Management Services: A Magazine of Planning, Systems, and Controls

Volume 5 | Number 6 Article 5

11-1968

Delphi Technique: Implementation in the Corporate Environment

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This appropriately named forecasting technique is basically subjective in nature and may thus be looked on suspiciously by devotees of the probabilistic school. But this method guards against many of the drawbacks of earlier estimating techniques—

THE DELPHI TECHNIQUE: IMPLEMENTATION IN THE CORPORATE ENVIRONMENT

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THE RAPID tempo of technological and cultural changes in our society has heightened the interest of corporate planners in long-range forecasting. As the need for more sophisticated corporate planning has become evident, the search for systematic approaches that will yield reliable information about future events has intensified.

It is the purpose of this article to present a new but proven approach to long-range forecasting, the Delphi Technique. This technique has been developed, tested, and found to be an extremely effective method of forecasting future events in both business and governmental organizations.

The Delphi Technique was first developed as a method of integrating the opinions of experts without sacrificing or compromising individuals' suggestions and ideas—as is so often the case when committees are assigned the task of compiling a long-range forecast.[1] Originally used by the military to answer such questions as, "What

[1] This technique was first described by Olaf Helmer and Nicholas Rescher, "On the Epistemology of the Inexact Sciences," *Management Science,* Vol. VI, No. 1, October, 1959; Norman Delkey and Olaf Helmer, "An Experimental Application of the Delphi Method to the Use of Experts," *Management Science,* Vol. IX, No. 3, April, 1963.

Information can be evaluated on its merit, without influence of personalities.

would be the effect of a nuclear attack on major U. S. cities?", this technique has since been adopted to answer such industry-related questions as "What impact on our product lines can be anticipated as a result of increased leisure time?"[2]

The Delphi Technique requires that a panel of experts on the subject under study be selected. These individuals are then asked to independently develop their best answers to the questions being asked, for example, to forecast changes within a specific industry or technology. In addition, they are required to make their underlying assumptions explicit and to identify any source material that they would find helpful in refining and improving their answers. After their first answers are completed, each expert is given the composite replies of the group, together with the other experts' assumptions and their own requested additional information, if it is available. The names of the individual panel members are not associated with the opinions provided. Successive revisions of the original forecasts are undertaken following this procedure. Finally, a composite forecast is compiled.

Forecast without bias

By means of this technique, information can be evaluated by the experts strictly on its own merit without the evaluation's being influenced by the personalities and status of the contributors. Through objective, critical evaluation of all information, independent thought can be systematically developed and compiled to formulate a group answer to the question under study. The method has the advantage of involving many individuals without the disadvantages of the committee method, which frequently results in composite problem solving that is skewed by the status levels and reputations of the members of the committee involved in the decision making process. When compared to committee forecasting methods, the Delphi Technique has been found to result in substantially improved forecasts.[3] For this reason, the technique is proposed here as an appropriate and promising long-range forecasting method that is likely to result in improved forecasting and planning if it is properly applied by organizations currently relying on individual forecasters or forecasts by committees.

However, the success of the Delphi Technique depends on two critical factors:

- the choice of experts to serve on the panels
- the way in which the technique is implemented.

For this reason, the selection of experts and the organizational relationships between the panels of experts and the rest of the top planning and decision making bodies in the organizaton are examined in some detail in this article. Finally, the article presents the application of this technique to forecasting the future external environment of the firm and the evolution of its product lines.

Panel selection

The forecast planner's selection of the forecast panel of experts is of primary importance to the success of the forecasting effort. Exhibit 1 on page 39 illustrates several of the most important group composition requirements that must be considered when selecting forecasters for specific forecasting tasks. Which participants are most appropriate for the forecast panels depends on the nature of the company's forecasting. A number of interesting differences in participant composition can be noted. For example, as a corporation's forecasting requirements change from broadening current applications of existing technologies to identifying

[2] For a description of how the Delphi Technique was adapted to determining the relative importance of cultural constraints on business enterprises in foreign countries see Richard N. Farmer and Barry M. Richman, *Comparative Management and Economic Progress*, Richard D. Irwin, Inc., Homewood, Ill., 1965, pp. 329-339.

[3] This study is reported in Robert Campbell, *A Methodological Study of the Utilization of Experts in Business Forecasting*. Ph.D. dissertation, University of California, Los Angeles, August, 1966.

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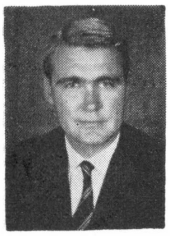

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EXHIBIT I Important Factors in Selection of Panel of Experts

Specific Corporate Orientation to the Future	Empirical Data	Judgment			Diversity of Participants		Imagination	
		Specialized Expertise	Less Specialized Expertise	Informal Generalists	Close to Specialized Fields and Interests	Widely Diversified and Inter disciplinary	Extrap olative	Creative Conjecture
a Broadened Applications of Existing Technologies	High	High	High	Low	High	Low	High	Medium
b New Alternatives Evolving from Existing Knowledge	Medium	Medium to High	High	Medium	Medium	Medium	Medium	Medium
c New Alternatives Evolving from New Knowledge Derived from Trends of Research Analysis and Social Developments	Low	Medium	High	High	Medium to Low	High	Medium to Low	High
d New Alternatives Evolving from New Knowledge Derived Strictly from Responsible Educated Conjecture	Low	Medium to Low	High	High	Low	High	Low	High
e New Alternatives from Creative Conjecture Not Discernible from Any Existing Knowledge	Low	Low	High	High	Low	High	Low	High

Exhibit 1 is adapted from the unpublished work of Charles W Williams, Jr , of the National Science Foundation for particular application in the World Future Society Washington, D.C.

more abstract future conditions not readily discernible from existing knowledge, forecast group composition requirements change radically. As forecast needs vary from the concrete to the abstract, the importance of empirical data diminishes rapidly; also, forecasters with specialized skills must be replaced by informed generalists, capable of operating without empirical evidence but with disciplined imaginations to evaluate diversified sources of qualitative information. Obviously, the use of interdisciplinary teams of experts in long-range forecasting is likely to become more fruitful as the nature of the forecast becomes more abstract.

This exhibit illustrates the diverse forecast group composition requirements to which the corporate planner must direct considerable attention in designing particular forecast programs. His selection of participants is of primary importance to the total forecasting program.

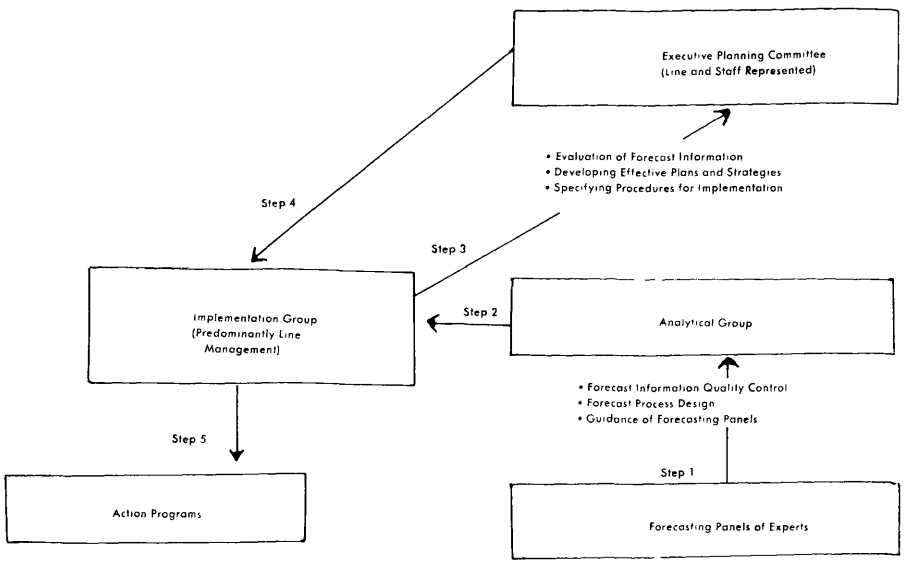
Determining whether or not to use corporate personnel on the forecasting panels is a major decision facing the forecast planner. Firms with the required reservoir of knowledge and creativity should actively exploit such in-house information sources during the long-range forecasting process. Often, however, the attitude of management toward its personnel will play a large role in determining the nature of the forecasting panels. For example, those companies with qualified experts may not make full use of them if management lacks the necessary confidence in its personnel. This is, of course, unfortunate, and it could prove very costly to the future of the organization.

The actual makeup of the panels of experts to be used in forecasting will depend to a large extent on the relationship between these panels and the rest of the organization. The design of an effective corporate long-range forecasting program must satisfy the specific needs of the corporation at that point in time. Thus, theoreticians and pragmatists must be properly balanced on the panel.

Perhaps more important than the makeup of the panels, however, is the relationship between the forecasting panels and the rest of the

The authors wish to acknowledge the assistance of Olaf Helmer, Rand Corporation; Theodore Gordon, McDonnell Douglas Company; and Clifford Craft, C. J. Craft Associates.

EXHIBIT 2 Corporate Forecasting and Planning Organization



corporate office. A recurring problem to be anticipated by the forecast planner is top management's understandable reluctance to relinquish any personal control over planning the corporation's future operations. Often, the forecasting groups are mistakenly identified by top management as performing planning and decision making functions. Thus, the forecast program and related organizational requirements must be designed so as to demonstrate to top management that the sole purpose of the forecasting panels is to provide the planners and decision makers with pertinent information, not to determine the corporations' destiny themselves.

Planning organization

An organization of the forecasting, planning, and operations groups that has proved to be effective is shown in Exhibit 2 on this page.

The forecasting panels begin the program by exploring some predetermined subject related to future conditions. As the forecast process proceeds, the forecast information is submitted to the analytic group, which maintains constant control over its quality (e.g., its realism and validity). Although the members of the analytic group must exercise extreme care to avoid introducing their own biases, such information control reduces the risk of ineffectual corporate plans and wasted executive time arising from the planning of corporate actions around low-quality forecast information.

Once organized by the analytic group, the final forecast information is reviewed by the implementation group, usually made up of high-level line managers. The resulting suggestions from this group on validity, content, and recommended usage and the finalized forecast information are then submitted to the high-level executive planning committee. Specific long-range and short-range plans and strategies commensurate with acceptable forecast information are then drafted by this group. The resulting plans and strategies are then transmitted to the implementation group for translation into action plans to be carried out by the various functional groups within the corporation.

Organizing the forecasting process in this manner provides the corporate planners with a maximum of relevant information while reserving their authority to plan and make decisions on behalf of the corporation. Furthermore, such an approach provides the necessary coordination, participation, and commitment within the corporation to assure the effective translation of sound ideas into corporate benefits.

Practical application

The concepts involved in designing and implementing the Delphi Technique in long-range forecasting programs are now being applied in several industrial and governmental organizations. It may therefore be useful to examine in detail the application of this technique to two important facets of long-range forecasting: exploration of a firm's future external environment and development of evolutionary product lines.

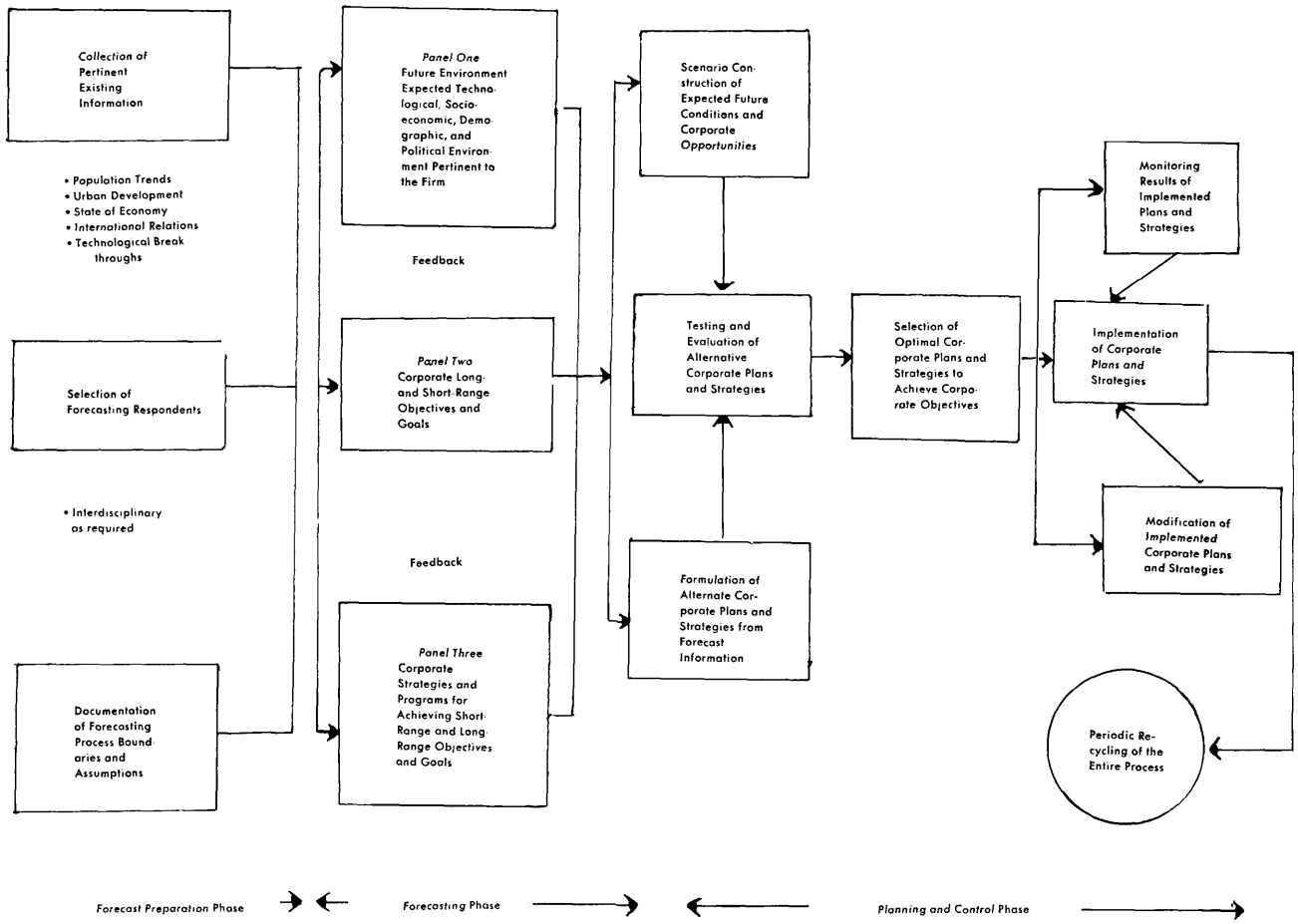
External environment

Corporations today are particularly concerned with gaining insight into future technological, socioeconomic, and demographic developments that will have substantial impacts on their product lines, financial strategies, and sociotechnical systems. By developing insights into these future events, these organizations are better able to set long-range objectives and establish plans and strategies that will optimize their chances of achieving their objectives.

An effective method of exploring corporate opportunities and requirements in light of changing environmental conditions is to establish three forecasting panels of experts. These would focus on

- Expected future environmental conditions
- Corporate long-range and short-range objectives
- Corporate strategies and programs for achieving these objectives in light of expected future conditions.

EXHIBIT 3 **Forecasting the Corporate Environment**



Each panel is, of course, provided with the forecast results of the other panels as the forecasting proceeds and is encouraged to comment on the estimates and reasoning of the other panels. In this manner, each panel is provided with the maximum of relevant information for pursuing its own particular objectives. The integration of these three forecasting panels is illustrated in Exhibit 3 above.

Feedback loop included

The unique concepts in the exhibit are those associated with the forecasting phase. A feedback loop is introduced in this phase to demonstrate the reciprocal flow of information between the forecasting panels of experts exploring the various facets of the subject matter. During the planning and control phase, the forecast information generated during the forecasting phase is organized into logical scenarios of future conditions and related corporate opportunities and requirements. Corporate planners then utilize this information to develop alternate plans and strategies by which the corporation can best meet its objectives and adjust, on a timely basis, to important future conditions. Various cost/benefit/effectiveness analyses of alternate plans and strategies are then conducted, and desirable alternatives are selected for implementation. Finally, the selected alternatives are implemented, monitored, and modified over time.

Not one-time project

It is important to note that this forecasting and planning progress is not a "one-time-only" activity; rather, all three phases of the process must be reactivated periodically to uncover and adjust to changing environmental and corporate conditions that render previous objectives, plans, and strategies obsolete. The dynamic nature of environmental and corporate processes requires such periodic reassessment and adjustment, no matter how effectively the forecast

and planning functions were conducted initially.

Evolutionary product lines

Another application of the Delphi Technique involves the identification of the series of interrelated activities that will carry a new product concept through its developmental stage and into final production. The many research and development, production, marketing, and administrative activities required in the new product evolutionary process are determined by the panel of experts. These activities and their interrelationships are then placed on a time continuum, working backward from the end product. In addition, likely derivative products that will or could be developed from a specified series of activities during the developmental process are identified. In effect, this process involves the development of inverse PERT charts depicting the developmental activities of a proposed product.[4] The forecasting panel begins with the fully developed product and proceeds to identify all activities required to develop the product from the current capabilities and supporting technologies of the firm and the industry. The resulting time-sequenced series of interrelated events provides corporate planners with the necessary information for deciding on the feasibility, the costs, and the benefits of proposed new products. Also, such information allows the planner to determine the effects of various levels of effort that might be devoted to developing the new product. Finally, after such continual analysis, the network of developmental events provides the corporate planner with the necessary visibility for answering resource allocation questions related to resource amount, resource type, and timing of the allocation and for monitoring the results achieved through such allocations.

Forecasting importance

It seems evident that long-range forecasting as a major support function to corporate planning will continue to increase in importance. Realizing that corporate survival in the future will depend on effective planning, corporations are beginning to adopt more elaborate and sophisticated forecasting programs. It therefore seems timely and appropriate to consider the adoption of the Delphi Technique as an effective group technique for long-range forecasting.

Advantages—difficulties

This article has examined the advantages and caveats of adopting the Delphi Technique for this purpose. In particular, the selection of the panel of experts and the organizational relationships between the panels and the corporate planners and strategic decision makers were explored. The roadblocks to the successful implementation of the technique are many. Although the forecasting may be effective, translating the resulting information into action plans that are subsequently implemented is a formidable task. Busy executives often claim that the resulting forecasts and plans are outside the mainstream of their activities and thus must be assigned lower priority than immediate problems. The screening of forecast information for use in corporate planning is also a most difficult process.

The future

In spite of these difficulties, the organizations that persist and develop effective long-range forecasting and planning programs are destined to reap substantial rewards for their efforts. Firms without such programs may not experience the competitive pinch in the short run, but the long-run effects of this oversight may prove to be devastating.

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[4] For a detailed discussion of this innovative approach see "New Products: Selling a Timetable," *Business Week,* May 27, 1967, pp. 52-61.