Operations Diagnosis in Research Planning

THERE are two basic reasons why the officers of a company set aside certain portions of the company's income to be spent on research. One is that they believe the company has current problems that can be solved through scientific investigation. The other is the knowledge that research may uncover new opportunities for bettering the company's competitive position.

The measure, then, of the effectiveness of a corporate research program is how well it solves corporate problems, and how well it uncovers industrial opportunities. Research that seems sound, worthy, and well directed while in progress but that does not lead to the fulfillment of one of these goals does not accomplish its function. It may produce scientifically interesting information, stimulate creative thinking, and result in useful by-products. But, unless it pays off in terms of corporate progress, it has not been a good investment from a business standpoint.

Obviously, if company research is to pay off, it must be well planned. In large companies today, business operations are so complex that it is no longer safe for management to make decisions based on individual judgment, even though this judgment results from broad and intensive experience in the company's affairs. For this reason, management in many industries is turning to techniques of scientific analysis to arrive at information necessary for making decisions.

Operations research is one technique for analyzing problems and determining the best approaches to technical research. Industry borrowed this tool from the military, when it was developed during the war to analyze the factors involved in a military operation. It embraces the relating of complex variables affecting an operation in a mathematical manner to show cause and effect. It has proved remarkably effective both in military and in industrial applications.

Engineering economics, another tool used by management to analyze company problems, is essentially a science of prediction of technical economic opportunities and risks. It provides a quantitative analysis of markets, sources of raw materials, opportunities for diversification, industrial logistics and plant location, the competitive effects of technology, and research planning. Operations research and engineering economics overlap to some extent.

At Battelle, in diagnosing the factors that enter into the planning of research, we combine operations research and engineering economics, and call the analytical procedures by a new term—"operations diagnosis." If a problem for industry, it is "industrial operations diagnosis;" if for the military, "military operations diagnosis."

This concept has an obvious parallel in medicine. A business organization may be compared to a biological organism. Both are organizations of intricately related parts, each with delicate function. In medicine, we diagnose what is wrong with the organism and then prescribe a remedy. With modern scientific tools, we can likewise diagnose what is wrong in an industrial operation and prescribe a remedy. The remedy may be either a planned program of technical research or carefully considered counsel for management action. In such an approach the industry is regarded as a unit, and the function of any part is considered only in relation to the whole. By diagnosing scientifically the causes of symptoms, remedial actions need not be based on hunches, pet ideas, or makeshift expedients, but on properly evaluated methods for removing the causes. Futile research on superficial indications is eliminated, and an efficient attack is formulated on the basic source of trouble. Problems of semantics in communication among members of management are reduced when the diagnostic approach is assumed.

The idea embodied in "operations diagnosis" tends to make research more efficient, by showing clear roads to profitable investigation. Anything that helps make research a more exact tool for industrial progress also stimulates science and technology generally.

CLYDE WILLIAMS

Battelle Memorial Institute
Columbus, Ohio

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