

*By tackling the soft issues –
such as information quality, credibility,
and trust – SB improved its ability to address
the hard ones: how much and where to invest.*

HOW SMITHKLINE BEECHAM MAKES BETTER RESOURCE-ALLOCATION DECISIONS

BY PAUL SHARPE AND
TOM KEELIN

IN 1993, SMITHKLINE BEECHAM was spending more than half a billion dollars per year on R&D, the lifeblood of any pharmaceuticals company. Ever since the 1989 merger that created the company, however, SB believed that it had been spending too much time arguing about how to value its R&D projects – and not enough time figuring out how to make them more valuable.

With more projects successfully reaching late-stage development, where the resource requirements are

Paul Sharpe is vice president and director of project management in neuroscience at SmithKline Beecham in Harlow, England. Tom Keelin is worldwide managing director of the Strategic Decisions Group, an international management-consulting firm based in Menlo Park, California.

greatest, the demands for funding were growing. SB's executives felt an acute need to rationalize their portfolio of development projects. The patent on its blockbuster drug Tagamet was about to expire, and the company was preparing for the impending squeeze: it had to meet current earnings targets and at the same time support the R&D that would create the company's future revenue streams. The result was a "constrained-budget mentality" and a widely shared belief that SB's problem was one of prioritizing development projects.

Major resource-allocation decisions are never easy. For a company like SB, the problem is this: How do you make good decisions in a high-risk, technically complex business when the information you need to make those decisions comes largely from the project champions who are

competing against one another for resources? A critical company process can become politicized when strong-willed, charismatic project leaders beat out their less competitive colleagues for resources. That in turn leads to the cynical view that your project is as good as the performance you can put on at funding time.

What was the solution? Some within the company thought that SB needed a directive, top-down approach. But our experience told us that no single executive could possibly know enough about the dozens of highly complex projects being developed on three continents to call the shots effectively. In the past, SB had tried a variety of approaches. One involved long, intensive sessions of interrogating project champions and, in the end, setting priorities by a show of hands. Later that

process evolved into a more sophisticated scoring system based on a project's multiple attributes, such as commercial potential, technical risk, and investment requirements. Although the approach looked good on the surface, many people involved in it felt in the end that the company was following a kind of pseudoscience that lent an air of so-

SB needed a solution that was technically sound and organizationally credible.

phistication to fundamentally flawed data assessments and logic.

The company had also been disappointed by a number of more quantitative approaches. It used a variety of valuation techniques, including projections of peak-year sales and five-year net present values. But even when all the project teams agreed to use the same approach—allowing SB to arrive at a numerical prioritization of projects—those of us involved in the process were still uncomfortable. There was no transparency to the valuation process, no way of knowing whether the quality of thinking behind the valuations was at all consistent. "Figures don't lie," said one cynical participant, "but liars can figure." At the end of the day, we couldn't escape the perception that decisions were driven by the advocacy skills of project champions—or made behind closed doors in a way that left many stakeholders in the process unpersuaded that the right road had been taken.

As we set out in 1993 to design a better decision-making process, we knew we needed a good technical solution—that is, a valuation methodology that reflected the complexity and risk of our investments. At the same time, we needed a solution that would be credible to the organization. If we solved the technical problem alone, we might find the right direction, but we would fail to get anyone to follow. That is typically what happens as a result of good backroom analysis, however well intentioned and well executed

it is. But solving the organizational problem alone is just as bad. Open discussion may lead to agreement, enabling a company to move forward. But without a technically sound compass, will it be moving in the right direction?

The easy part of our task was agreeing on the ultimate goal. In our case, it was to increase shareholder value. The hard part was devising a process that would be credible to all of the interested parties, including top management, dozens of project teams, the heads of SB's four major therapy areas,

and executives from key functions such as strategic marketing, finance, and business development—all spread across Europe, the United States, and Japan. In particular, the traditional advocates in the process—the project teams and their therapy area heads—would have to believe that any new process accurately characterized their projects, including their technical and commercial risks. Those who were more distant—leaders of other project teams and therapy areas, regional and functional executives, and top management—would require transparency and consistency. How else could they make any meaningful contribution to the teams' thinking, or compare projects to one another, or understand how projects might affect one another?

Most organizations think of decision making as an event, not a process. They attach great importance to key decision meetings. But in most cases, and SB is no exception, the real problems occur before those meetings ever take place. And so the process that SB designed—a three-phase dialogue between the project teams and the company's decision makers—focused on the inputs to the resource-allocation decision and the role of the organization in preparing those inputs.

Phase I: Generating Alternatives

One of the major weaknesses of most resource-allocation processes is that project advocates tend to take

an all-or-nothing approach to budget requests. At SB, that meant that project leaders would develop a single plan of action and present it as the *only* viable approach. Project teams rarely took the time to consider meaningful alternatives—especially if they suspected that doing so might mean a cutback in funding.

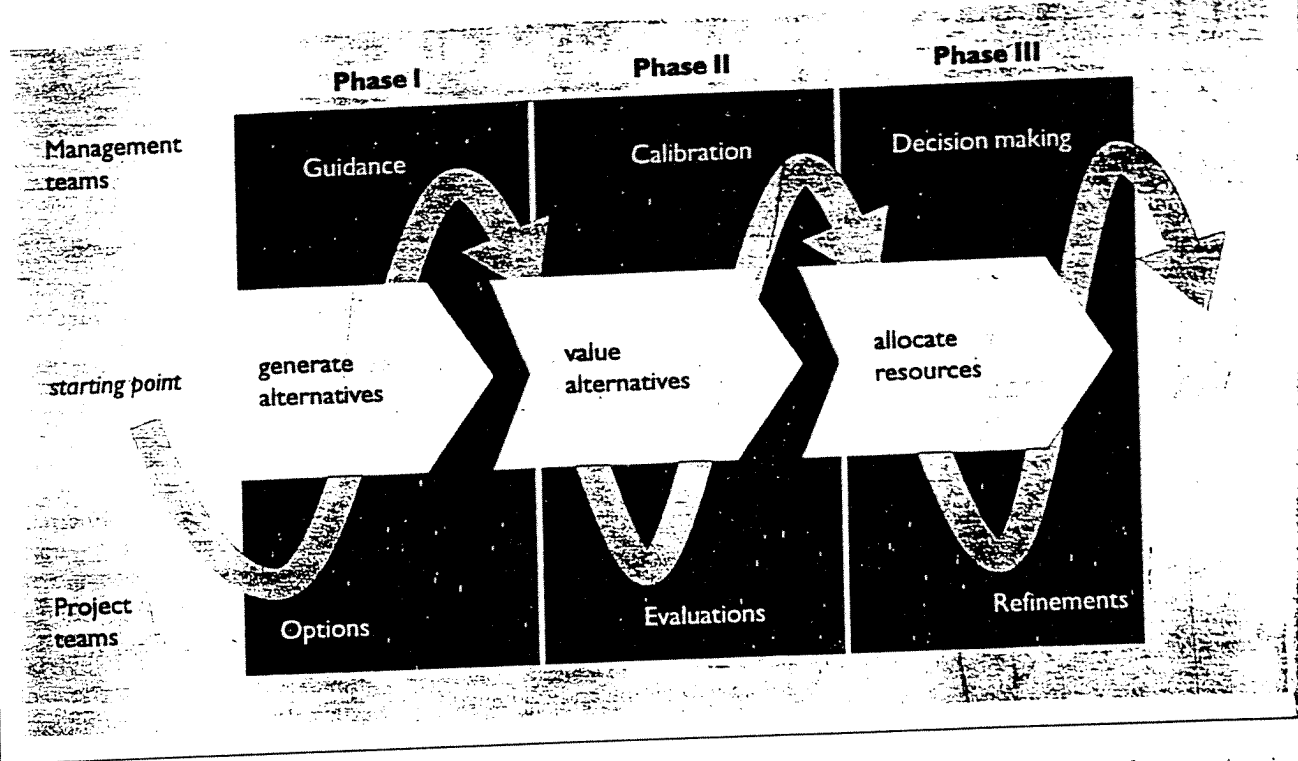
And so we insisted that each team develop at least four alternatives: the *current plan* (the team would follow the existing plan of activity), a "*buy-up*" option (the team would be given more to spend on the project), a "*buy-down*" option (the team would be given less to spend on the project), and a *minimal plan* (the team would abandon the project while preserving as much of the value earned to date as possible). Working with a facilitator, a team would begin by describing a project's objective, which usually was to develop a particular chemical entity targeted at one or more diseases. Then it would brainstorm about what it would do under each of the four funding alternatives.

Consider a compound under development in SB's cancer area. The current plan was to develop the drug in two formulations, intravenous and oral, for the treatment of two tumor types, A and B, by investing \$10 million beyond what had already been invested. (The numbers in this example are not actual figures.) When the team working on the project was asked to develop alternatives to the current plan, they balked. Their project had always been regarded as a star and had received a lot of attention from management. They believed they already had the best plan for the compound's development. They agreed, however, to look at the other alternatives during a brainstorming session.

Several new ideas emerged. Under the buy-down alternative, the company would drop one of the products (oral) in one of the markets (tumor type B), saving \$2 million. Under the buy-up alternative, the company would increase its investment by \$5 million in order to treat a third tumor type (C) with the intravenous form. When the value of those alternatives was later quantified

A FRAMEWORK FOR EFFECTIVE COMMUNICATION

This three-phase process allows SB to find more value in its portfolio of development projects.



fied, a new insight emerged. Although the buy-up option increased costs considerably, it also increased value by about 30%. Suddenly it occurred to one team member that by selecting only the most valuable combinations of products and markets, they might both increase value significantly and reduce costs in comparison with the current plan. That insight led the team to a new and even more valuable alternative than any they had previously considered: target all three markets while cutting back to just one product form in each market. (See the exhibit "Developing Project Alternatives.") This solution was so powerful that it quickly won project team support and management endorsement as an improvement over the current plan. Although such results are not an inevitable result of insisting on alternatives, they are unlikely to occur without it.

Considering alternatives for projects had other benefits. First, ideas

that came out of brainstorming sessions on one project could sometimes be applied to others. Second, projects that would have been eliminated under the previous all-or-nothing approach had a chance to survive if one of the new development plans showed an improved return on investment. Third, after walking through preliminary back-of-the-envelope financial projections, the teams had a better picture of which of the elements of their development plans—time to market, for example, or the claims made on the drug's label—had the greatest impact on the drug's expected value. The team could then focus its development work accordingly.

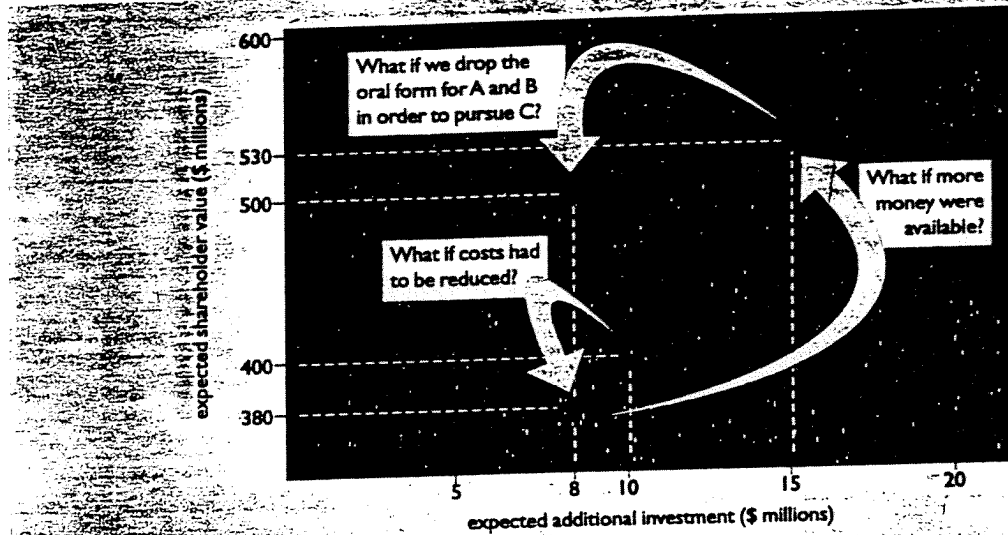
Near the end of this phase, the project alternatives were presented to a peer review board for guidance before any significant evaluation of the alternatives had been performed. Members of the review board, who were managers from key functions and major product groups within

the pharmaceuticals organization tested the fundamental assumptions of each alternative by asking probing questions: In the buy-down alternative, which trial should we eliminate? Should a once-a-day formulation be part of our buy-up alternative? Couldn't we do better by including Japan earlier in the current plan? The discussion session improved the overall quality of the project alternatives and helped build consensus about their feasibility and completeness.

The project teams then revised their alternatives where appropriate and submitted them again for review, this time to the group of senior managers who would, at a later point in the process, make the final investment decisions on all the projects. The group included the chairman of the pharmaceuticals business; the chairmen of the U.S., European, and international drug divisions; and other senior managers from major corporate functions.

DEVELOPING PROJECT ALTERNATIVES

When a project team in SB's cancer area began to consider alternatives for a compound in development, it found that it could create more value for less money.



1 Current plan

| | tumor | intravenous | oral |
|---|-------|-------------|------|
| A | ✓ | ✓ | ✓ |
| B | ✓ | ✓ | ✓ |

What is the current development plan for this compound?
Develop it for two tumor types in both intravenous and oral formulations.

For an additional investment of \$10 million, the expected value of the product is \$400 million.

2 Buy-down plan

| | tumor | intravenous | oral |
|---|-------|-------------|------|
| A | ✓ | ✓ | ✓ |
| B | ✓ | ✓ | |

What if the project's costs had to be reduced?

We would drop the oral program for tumor type B.

Compared with the current plan, this plan saves \$2 million in costs and gives up \$20 million in value.

3 Buy-up plan

| | tumor | intravenous | oral |
|---|-------|-------------|------|
| A | ✓ | ✓ | ✓ |
| B | ✓ | ✓ | ✓ |
| C | ✓ | ✓ | |

What if more money were available?

We would expand the program to include a third tumor type.

Compared with the current plan, this plan adds \$130 million in expected value for an extra \$5 million in investment.

4 New buy-down plan

| | tumor | intravenous | oral |
|---|-------|-------------|------|
| A | ✓ | ✓ | |
| B | ✓ | ✓ | |
| C | ✓ | ✓ | |

What if we drop the oral form for A and B in order to pursue C?

This provides higher expected shareholder value for less investment than the current plan.

Compared with the current plan, this plan adds \$100 million in expected value and saves \$2 million in costs.

In SB's process, alternatives are created and presented to the senior management group for discussion before any significant evaluation of project alternatives is performed. In many organizations, investment alternatives are presented together with an evaluation; in others, the alternatives are evaluated as soon as they are put forth, before they are fully fleshed out. Instant evaluations

often focus on what's wrong with an idea or the data supporting it; they offer insufficient attention to what's right about an idea or how can it be improved.

Although it takes discipline to keep from debating which of the project alternatives are best, it is critical to avoid doing so at this early stage in the process. Premature evaluation kills creativity and the poten-

tial to improve decision making along with it.

At SB, we wanted to be sure that we had developed a full range of project alternatives before starting to judge their value. To accomplish that end, the role of the project teams would be to develop the initial alternatives, and the role of management would be to improve the quality of the alternatives by

challenging their feasibility, expanding or extending them, or suggesting additional possibilities.

Phase II: Valuing Alternatives

Once we had engineered the process that took us through phase I, we needed a consistent methodology to value each one of the project alternatives. We chose to use decision analysis because of its transparency and its ability to capture the technical uncertainties and commercial risks of drug development. For each alternative, we constructed a decision tree, using the most knowledgeable experts to help structure the tree and assess the major uncertainties facing each project. (See the insert "How SB Overhauled Its Investment Process.")

We developed six requirements for achieving credibility and buy-in to the valuation of each alternative:

- First, the same information set must be provided for every project. We developed templates that are consistent in scope but flexible enough to represent the differences among the projects and their alternatives.
- Second, the information must come from reliable sources. Experts from inside and outside the company must be selected before anyone knows what their specific inputs will be regarding the major uncertainties the development team faces.
- Third, the sources of information must be clearly documented. The date and place of each interview with an expert must be recorded along with the key assumptions that were made and any important in-

sights that came up in the conversation. Thus management can dig as deep as it likes into the assessment's "pedigree" to test its quality.

- Fourth, the assessments must undergo peer review by experienced managers across functions and therapeutic areas. Those managers can then make comparisons across all projects and gauge, for example, if the project teams are being consistent in assessing similar uncertainties. They can determine, for instance, if the teams are using similar assumptions when assessing the probability of passing key development milestones.
- Fifth, the valuations must be compared with those done by external industry observers and market analysts to establish that the numbers are realistic.

HOW SB OVERHAULED ITS INVESTMENT PROCESS

It was no small task for SB to introduce a new resource-allocation process into a pharmaceutical development area that included no major projects, dozens of managers, and more than half a billion dollars of investment. How was a large, complex organization going to overhaul its investment process? The answer was gradually.

Before the new process was introduced to the entire 20-project portfolio, it went through two pilot tests—first, on a single development project for migraines, and second, on a subsection of the portfolio that included 10 projects. The company's head of development, Paul Nicholson, believed that the people who would be using the new process, such as his staff in the development area and leaders of SB's functional areas, should have significant involvement in the process's design and gradual implementation.

It was important to address the anxiety people felt at the prospect of such a major change. Would the new process, project team members wondered, mean a cut-back in their funding? Would it mean termination of their projects? In an industry like pharmaceuticals, where a project leader may work on as few as five or six projects in an entire career, such anxieties could not be taken lightly.

To manage the issue, Nicholson made a commitment to the teams that during the initial pilot no investment decisions would be made. The only objective would be to develop the new approach and gauge its viability.

During the pilot tests, we worked to build a valuation methodology that would win the confidence of its future users. The core of the methodology that prevailed was decision analysis. That approach included problem framing, the creation of alternatives, the use of decision trees to represent risk, options analysis, sensitivity analysis (to represent different viewpoints and focus attention on value drivers), and key output measures of risk-adjusted return. Although such tools are in widespread use, they cannot be applied in cookie-cutter fashion. SB spent considerable effort tailoring the tools to its specific applications.

The pilot phase served to develop consensus about all dimensions of the new process, from its general philosophy to the specific templates and formats that were designed. The project teams and therapy areas were satisfied that the new process could accurately represent their projects, even in complex areas such as the risk associated with product development and commercialization. Regional and functional management as well as decision makers could see that transparency and consistency were built into the process. The pilot was followed by a full-scale rollout of the new process in 1995.

The acid test of whether a valuation methodology has won credibility is this: it is credible if it no longer attracts attention to itself. When that happens—as it did at SB by late 1995—the attention of the organization shifts from "How should we measure value?" to "How can we create more value?"

• Sixth, the impact of each variable on the project's expected value must be identified. Doing so gives management and the project teams a clear understanding of the key value drivers so that they can focus decision making and implementation in ways that add the most value.

We agreed early on that the project teams would use ranges rather than single-point forecasts to describe future possibilities. Using ranges enhances credibility by avoiding false precision. In previous development cycles, nothing derailed us faster than having a strategic marketing expert stand in front of a room full of scientists while trying to defend a statement like, "The worldwide market for Alzheimer's disease treatments in 2010 will be \$21.2 billion." The use of ranges—with thorough explanations of the high and low ends—has become standard practice at SB for forecasting all uncertainties, from product profile to market share to prices achieved.

We increased transparency and consistency in yet another way by having a specially designated group of analysts process the valuation information and draw preliminary insights. Having this work done by a neutral group was a relief to many project team members, who were rarely satisfied with the previous approaches to valuation, as well as to the top management group, who

As a CFO of SB once put it, "Inconsistent valuations are worse than none."

were tired of trying to make sense of widely disparate types of analysis. As the company's CFO for pharmaceuticals put it, "Inconsistent valuations are worse than none."

Once the alternatives had been valued, a second peer-review meeting was held to make sure that all the participants had a chance to question and understand the results. This step was designed to ensure that no surprises would emerge when the decisions were being made. And again, the peer review

was followed by a senior management review that provided an opportunity to challenge, modify, and agree on the underlying assumptions driving the valuations. During the meeting, however, the senior managers were explicitly asked *not* to begin discussing which alternatives to invest in; instead, they were asked only to confirm that they understood and believed the valuations. And if they didn't, why not? What seemed out of line?

In this give-and-take, senior managers and project team members were able to learn from one another. For example, senior executives wanted to be sure that all the cross-project effects had been taken into account. Was marketing success in one project dependent on establishing a franchise with an earlier product? Would a new product cannibalize an existing product, and if so, would the result be a higher or a lower total value? Was the technical approach in two projects the same, so that success in one would mean success in the other? Did SB have the staff in its technical departments—or the ability to contract out—in order to accelerate three projects simultaneously? Such conversations improved the quality of the valuations and led to additional learning about technical and commercial synergy.

Once everyone had reviewed the valuation of the project alternatives and agreed that the inputs and logic were valid, the stage was set for successful decision making in the next phase. Suppose an agreement had been reached that a certain drug had only a 10% probability of obtaining approval in oral form. Suppose it turned out after a roll-up of all the project alternatives that the 10% probability killed the project because its expected value was too low. Under SB's new approach, no one could come back and arbitrarily challenge the probability assessment. Instead, someone would need an argument that would overturn the project's pedigree—the basis of

the 10% assessment in the first place. Given the thorough nature of the process, the creation of such an argument would be extremely difficult unless significant new information had come to light.

For example, in one case a senior manager remarked that a project team had given an estimate of a product's likely registration with the

To the relief of many project team members, a neutral group studied the valuations.

FDA that was too high. The response from the project team was, "What probability would be more appropriate, if this one is too high?" The facilitator probed the manager's thinking: "Do you think it's too high relative to other projects? Or that it's too high based on other considerations?" he asked. Following another exchange of views with the expert who had offered the original probability assessment, the judgment stood. In the end, the likelihood of FDA registration turned out to be a key driver of value. The manager who had challenged the estimate was satisfied that the company was using the best information available and did not question the ultimate funding decision.

That exchange illustrates an important dimension of SB's decision-making process. If challenges such as "too high" or "too low" are accepted without requiring the skeptics to put forth alternative estimates or clear rationales, then snap judgments by senior managers can carry the same weight as carefully researched plans. When that happens, project team members become cynical. They come to expect that management will badger them into providing estimates that yield the answers they want.

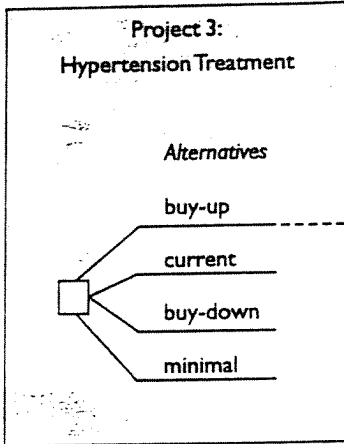
Phase III: Creating a Portfolio and Allocating Resources

The goal of this phase was to create the highest-value portfolio based on all the project alternatives that had

CREATING A HIGH-VALUE PORTFOLIO

Phase I

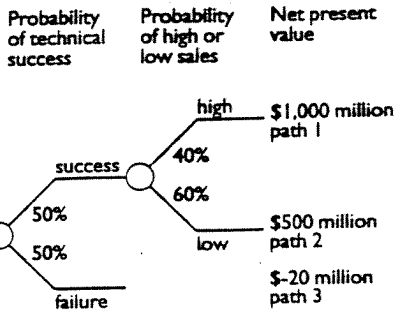
For each project, develop creative, feasible investment alternatives.



Phase II

For each alternative, determine expected value.

If \$8.5 million is invested...



...then the expected value is \$340 million and the return on investment is 40:1.

Note:

To calculate expected value, multiply the net present value for each path by its probability. Then add all the paths.

path 1 $50\% \times 40\% \times \$1,000 = \$200$

path 2 $50\% \times 60\% \times \$500 = \$150$

path 3 $50\% \times \$-20 = \-10

expected value = \$340 million

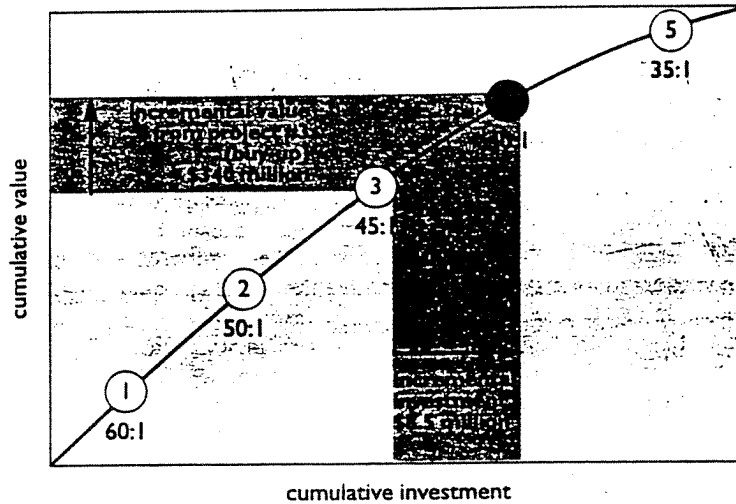
Phase III

Rank projects by highest return on investment and construct the highest-value portfolio.

| Rank | Return on investment | Project | Alternative |
|------|----------------------|---------|-------------|
| 1 | 60:1 | #10 | current |
| 2 | 50:1 | #4 | buy-down |
| 3 | 45:1 | #7 | buy-down |
| 4 | 40:1 | #3 | buy-up |
| 5 | 35:1 | #7 | current |

Highest-Value Portfolio

Construct the highest-value portfolio based on the return-on-investment ranking.



been developed. This was no easy task: with 20 major projects—each of which had four well-conceived alternatives—the number of possible configurations was enormous. We appointed a neutral analytic team, rather than the project advocates, to carry out a systematic approach to identifying the highest-value portfolio based on return on investment.

The portfolio could then be examined along a number of strategic dimensions, including stability under different scenarios, balance across therapeutic areas and stages in the development pipeline, and feasibility of success given SB's technical and commercial resources. Because the senior managers had already agreed—and vigorously debated—the underlying project descriptions (phase I) and valuations (phase II) for each alternative, they now focused their complete attention on the portfolio decisions.

It turned out that the portfolio with the highest expected return on investment represented a significant departure from the status quo. Only four projects would receive their expected funding, ten would get increased funding, and six would be cut back. The senior management group was able to discuss the new portfolio without wasting time and

energy questioning the numbers and assumptions.

The first 14 project decisions, which involved increasing or maintaining funding levels, were made without controversy. However, when it came time to discuss the first project whose funding would be cut, the manager of the relevant therapeutic area challenged the decision. The meeting's chairman listened to his case for maintaining the current funding and then asked whether that case was reflected in the project valuations. The manager agreed that it was, but repeated the argument that SB would lose value by terminating the project. The chairman agreed that value would be lost but pointed out that the funds originally scheduled for the project would create more value when applied elsewhere. That ended a potentially explosive discussion.

The new process not only reduced the controversy in the resource-allocation process, it also led the company to change its investment strategy. Although top management had set out to cut back on the company's development budget, they now saw their investment decision in a new light: they believed the new portfolio to be 30% more valuable than the

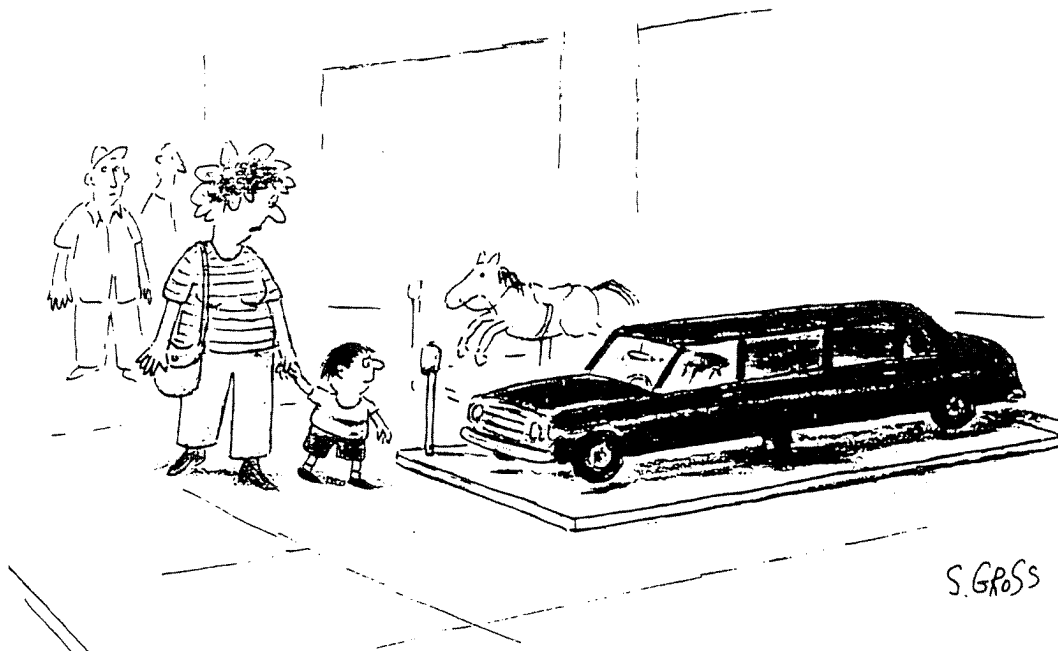
old one—without any additional investment. Furthermore, the marginal return on additional investment had tripled from 5:1 to 15:1. To exploit this opportunity, the company ultimately decided to increase development spending by more than 50%.

The three-phase process—generating alternatives, valuing them, and creating a portfolio—has led to shared understanding among decision makers and development staff about the best investment options for the company. The process the company adopted is based on our experience that no single value metric, facilitation technique, peer review meeting, or external validation approach on its own can solve the complex resource-allocation problem faced by many companies like SB. In the end, we learned that by tackling the soft issues around resource allocation, such as information quality, credibility, and trust, we had also addressed the hard ones: How much should we invest and where should we invest it?

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