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lot of publicity surrounding it, lots of hoopla. It uses another adage: What gets measured, gets done. The author says, "This might sound simplistic. But I've seen so much evidence to the contrary that I beg you to try it."

Pay for share-of-new-product-sales. This one says that "what gets paid for, gets done even more." 3M uses this method, even in the face of differences between divisions (a mature division and a new-technology division both will have the same target).

Use time as a principle business performance. This is the accelerated new product development thrust that all product innovators are well aware of.

Organizing Strategies

In this section the author summarizes a series of action lines that are quite familiar to new products people. Explanations and examples are given for each: *Get flat/lean, fast. Grant high spending authority. Grant true autonomy to divisions. Bend over backwards to install small profit and loss centers. Install a project orientation everywhere. Create co-located joint-function teams. Get customers/vendors onto teams. Don't let teams become committees. Destroy job descriptions.*

The Measurement of Innovation Performance in the Firm: An Overview, Cordero Rene, *Research Policy* (1990), pp. 185–192 (AKG)

Managers need to determine whether their investment in a research and development project is justified, determine whether maximum utility of technology has been attained, and finally, develop reward systems that motivate performance. In high-performing teams, evaluation of innovation performance is conducted in a formal and systematic way. This article describes a model to evaluate innovation performance of an R&D-intensive firm.

The model proposes that the effectiveness of the outputs and the efficient utilization of resources in the production of these outputs should be measured (1) at the firm or strategic business unit (SBU) level for the overall performance evaluation, (2) at the level of R&D/technical unit for technical performance, and (3) at the level of marketing, manufacturing, etc., for commercial performance. This model can be applied "to the development of new products, processes and services for the market place."

The *overall performance* of the firm/SBU can be measured on the basis of marketable outputs and resources to technical and commercial units. Both quantitative and qualitative techniques can be applied.

Profit can be used as a tool to realize the monetary aspect of resources and outputs. Simple techniques such as rate of return, net present value, and payout period can be applied; or, more complex methods such as portfolio models, decision trees, risk profiles, and risk return trade-offs can be used.

The relative overall performance of a firm/SBU can be evaluated based on a comparison between the percentage of new product sales and the "industry average for a past ratio of R&D expense/total sales." This, however, is not a profit measure and, moreover, relates sales to R&D expenditures of a previous year instead of actual R&D expenses.

Nonmonetary measures such as market share, "the number of new products developed in the last few years as a percent of current sales," new product success rate, etc., can be used to evaluate marketable outputs.

Resources such as time needed to produce marketable outputs, manpower, raw materials, supplies, and equipment can all be measured to evaluate the effectiveness of resource utilization.

Qualitative methods can also be used to evaluate the overall performance of the firm/SBU: profiles, scaling models, checklists, scoring models, and Q-sorting.

In order to evaluate *technical performance*, technical outputs and resources to technical/R&D units should be measured. Technical outputs are not usually measured in monetary terms "because these outputs need to become marketable outputs before they can produce a revenue." One exception is the "business opportunity," which is an attempt to measure the monetary value of the total market created by technical outputs and thus to compare the market potential of different technical products.

The nonmonetary techniques used to measure technical outputs include bibliometric analysis, citation analysis, patent analysis, and honors and awards to researchers.

The qualitative techniques such as PERT and CPM can be used to measure manpower, supplies, raw material, and equipment. Estimates of technical resources required during the year also help in forecasting the annual R&D budgets.

Qualitative measures discussed in the previous section are also applicable here. Apart from these measures, a combination of different measures such as converging partial indicators and factor analysis can also be used to evaluate the qualitative aspect of technical performance. Individual performances within a unit can be evaluated by means of ratings and sometimes by ranking "individuals on a dimension or several dimensions of technical performance." This is generally done by managers or peers.

Commercial performance evaluation depends on measuring the resources, both from outside the firm and those transferred from the technical units, and the marketable outputs. Most of the measures have been outlined in previous sections.

To summarize, the model of innovation performance evaluation depends on measuring resources given to technical and commercial units, technical outputs, and marketable outputs. These measures should be objective and accurate so that they can be used during the planning stage "to make the estimates needed to evaluate and select innovation strategies, to establish output and resource standards, and to allocate resources."

One would tend to believe that the techniques used to evaluate the innovation performance of an R&D-intensive firm are quite accurate and reliable. In reality, most of the measures discussed are expensive and imperfect because (1) quantitative measures miss important facets of outputs, (2) some measures cannot be quantified, and (3) qualitative measures as compared to quantitative measures are less objective, less useful in establishing output and resource standards, and virtually useless for allocating resources.

Partly due to these limitations, according to this report, only 65% of all manufacturing firms use formal measures to evaluate new products performance.

The Return Map: Tracking Product Teams, Charles H. House and Raymond L. Price, *Harvard Business Review* (January–February, 1990), pp. 92–100

A return map is a diagram on which are drawn various lines and points representing key steps in a new product's development. It has time across the bottom, cumulative cost and revenue on the left, and several key points designated by words.

At Hewlett-Packard (where the senior author works as a division general manager), such maps have been in use for 4 years, with great satisfaction.

Behind the approach is the idea that product innovation is performed by multifunctional teams of people, so techniques are needed to enhance teamwork and decisions. The return map is one. Second, the map bears on Bill Hewlett's well-known axiom that you cannot manage what you cannot measure.

The H-P innovation process calls for four stages—investigation, development, manufacturing, and sales. Investigation leads to the product description followed during development. Development ends with a manufacturing release. Manufacturing and sales lead to meeting sales and profit goals.

Running through the map (and clearly noted on it) are four key metrics used by H-P team managers. Break-Even Time (BET) is the key metric, and represents the time from when investigation begins until product profits equal the investment in development. Time-to-Market (TM) is the total development time from the start of the development phase until manufacturing release. This is primarily an R&D matter, but the authors emphasize that all functions of the team are involved in the forecasts and decisions. Break-Even-After-Release (BEAR) is the time from manufacturing release until the project investment costs are recovered in product profit. Whereas TM measures R&D proficiency, BEAR measures manufacturing and sales efficiency. Lastly, the Return Factor (RF) is profit dollars divided by investment dollars at an agreed-upon time after a product has moved into manufacturing and sales. One and two years are common datings.

The range and importance of these four measures show why the team must function as a team, that it must be (and want to be) efficient,