

CFO

NO CFO WORTH HIS OR HER stock options doubts the importance of research and development. Common wisdom holds that a company that's six months late with a new product stands to lose a third of its market share. And R&D will only become more critical, as product life cycles shrink and new product development and time to market become even higher priorities.

**CAN YOU
APPLY
DISCIPLINE
TO R&D
WITHOUT
KILLING IT?
THAT'S THE
CHALLENGE.**

**BY GEORGE
DONNELLY**

At many companies, however, the R&D never delivers. According to several recent surveys, roughly 40 percent of all new products never make their target returns. The problem, often, is a disconnect between the two phases of the R&D process. Typically, once a product is developed, marketers focus on sales while the designers go on to the next project, leaving no one with responsibility for overseeing the overall effort.

That problem has plagued Roche Molecular Biochemicals. A business unit of Roche Holdings, the company recently revamped its R&D process because too many new products didn't meet expectations. For example, in 1994, the Indianapolis company developed an innovative process to isolate cells out of solid tissue. Bob McCarthy, director of strategic planning, describes the move as a "preemptive strategy to establish a technology position" in what was expected to be a growth area. But the market was slow to develop. "It's a great technology," says

McCarthy, "but there wasn't a clear match with the needs of the business," so funding for the project was cut back.

"We're very process-driven to finish milestones," McCarthy explains. "Yet their relevance to the business never really entered into it. Project teams were deciding the business. People at the project level are too wedded to the project—they live or die by their project. Somebody has to look at the broader issues as a check," he says.

Roche isn't alone in its concerns. Among other companies out to gain more control over R&D are small ones like Rogers Corp., in Rogers, Connecticut, as well as such giants as Deere & Co. and Eastman Kodak Co.

As these and other companies strive to better monitor their R&D, CFOs will be called upon to instill financial discipline into the process. They must do so without extinguishing the flexibility and creativity required for successful research, of course. But clearly there is lots of room for more hard-

A P&L
FOR R&D

nosed appraisal of the profit potential of R&D initiatives. According to one study (by Brad Goldense, a consultant based in Cambridge, Massachusetts), most companies fail to establish fundamental metrics that link R&D initiatives to the bottom line. None of the five most widely used metrics do so. While project-oriented metrics, such as time-to-market and product cost, are tracked by 80 percent of the 184 respondents, less than 30 percent use profit-oriented metrics like time-to-profit or break-even time.

Big mistake, says Goldense. "When you take the time to see what turned out," he says, "you're going to be smarter the next time and potentially stop another loser from getting into your pipeline."

The case of Rogers, a specialty-materials manufacturer, is particularly instructive. Once, for instance, it decided to introduce a cushion insole product for the footwear industry that was 10 percent cheaper and included fewer color

CUSTOM MEASURES

THESE DAYS, CFOs often find themselves grappling with new measures that go well beyond such traditional yardsticks as net present value calculations.

Kodak's senior vice president for strategy, Jesse Greene, for instance, wore two hats as he helped deploy a new set of metrics for measuring R&D efficiency. Says Greene: "You really have to separate into two people; one is the policeman, one is the creative role. You have to play both roles to be effective."

Such thinking has landed some finance executives on cross-functional teams that review new projects. They sit on product-approval committees, where they help perform due diligence on R&D efforts as part of a larger effort to develop and manage their companies' product portfolios.

But insinuating finance into a process that generally resists measurement can be daunting, if only because traditional accounting systems are not well suited to

optimistically," he notes, "you can ask, What justifies that incremental [revenue] difference from what we've done in the past?"

A critical component, obviously, is to track projects beyond launch. That's something that Deere's lawn and garden unit had in mind when it deployed a formal feedback loop for R&D two years after the product launch. "The feedback loop is critical," says Hank Martens, the unit's general manager. In the past, says Martens, "once we did it, that was the end of it. Now we're going back in and [asking], If it was an extremely successful project, what made it that?"

Kodak is going even further. It recently added three new metrics: R&D revenue growth rate, pipeline throughput per \$1 million spent on R&D, and R&D waste, calling it "unrealized product-delivery spending." And with traditional measures of product cycle time and time-to-market, Kodak has extend-

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variations. But customers preferred the premium product, so the company abandoned the cheaper one.

Says Rogers president and CEO Walter Boomer: "We had good products out there. The attitude was, If we build it, they will come. And sometimes they did and sometimes they didn't."

Adds CFO Frank Roland: "The salespeople or customers would [push new ideas] and you would spend a lot of effort on a product, and the market you had anticipated just wasn't there."

In 1998, Rogers set up a system that introduces more marketing insight early in the development time line. Now engineering design specifications more closely reflect the product's potential in the marketplace.

"The process really makes the people working on the projects define the market and what they're working on," says Roland.

It's too soon to tell just how effective the new controls have been. But, Rogers's new product revenues as a percentage of total sales, a metric adopted expressly to monitor R&D's contribution to overall performance, have already increased to 40 percent, up from 15 percent in 1993.

the task. To get more out of R&D, experts say, accounting systems must be supplemented by measures that allow an individual product's contribution to revenue and profits to be thoroughly analyzed. "Accounting systems haven't been set up with any understanding of the business," notes Marv Patterson, a Los Altos, California-based consultant at Innovation Resultants International and the former director of corporate engineering at The Hewlett-Packard Co. "Unless somebody takes it upon him- or herself to track [R&D's contribution] manually, it never happens. Even if one business unit cares about it, other business units may not, and you can't combine the results."

Patterson contends that to analyze R&D results effectively, one must track not just a product's overall results, but also what he calls "vintage-year" revenue, meaning the amount of sales generated over time from a specific year of R&D spending. By charting future revenue from a given year of R&D, says Patterson, companies gain a clearer sense of how new products contribute to revenue growth and, with that, a standard against which to weigh future investment. "If marketing is prognosticating

ed the initial conception stage to better capture the full extent of the development process.

"There's a lot of work and time spent looking at when an opportunity appears to be of interest until you make the commitment to do it," says David Dieterich, Kodak's general manager of integrated product delivery.

One of the most difficult aspects of deploying new R&D metrics at Kodak, says Dieterich, was ferreting out information across its half-dozen business units. Finance was instrumental in setting up systems that collect the data.

But consultants say too few companies are following Kodak's example. Besides failing to measure the link between R&D and the bottom line, only 5 out of 30 possible metrics were used by more than 50 percent of the companies surveyed by Goldense (see chart, page 4). Goldense notes that much the same problem plagued U.S. manufacturing companies until they got religion in the 1980s, and he's confident the same thing will happen with R&D. "By 2010, 75 percent of companies will be tracking the same things, just as we saw in manufacturing," says the consultant.

THE R&D GAP

A recent survey concluded that the stocks of companies whose R&D spending growth exceeds their earnings growth are undervalued by investors. Assuming the markets are efficient, those companies should outperform others whose growth in spending is lower or no greater than their earnings growth, according to the survey's authors, Baruch Lev of New York University, Bharat Sarath of Baruch

College, and Theodore Sougiannis of the University of Illinois. Based on their findings, companies in the top 25 percent of those whose spending growth over the past five years outpaced their earnings momentum for the same five years can expect their shares to rise by roughly 6 percentage

points more than average over the next three years.

The table above lists those companies whose market value exceeds \$10 billion and whose growth in R&D spending outpaced their earnings growth by the widest margin as of 1995. * *Ronald Fink*

Sources: Baruch Lev (New York University), Bharat Sarath (Baruch College), and Theodore Sougiannis (University of Illinois)

Cisco Systems	1,954%
Microsoft	265%
American Home Products	215%
Nynex	158%
Kellogg	108%
CPC International	77%
Kimberly Clark	39%
Eli Lilly	36%
Bristol Myers Squibb	21%
AT&T	19%
Baxter International	19%

At a minimum, says Goldense, key metrics should track unit gross margin accuracy; schedule prediction accuracy; and target product cost accuracy, revenues per development professional, and profit per development professional.

Other consultants still favor the old standby, time-to-market. "The amount you spend on development is less significant than how long it takes," says Michael McGrath, a Waltham, Massachusetts-based managing director at management consulting firm Pittiglio Rabin Todd & McGrath. Generally, McGrath says, the product margins are so big and the opportunities so great that "if you can spend 20 percent more and get it to market 10 percent faster, you should do it. If a company cuts its time to market in half, it generally increases productivity by a third."

SPEED BUMPS

BUT THERE'S SMART speed and dumb. Many companies still cut corners in the early stages, notes Scott Edgett, the director of the Product Development Institute, in Ontario, Canada. Neglecting good initial market research, these companies risk wasting a relatively expensive month in a lab rather than

spend a little time and money up front to build a better business case for the product. "The smart companies are spending time up front to save months down the cycle," Edgett says.

Take Deere. The company is targeting the mass consumer market, which demands products faster and with fewer bugs to work out. To avoid altering lawnmowers and other products after they're released, Deere has been refining product development in the early stages. Thanks in part to three-dimensional computer-aided design, says Martens, the company has gone a long way to meeting that goal. "Rather than running thousands of prototypes and testing and testing and testing, we do that up front," he says.

Effective speed, of course, requires an organized process, which discipline backed by metrics can help create. Before revamping R&D, for example, Rogers's pipeline was clogged. "We had many more projects going on than we could adequately resource," says Bruce Kosa, vice president of technology and product development. Typically, the en-

management. The gate provides the opportunity to decide whether to continue the R&D investment. A product may look good in the definition stage, yet may get blocked at the initial development stage for technical or marketing reasons. Results: Rogers wastes less time and money adjusting product specifications along the pipeline, and kills unpromising projects.

When companies fully implement a stage-review process, "you can begin to change the role of finance," says McGrath, who advocates an aggressive "yes-no" decision process rather than the "yes-no-hold-recycle" recommended in traditional stage-gate models. "If there's no formal process, how can finance get involved?" he adds.

A more organized, efficient, and measurable process need not stifle creativity, says Kosa. "If you're a team leader and working to transition an idea, the lack of discipline is very frustrating, so the more-senior people welcomed the idea. The priority setting is better, and we're trying to capture ideas more formally."

R&D PORTFOLIO THEORY

ULTIMATELY, companies wishing to instill more discipline in the R&D process are out to rationalize their product portfolios. But in helping rationalize portfolios, financial models that favor relatively easy projects and certain

A single hurdle rate is "a totally erroneous concept," says one consultant.

gineers weren't penalized for taking on more projects than they could handle. "What moved were the projects that had a champion," he says. As a result, as Rogers tried to expand its product line, "we were unhappy with the time it took to introduce and commercialize a product."

The solution in Rogers's case was "stage-gate" systems, a term coined by product-development expert Robert Cooper. These call for forming cross-functional teams and breaking down product-development cycles into several phases, such as product definition, development approval, and product sampling.

For projects to move on to the next stage, they have to pass through a review process, or a gate, manned by senior

returns can misdirect resources. In going for the "low-hanging fruit" in product development, spending is spread too thin to create a breakout project, says Edgett. "Everybody is saying we have too many balls in the air for the amount of people and money we have available," he says. "Executives say, 'I know I can kill half of my projects without affecting the long-term viability of the company. The problem is, I don't know which half to kill.'"

To help figure that out, new-product portfolio management should target three main goals, says Edgett: efficient resource allocation (including long-term profitability of the portfolio), a balance between a stress on time-to-market and risk of development, and strong links

among the product pipeline mix, spending, and strategy.

As for the method of pursuing those goals, Edgett warns against using any that calculates expected returns in isolation. For that reason, he says, a financial model should calculate uncertainty. Edgett proposes one model in the form of an expected commercial value (ECV) formula, which factors in the probability of both technical and commercial success, unlike standard net present value (NPV) calculations. ECV essentially starts with the NPV, multiplies it by the probability of commercial success minus the commercialization cost, and then multiplies that number by the probability of technical success minus the development cost.

Some consultants also bridle at return-on-capital formulas for R&D, saying a single hurdle rate may be self-defeating. "That's a totally erroneous concept when it comes to product development," says McGrath. He suggests a different allocation model: invest a third of R&D in "something that will change the future" of a company's business, another third in products that will have a 200 percent return, and a final third in products that have a more modest return, say, 30 percent. "You need to set the bar a lot higher, and you

need to have the discipline not to invest in a single hurdle rate," he says.

Roche Molecular Biochemicals, for instance, allocates 65 percent of R&D to "next generation," breakthrough-type products.

Yet traditional finance thinking has its place, says McGrath. He recalls how an engineer once told his company's product-approval committee that he had found a solution for a low-margin development problem. The engineer suggested buying a key component in bulk—a non-cancelable, high-volume agreement that would have produced a much lower cost. But the CFO, sitting on the committee, pointed out what might have appeared to many in finance as an obvious risk. That is, if the project were scotched (as it ultimately was), the company would be stuck with a lot of useless components. Without a formal process and a role for finance in the decision-making, McGrath explains, a CFO "wouldn't see that issue until the

TOP 10 R&D METRICS IN USE

1. R&D spending as a % of sales	78%
2. New products completed/released	68%
3. Number of approved projects ongoing	61%
4. Total active products supported	54%
5. Total patents filed/pending/awarded	51%
6. Current-year % of sales due to new products released in past X years	48%
7. % of resources/investment dedicated	46%
8. % of increase/decrease in R&D head count	43%
9. % of resources/investment dedicated to sustaining products	39%
10. Avg. development cost per project/product	39%

Source: Goldense Group Inc.

purchase order was being signed."

With more riding on R&D, fewer companies can afford to be blindsided in this fashion. Says Kodak's Greene: "For the \$850 million we spend, there needs to be a disciplined process to make sure we're spending money in the right places." *

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