

RESEARCH IS COSTLY BUT NECESSARY

Competition keeps industry spending for research, says NSF, but rating the results is difficult

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Why does industry spend billions for research? Competition is the biggest reason, concludes the National Science Foundation in a survey looking into factors which affect company spending for research. The survey, first of its kind, was conducted for NSF by the Labor Department's Bureau of Labor Statistics.

Interviews with 200 large companies, including 33 chemical firms, indicate that the competitive situation is often an overriding factor for spending money for research. The chemical industry is very sensitive to competition, say company officials, stressing the need for a steady stream of new products.

Research done for the Government influences the amount of research industry does, since it represents one third of the total industry research effort. NSF says a sudden decrease in government research needs would be an unsettling factor, while a gradual reduction in medium-sized federal programs could result in compensating increases in industry research programs. Results of increases in government research needs would depend considerably on availability of trained manpower. Should these increases occur when there is a shortage of scientists, the result would probably be a cutback of industrial research programs to meet government demands.

Management attitudes toward research and company aspirations for the future also stand out as factors influencing the amount and kind of research industry does, says NSF. Some companies stress short-term research designed to meet current competition. A chemical company official reports his company does not allocate funds for research on a regular basis. Instead, it supports projects as they appear to be needed.

A large proportion of the companies interviewed, however, have research programs geared to long-range growth plans and sometimes to diversification of products. A research official of another chemical company says his firm stresses basic research leading to new products which will help it reach its long-range diversification goals.

How Much to Spend - Methods for establishing the size of a research budget are many. About half of the interviewed companies say the research budget is set by an educated guess of company needs. Officials of these firms feel that research expenditures should fluctuate with company needs and not with measures of company activity such as sales volume.

Many companies use the formula approach for setting a research budget. A popular formula uses a percentage of annual sales as a guide. Some firms derive this ratio from past experience while others try to stay within the limits that other companies in their industry allocate for research. A chemical company reports that it uses a figure of 4% of sales. In a nine-year period the company's actual expenditures range from a low of just 3% to a high of a little over 5%. Figures ranging from 2% to 4% are common. Most companies use formulas as a rough guide in setting research budgets, says NSF. Formulas are rarely applied mechanically to get an exact figure.

Ultimately, says NSF, most companies rely on good judgment in establishing

research budgets. Regardless of approach, many companies place emphasis on maintaining a continuing and stable research organization.

Is It Worth It? - Evaluating the financial returns of a research program is a tough problem, according to NSF. The survey indicates most companies have no satisfactory solution. However, a majority of the companies interviewed said they attempt some type of appraisal.

Formulas are finding some use in estimating the value of a research project. Factors considered are promotion, administration, and marketing costs, in addition to research and development costs. Some companies estimate a research program's value through a formula establishing a ratio between estimated return, and probability of success as against estimated research expenditures. Thus a ratio lower than 3:1 might be considered too low to justify the proposed research.

Many companies using formulas limit their application to certain types of research—such as cost-reduction projects—which lend themselves to the formula technique. Most companies using formulas, says NSF, feel their use, while not providing exact measurements in all cases, tends to assure consideration of some factors which might be slighted with a less formal approach.

Nonformula approaches to research evaluation stress general criteria such as the impact of new products on the company's position. NSF reports that a pharmaceutical firm and a chemical company use the yearly contribution of new products to the sales volume as a measure of the company's research effort.

A very few companies report they do not evaluate their research attempts. Some feel their research programs are too small to justify the cost of evaluation, says NSF, while others say that too much emphasis on monetary return might tend to inhibit the exploration of new ideas.

The need for more basic research to provide a base for research program expansions is stressed by many of the companies NSF surveyed. These companies say that a shortage of qualified personnel is limiting their efforts in basic research. Availability of more basic data, say these companies, would make applied research programs more effective.

R & D Bill. - Private industry spent \$4 billion in 1954 for research and development, according to final figures in that part of the NSF survey devoted to R & D expenditures. These figures represent a 12% increase over the \$3.7 billion NSF reported for 1953. Other statistics in this final report are virtually unchanged from those in its preliminary report (C & EN, Jan. 2, page 24).

Copies of "Science and Engineering in American Industry - Final Report on a 1953-1954 Survey" can be obtained for 70 cents from the Superintendent of Documents, Washington 25, D. C.