that training can be useful, but only in the context of a larger effort.

It has been suggested that changes in norms and attitudes towards more innovative approaches to job performance may be encouraged through changes in the employees' relevant reward system to tie that system more closely to innovative behavior. It has been shown that when "considerable prestige and social status is attached to a person who innovates" more proposals are forthcoming.^{39/} A further refinement of this idea is suggested by O'Connell when he points out that organizational members can be made much more aware of the need for innovation "if the individuals and subunits are rewarded on the basis of total organizational performance rather than subunit performance."^{40/}

^{38/} Abraham Zalesnik, "Power and Politics in Organizational Life," Harvard Business Review, Vol. 48 (May-June, 1970), p. 54.

^{39/} Knight, "A Descriptive Model," p. 489.

^{40/} "Organizational Innovation," p. 7.

This need for tying rewards to behavior will be shown as important not only in the proposal stage but also in the evaluation and adoption phases to be considered below.

Evaluation phase

In the evaluation phase a proposal for a new-product has been submitted. The organization must now gather information on the viability of the proposal and on possible alternatives, decide on criteria for decision making, and then accept or reject the proposal for further development. Here the key factors related to successful innovation concern the problem-solving process and those who make the decisions. These factors were considered in general terms in an earlier section; however, a more detailed analysis is in order.

The consideration of this subprocess may be divided into three areas of focus: (1) the quality of information available to the decision maker, (2) the criteria for analysis used by the organization, and (3) the objectivity and ability of the decision maker. The information-processing function is critical in decision making because in most cases the decision maker has little direct knowledge of the merits of the proposal and must rely on data provided by his staff or by the proposing group. Since the decision is likely to be only as good as the information available, the organization must ensure that communication links and data-gathering techniques are the best possible. A study by Thomas Allen provides a good example of the vital nature of highly

developed resource and communication channels in successful problem solving.^{41/}

Correct mechanics, however, still do not guarantee correct information.

It should be recognized that even the best structure may have built-in biases, a fact which must be understood by the decision maker. Pessemier and Root warn, "Managers must be sensitive to the interactions between models in use as these affect information collection and processing, and organizational structure as it affects the communication of information."^{42/} Here experience and training can be the best defense against mistakes.

The decision maker must also learn to evaluate information according to its source. Those interested in the success of a given project will obviously wish to present the best picture possible. Bower, Whistler, and Hall have conducted research which supports the statement that information cannot be evaluated apart from the manager who is its source.^{43/} In each study there is evidence that there are those in the firm who formally or informally influence the choice process by searching for and selectively presenting information. Perhaps what is needed are multiple information channels so that figures may be cross-checked.

^{41/} Thomas J. Allen, "Information Needs and Uses," Annual Review of Information Science and Technology, ed. by Carlos A. Cuadra, Vol. 4 (Chicago: Encyclopedia Britannica, 1967).

^{42/} Edgar A. Pessemier and H. Paul Root, "The Dimensions of New Product Planning," Journal of Marketing, Vol. 37, No. 1 (January, 1973), p. 11.

^{43/} Bower, "Managing the Resource Allocation;" Thomas L. Whistler, "Measuring Centralization of Control in Business Organizations," New Perspectives in Organizational Research, ed. by W.W. Cooper, H.J. Leavitt, and M.W. Shelly (New York: John Wiley and Sons, 1964), Chapter 18, pp. 314-33; and William K. Hall, "Strategic Planning, Product Innovation, and the Theory of the Firm." (Unpublished Working Paper, The University of Michigan, 1972).

Poor decisions, however, may result not only from deficient information but also from poor decision criteria. In the past it has been assumed that profit potential was the basic measure of proposal worth. This assumption has since been replaced by the knowledge that new-product decisions may be based on a variety of financial and nonfinancial considerations. It would not be worthwhile in this paper to discuss specific criteria which enhance innovation, since in many cases criteria must be adjusted to fit the individual organization. Studies have been conducted, however, on general procedural considerations in the decision-making process. O'Connell points to a need for clarity in the criteria for analysis. He concludes that "When the criterion for selection is very vague or the cause and effect relationships are not stated, the organization may be reluctant to commit resources to any proposal."^{44/} This reluctance to act on proposals which have not been analyzed according to specific goals may be traced to the general aversion of organizations to uncertainty.

James D. Thompson points out that one of the prime responsibilities of decision makers in the new-product area is to reduce the amount of uncertainty connected with proposals which are brought before them.^{45/}

^{44/} "Organizational Innovation," p. 8.

^{45/} James D. Thompson, "Decision-making, the Firm, and the Market," in New Perspectives in Organizational Research, ed. by Cooper, Leavitt, and Shelly, Chapter 19, pp. 334-48.

However, if the manager has no distinct guide-lines from which to draw conclusions, little confidence is likely to be placed in his decision. For this reason Bower has suggested that new-product decisions be made "by the book," that is, by an objective, preplanned method of analysis.^{46/} Bower has two reasons for this suggestion: (1) objectivity increases confidence in the decision and reduces fear of criticism and (2) objectivity provides a means for suggesting alternatives to the original proposal.

A note of caution comes from Pessemier and Root who point out that new-product analysis may often be a negotiative rather than an objective decision-making process.^{47/} Proposals are championed by supporting groups as they vie for the limited resources available in the firm. The proposal, then, is shaped to its final form by this bargaining operation. They suggest, however, that this bargaining can be an effective means of new-product decision making if it is "based on appropriate information." This type of problem solving puts a great deal of emphasis on having a decision maker who is ideally both able and objective.

A lack of ability or objectivity in the key managers who handle new-product decisions can severely restrict successful innovation in the firm.

^{46/} Marvin Bower, "Nurturing Innovation in an Organization," The Creative Organization, ed. by Gary A. Steiner (Chicago: University of Chicago Press, 1971), Chapter 10, pp. 169-81.

^{47/} "Dimensions of New Product Planning," p. 11.

Vroom speculates that "a major source of ineffectiveness in large scale organizations" is inability of decision makers to recognize and discriminate among stimuli which require different responses.^{48/} This inability indicates further evidence of the point made by Pessemier that human error plays a significant role in the failure of many new-product ideas.^{49/} Vroom suggests a solution to this problem: "Insofar as the capacity to discriminate between stimuli can be modified by experience, it is possible for organizations to train individuals to make discriminations required by their roles."^{50/} This ability to discriminate, then, is another facet of the innovative process which could be improved by a management-development, management-training program. The objectivity of managers is perhaps not so easily insured.

It was suggested earlier that decision makers are subject to errors of emotion which may tend to impair their objectivity. Alexis and Wilson concur in their study of organizational decision making: "The judgment of perceivers is often distorted when a strong need is attached to an event."^{51/}

^{48/} Victor H. Vroom, "Some Psychological Aspects of Organizational Control," New Perspectives in Organizational Research, ed. by Cooper, Leavitt, and Shelly, Chapter 5, p. 73.

^{49/} "New-Product Ventures."

^{50/} "Psychological Aspects of Organizational Control," p. 75.

^{51/} Marcus Alexis and Charles Z. Wilson, Organizational Decision-making (Englewood Cliffs, N. J.: Prentice-Hall, Inc., 1967), p. 68.

The lack of objectivity on the part of the decision maker results from a conflict between personal and organizational needs. As in the proposal stage, it is up to the organization to provide the individual with a situation which makes it to his advantage to have the same goals as those desired by the firm.

Adoption phase

Once the decision to proceed with a new-product proposal has been made, the organization is still faced with the problem of implementing the project and integrating it into the on-going functions of the firm. Here production, marketing, and other line functions must be brought into the development process so that the product may be built and sold. In this phase, coordination becomes the key to success.

In an earlier discussion of the coordination problem, evidence was presented which indicated that misunderstandings about the rank of product innovation on the list of organizational goals can result in a lack of cooperation among operating divisions. It was suggested by Roberts that the absence of a common language for communication among departments can aggravate the goal-congruence problem and also cause difficulties in transmitting necessary knowledge about the new product from the R & D department to the line functions.^{52/} Further proof of this point is offered by Guetzkow:

^{52/} "Communication Imperative."

The functional specialties like sales and engineering must have an adequate language for communication of their problems to each other, so the bands of assumed constraint may be broken and innovation achieved.^{53/}

If misunderstandings and barriers to communication do exist, conflict among the departments is likely to arise and not likely to be resolved. This resentment, if left unresolved, results in the rise of subgroup norms which hinder the operations of other groups and make coordination very difficult. Without the perspective and overview of the whole organization provided by the interaction among departments, individual subgroups become reluctant to compromise, a process which Normann considers essential to coordination in the new-product process. J.D. Thompson provides a rationale for this reaction in his discussion of organizational aversion to uncertainty.^{54/} Each department, in the absence of knowledge of other department functions, wishes to insulate itself from uncertainty. The result is that production wants a constant production flow; marketing wants line variety and short delivery; and the financial department wants low inventory. The outcome of these conflicting demands is disastrous if coordination is lacking.

^{53/} Harold Guetzkow, "The Creative Person in Organizations," in The Creative Organization, ed. by Steiner, Chapter 2, p. 40.

^{54/} Normann, "Organizational Innovativeness;" and Thompson, "Decision-making, the Firm and the Market."

The suggested solution is to train those responsible for interdepartmental communication to understand each other and, further, to get line managers involved as a group in the product development at an early stage so that problems may be anticipated before the product is introduced.^{55/} This solution is likely to head off successfully interdepartmental conflict between general management and functional hierarchies over organizational change resulting from product innovation. In considering the impact of innovation on the structure of organizations, Herbert Shephard explains that any of the necessary changes "are likely to run counter to certain vested interests or to violate certain territorial rights."^{56/} Zalesnik puts this problem into perspective:

Whatever else they may be, business organizations are political structures in that they provide a base for the development of managerial careers and a platform for the expression of individual interests and motives.^{57/}

Each organization, then, has an existing power structure which has a large commitment to the status quo. New products require shifts in that

^{55/} Tietjen, Organizing Product Planning Function, p. 6.

^{56/} "Innovation Resisting and Innovation Producing Organization," p. 420.

^{57/} "Power and Politics," p. 47.

power structure because they demand scarce resources and provide new power bases for those responsible for the products' success. Those in power who are unwilling to see their power reduced will fight the innovations. The result may be a sort of "organizational inertia" as the struggle for power paralyzes the firm.^{58/} Even where there is no open conflict, resistance may remain; as Sayles points out, "Hidden behind the consensus for innovation may be, and usually are, diverse and conflicting interests in the organization."^{59/}

When there are many bases of power in the organization this problem of resistance can become complicated. In a study of retail stores, Sapolsky found that

Diversity in department store structural arrangements, the decentralization of decision-making authority, and the existence of a large number of equally powerful subunits frustrated attempts to implement innovative proposals.^{60/}

Here is one of the contradictory situations alluded to earlier. The open and decentralized type of structure, which has been identified as enhancing the

^{58/} Peter G. Peterson, "Some Approaches to Innovation in Industry," in The Creative Organization, ed. by Steiner, Chapter 11, p. 185.

^{59/} Leonard R. Sayles and Margaret K. Chandler, Managing Larger Systems (New York: Harper-Row, Publishers, 1971), p. 39.

^{60/} Harvey M. Sapolsky, "Organizational Structure and Innovation," Journal of Business, Vol. 40, No. 4 (October, 1967), p. 509.

ability of the organization to propose and evaluate innovations, now makes it difficult to get innovations implemented. The strong leadership from the top and the singleness of purpose so essential to gaining compliance from the various power centers in the firm is absent in the decentralized firm. If the whole process of innovation is to be carried through there will obviously need to be some tradeoff between these two opposing structural demands. The relevant criteria for deciding on what this tradeoff should be will be discussed in the next section. One consideration that should be kept in mind is that perhaps the problem can be dealt with by other than structural means.

Theorists in the area of motivation, such as Atkinson and Lawler, have indicated that performance is more likely to conform to desired patterns if members see personal goal attainment promoted by good performance. Thus the organization must restructure the firm so that individual power centers see innovation as expanding rather than restricting the scope of their control.

In order to understand the relationships among the inter- and intra-organizational variables which have been identified as impacting on new-product development, the author has outlined a factor model of innovation. The model and an explanation of the relationships are discussed below.

A Factor Model of Innovation

The model (Figure 3) contains all the organizational processes and characteristics previously discussed, such as organizational climate, decision-making and coordination functions, and the organization's human-perceptual

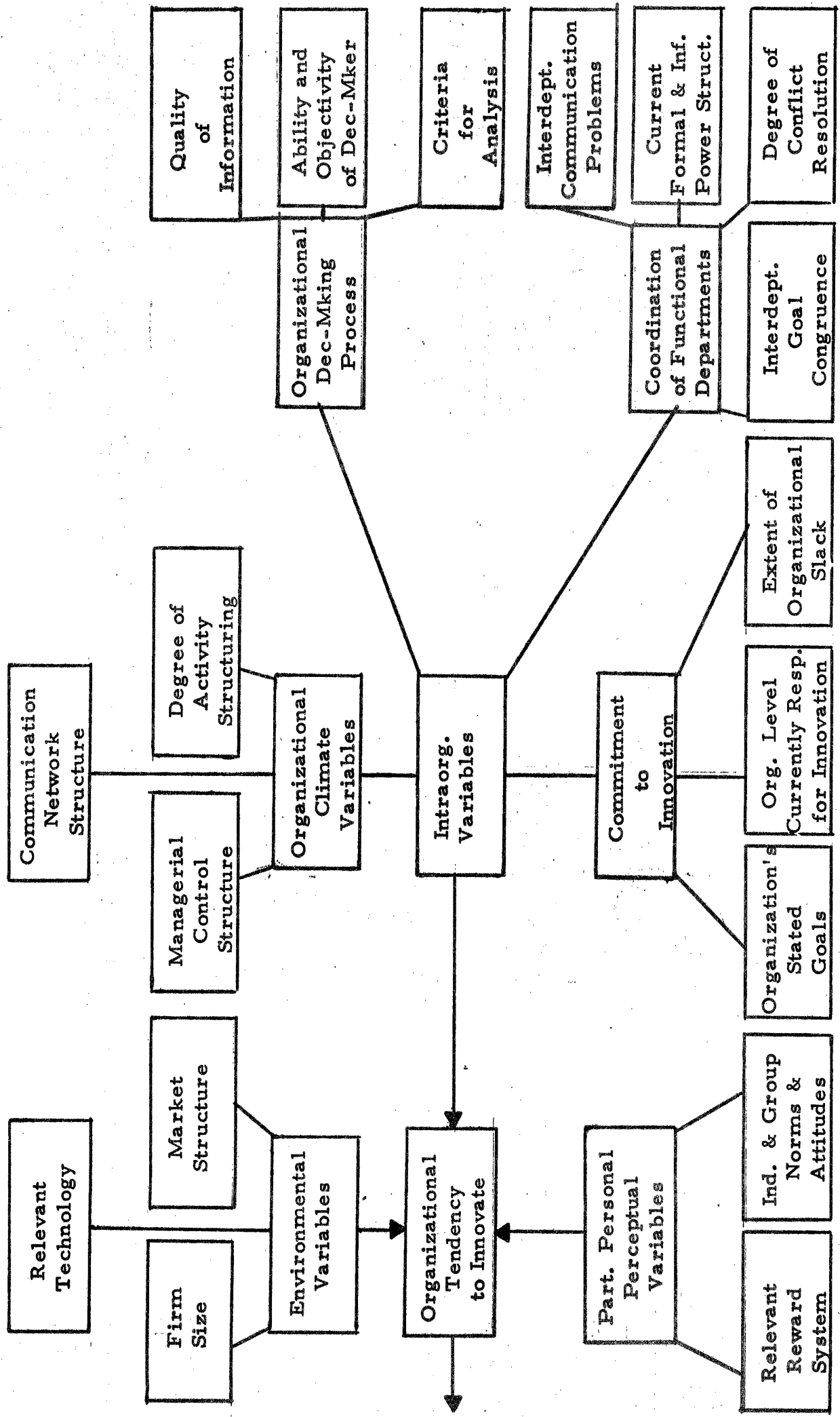


Fig. 3. A factor model of innovation.

characteristics. Also included are a group of variables not previously considered: the environmental variables--relative firm size, market structure, and relevant technology. Of all the factors suggested in the model, these variables are unique in that they are relatively permanent conditions faced by the organization and, for the most part, beyond its control. These variables become significant because, as Merton points out, the rate of innovation

depends on things outside the organization--its environment and market... In an effort to diagnose the more or less innovative organization, therefore, one should diagnose the environment of which it is a part, the kind of competition it is subject to. 61/

The conclusion that may be drawn from this statement is that while there are some organizational characteristics which generally make a firm more able to innovate, there are also factors in the firm's environment which may make it undesirable for the organization to acquire these characteristics. For example, organizations that are small relative to other firms in a particular market may find it too expensive to develop their own innovations; or a firm in a relatively stable market, perhaps a market in which it is the only firm, may find that the cost of innovation cannot be economically justified. These are situations in which the organization might wish to forego the flexibility and increased tendency to innovation which result from an open structure in order to gain the advantages of accountability and predictability that are characteristic of a more bureaucratic form of management.

61/ Robert K. Merton in The Creative Organization, ed. by Steiner, p. 194.

Research into the effect of size on a firm's propensity to innovate indicates that the effect varies with the type of technology in the firm's industry. A study by Mansfield implies that in industries where the complexity of technology makes the innovation process relatively expensive most of the innovation is conducted by larger firms which can afford the risk of failure. On the other hand, in environments where the cost of innovation is relatively low and returns initially small, the smaller firms tend to lead the way. Westfall suggests that such findings may be the result of more organizational inertia in the larger firm and of the fact that innovations must show a probability of larger returns to interest the largest firms in an industry. Collier presents research which supports these contentions and in addition offers the idea that size may also affect technology. He suggests that as firms become larger they tend to have more cost-efficient but less-changeable forms of technology.^{62/}

The functioning of a firm's relevant market is another variable which has been studied. For example, Mansfield shows that firms in a more competitive market environment tend to be more innovative. Another aspect of market function is suggested by Enos in his finding that the number of

^{62/} Edwin Mansfield, "Size of Firm, Market Structure, and Innovation," Journal of Political Economics, Vol. 71, No. 6 (December, 1963); Westfall, "Stimulating Corporate Entrepreneurship," p. 242; and Donald W. Collier, "An Innovation System for the Larger Company," Research Management, Vol. 13, No. 5 (September, 1970), pp. 342-3.

innovations tends to be greatest in an industry where the market is expanding.^{63/} These results seem accurate, since in the former case competition from other firms would tend to spur the organization to get ahead of the pack, and in the latter case an expanding market would generate slack in the industry and also give promise of greater returns on innovation.

The final variable which has been identified as part of the environment is the relevant technology in the industry. Perrow has found that in industries where operational technology tends to be fairly stable, programmed, or routinized the tendency to innovate is less than in industries where technology must deal with more exceptions or is in a state of flux. This relationship of technology to innovation is a reflection of a similar relationship between industry innovation and the degree of turbulence in the whole environment. O'Connell concludes that innovation is more likely to occur in uncertain environments because pre-programmed solutions do not exist to deal with problems that arise.^{64/} This lack of preprogrammed solutions sets off a search-for-solutions process which

^{63/} Mansfield, "Size of Firm, Market Structure," and John Enos, "Invention and Innovation in the Petroleum Industry," The Rate and Direction of Innovative Activity: Economic and Social Factors, ed. by R.R. Nelson (Princeton, N.J.: Princeton University Press, 1962).

^{64/} Charles Perrow, Organizational Analysis: A Sociological View (London: Javistock Publications, Ltd., 1970); and O'Connell, "Organizational Innovation," p. 5.

ends with an innovation. Thus the environment may be viewed as affecting the innovative process in significant ways.

Implications

In order to determine the effect of these environmental variables on the efforts of those trying to improve the organization's innovation process, these variables should first be included in the organizational audit proposed by this author as a first step toward change. Since environmental characteristics can make it unprofitable for a firm to attempt innovation, perhaps a study of the environment is the most logical place to begin analysis. What is needed is a means of classifying firms according to type of environment and from this classification deciding the potential advantage to the firm of an improved climate for innovation. Emery and Trist provide a possible methodology for classifying the environment of firms on a continuum from turbulent to patterned. Although this measure is relatively rough, it could indicate the constraints to innovation that exist in the environment. The second step in determining the value of innovation to the firm brings to mind a suggestion by Rensis Likert that what is needed in any change effort (improving innovation could be considered a subset of organizational change) is a computation of the economics of change^{65/} --an assessment of the cost to the firm of instituting a more open

^{65/} F. E. Emery and R. L. Trist, "The Causal Texture of Organizational Environments," Human Relations, Vol. 18 (August, 1963), pp. 20-26; and Rensis Likert, New Patterns of Management (New York: McGraw-Hill Book Company, 1961).

system of control, new communication networks, etc. The cost of such change would be measured according to such variables as the amount of resistance expected, value of control lost, and the increase in uncertainty. All these costs must be balanced against the value of expected return on the innovations which come as a result of the change. Although this type of analysis is imprecise and subject to judgmental error, if it could avert a change effort by showing the change to be undesirable, it would be worthwhile.

Techniques

If it is valuable to continue with an effort to improve the intraorganizational management of innovation, the next step is to design and implement the organizational audit. Although each audit should be designed to fit the particular organization, there are general rules to be observed for all cases. The first is that those conducting an organizational audit should hold no preconceived notion as to what is right for the company. The fact has been alluded to previously in this paper, but it is worth repeating: "We can scarcely assume that the dynamics of innovation are the same for all formal organizations regardless of type."^{66/} Thus it is possible that what may make one firm more innovative may create chaos in another.

Those conducting the audit should also realize that they are dealing with

^{66/} William M. Evan and Guy Black, "Innovation in Business Organizations: Some Factors Associated with Success or Failure of Staff Proposals," Journal of Business, Vol. 40, No. 4 (October, 1967), p. 520.

individuals not simply an organization. The analyst may be variously viewed by those in the firm as a troublemaker, a knowledgeable specialist, or a helpful friend. How he is viewed depends largely on the amount of trust the members of the group have in him. Since the amount of information the auditor is likely to gain hinges on the cooperation of those on the line, his first effort should be winning the acceptance of those with whom he must deal. Watson and Glaser have advised that the best way for the auditor to dispel suspicion is to bring the managers into the audit process as soon as possible: "Their participation can be invaluable for pinpointing troublespots, collecting facts, and suggesting improvements."^{67/} Another recommendation is that the auditor identify formal and informal power centers in the firm. By working with these centers, he can possibly avert conflicts in the shift to the innovation-encouragement form of operation and also later when more changes are necessitated by the resulting increase in new products.

In considering which functions and organizational roles should be analyzed, the auditor should remember this point: it is generally agreed that the various aspects of the organization, such as task structure, political structure, and human component, are interrelated and that changes in one are likely to result in changes in the others. In order that the analyst avoid

^{67/} Goodwin Watson and Edward Glaser, "What We Have Learned About Planning for Change," Management Review, Vol. 54, No. 11 (November, 1965), pp. 34-47.

unanticipated consequences arising from changes he may suggest, he must first consider the implications of those changes for the other components of the organization and then expand his analysis to include any component likely to be affected. For example, if a change is made in the organization's structure necessitating shifts of responsibility, it would be logical to assume that the result could be some form of reaction from the managers affected. In order to understand the dynamics of the change, the auditor should get feedback from the affected members. It will obviously be difficult for the auditor to anticipate all the repercussions of such changes, but he should make the effort.

Perhaps the worse mistake would be to move too quickly from the audit to the actual change program. Any effort at adjusting structure or beginning a management-training program before the organization is sure of the right course can make later change efforts difficult. Managers involved in an abortive change process that is later modified or scrapped tend to become sceptical of any future efforts.

Conclusion

After the audit is completed and the results fed back to top management to work out problems and gain acceptance, the change program should be ready for implementation. The analyst should be forewarned, however, that the possibility exists that top management, even at this late date, may decide not to proceed with the suggested changes. Wallenstein cautions that

top management, in considering the larger framework of total operations, may find that a shift of objectives to redefine the relevant environment is more acceptable than the indicated organizational changes.^{68/} He suggests that management must have the final decision and that it should not be up to the proposer of change to sell the idea to those in charge, for change that is difficult to introduce is not likely to be effective. Assuming, however, the case of management acceptance, the audit may then serve as a guide for the content of training programs and for decisions regarding changes in organizational structure or functions.

This paper has tried to relate the analysis of an important problem with some suggestions for its solution. The process is as yet only an outline, but it is hoped that some of the proposals here can be used as the first step toward relieving the problems associated with the intrafirm management of innovation.

^{68/} Gerd D. Wallenstein, Conceptual Practice of Product Planning (New York: American Management Association, 1968).