

Today's options for tomorrow's growth

W. Carl Kester

At a recent management conference, an upper-level executive of a prosperous high-technology company was asked to name his most difficult problem. Instead of citing Japanese competition or the constant need in that business to come up with innovative technology, the executive stated simply, "trying to convince my CEO and board to approve an idea for a new investment project."

Many managers will agree that getting a project through a corporate capital appropriations committee can be one of the most frustrating and unrewarding experiences of corporate life. Battles wage against a background of high interest rates, tight budgets, and increasing sensitivity to investment risk. Typically, two sides develop; strategists, who look at a project for what it might accomplish, are pitted against quantitative analysts, who look at it for what it will cost. Often the only result is a stalemate.

In an attempt to bridge the gap between the two sides, Mr. Kester offers a suggestion that gives a harder

analytic edge to the soft side of the investment argument. He suggests that managers think of investment opportunities as options on the company's future growth. Like call options on securities, growth options represent real value to the companies that possess them, and almost any future investment plan can be analyzed in those terms. He guides the reader through a discussion of the rationale behind this way of thinking and of some of its practical applications for companies.

Mr. Kester is assistant professor of finance at the Harvard Business School. Consulting and research activities have taken him into the areas of capital budgeting, working capital management, financial goal setting, valuation, and acquisition.

Companies can reduce the guesswork of investment analysis by clearly linking current capital budgeting decisions with strategic opportunities

Since the rise in the use of discounted cash flow techniques, most managers face an increasingly difficult choice in evaluating complex investment decisions. Should they pursue risky projects that offer a below-target rate of return but could create valuable strategic opportunities later? Or should they stick with a less risky and more immediately profitable bet?

Whether it's a diversified company trying to keep pace in a fast-growing market or a smokestack company struggling to regain its competitive edge, the choice must be made. Take the case of a large, technology-based company. Despite a cut in spending plans to avoid outside financing, the capital appropriations committee decided to consider a special project that would require a plant for the large-scale manufacture of a new, proprietary material that had been successfully produced in a pilot plant.

On an ordinary net present value basis, high construction costs, low projected cash flows, and a high sensitivity to cyclical fluctuation combined to make the project unattractive. Opponents argued it would hurt reported earnings, diminish near-term cash flows, and depress an already low stock price.

Proponents pointed out the project's long-term strategic benefits. Wide acceptance of the material would produce a virtual cascade of new commercial development and capacity expansion projects. The project's value came not so much from cash flows directly attributable to the new plant as from opportunities for growth. In the end, the proponents prevailed by not falling back on the corporate culture. They recalled a similar project the company had pursued just before World War II—one on which much of its postwar success was built.

The committee finally approved the project but, because of uncertainty and the lack of stronger analytic support, it deferred final appropriation for one year. Ultimately, the new material suc-

Research methodology

Clinical data and impetus for this article came from my involvement in field research on financial goals and resource allocation conducted in 1979-80 by Professors Gordon Donaldson and Jay Lorsch at the Harvard Graduate School of Business Administration. Twelve *Fortune* "500"-size companies with varying degrees of product market diversity and ownership concentration were studied. I interviewed managers at each company ranging from financial analyst to chairman of the board, including the chief executive officer, the chief financial officer, and the director of planning (or an officer with more or less equivalent responsibilities). I also reviewed documents such as capital budgeting manuals, annual plans throughout the 1970s, and internal records of capital expenditure and performance by line of business. The result of this field research was an extensive clinical data base of corporate documents and interview transcripts, rich in practical perspectives on corporate planning and resource allocation processes.

ceeded. Production efficiencies were achieved, user acceptance developed, and new applications proliferated. But the initial delay proved costly. A competitor's substitute product gained an early foothold in the new material's primary market, forcing the first company to spend more money than originally planned.

How could the project's proponents have made their argument more convincing so that funds would have been committed at once? More to the point, what if a manager doesn't have history to back up his argument? What analytic framework can be used to give a hard edge to the "soft" strategic side of the investment argument?

Based on my research into the investment and capital budgeting decisions of companies (see the first insert), I've concluded that one answer is to think of future investment opportunities as analogous to ordinary call options on securities.¹ Most managers are familiar with call options since they trade actively on public exchanges and such options are often an important part of a compensation package.

Securities options give the owner the *right* (as distinct from an obligation) to buy a security at a fixed, predetermined price (called the exercise price) on or before some fixed date (the maturity date). By way of analogy, a discretionary opportunity to invest capital in productive assets like plant, equipment, and brand names at some future point in time is like a call option on real assets, or a "growth option." The cost of the investment represents the option's exercise price. The value of the option (its underlying "security") is the present value of expected cash flows plus the value of any new growth opportunities

expected through ownership and employment of the assets. The time to maturity is the amount of time available before the opportunity disappears.

Like call options on securities, growth options represent real value to those companies fortunate enough to possess them. Any investment project whose implementation can be deferred, that can be modified by the company, or that creates new investment opportunities can be analyzed using this framework. This would include opportunities to:

- Expand capacity, make new product introductions, or acquire other companies.
- Increase budgets for advertising, basic research, and commercial development programs (insofar as these budgets represent investment in assets like brand names or technical expertise).
- Make outlays for maintenance and replacement projects (since these too are discretionary projects that can be forgone if management decides to shrink or leave a business).

Just as securities traders would price a bond-warrant unit to reflect both of its sources of value—that is, the cash from the bond and the option value from the attached warrant—so too should a company analyze an investment in such a way as to delineate all its sources of value.

The importance of growth options can be recognized by looking at the difference between the total market value of a company's equity and the capitalized value of its current earnings stream (see *Exhibit I*). The difference is an estimate of the value of its growth options. As the last column indicates, valuable growth options constitute well over half the market value of many companies' equity.

While only large, publicly traded companies are represented in this exhibit, small, privately held organizations share similar characteristics. In fact, growth options probably dominate the equity value of small, high-growth companies marketing innovative products. The plethora of companies making initial public offerings at high price-earnings multiples attests to this fact. Genentech went public with annual revenues of \$9 million and an operating cash flow of only 6¢ per share. At the initial public offering of \$35 (a level quickly surpassed in the immediate aftermarket), the market value of its equity was \$262 million—almost entirely based on options for future growth, not on the attractions of its current cash flow.

¹ This analogy was first drawn by Stewart Myers in "Determinants of Corporate Borrowing," *Journal of Financial Economics*, no. 5 (Rochester, NY: University of Rochester, 1977), p. 147.

Exhibit I

Growth option value as a component of selected companies' total equity value

	Market value of equity* \$ millions	Anticipated earnings* \$ millions	Capitalized value of earnings using various discount rates** \$ millions			Estimated value of growth options† \$ millions	Percent of market value represented by growth options
			15%	20%	25%		
Electronics							
Motorola	\$ 5,250	\$ 210	\$ 1,400	\$ 1,050	\$ 840	\$ 3,850– 4,410	73–84 %
Genrad	550	17	113	85	68	437– 482	79–88
RCA	2,200	240	1,600	1,200	960	600– 1,240	27–56
Computers and peripheral							
Apple Computer	2,000	99	660	495	396	1,340– 1,604	67–80
Digital Equipment	5,690	285	1,900	1,425	1,140	3,790– 4,550	67–80
IBM	72,890	5,465	36,433	27,325	21,860	36,457–51,030	50–70
Chemicals							
Celanese	1,010	78	520	390	312	490– 698	49–69
Monsanto	4,260	410	2,733	2,050	1,640	1,527– 2,620	36–62
Union Carbide	4,350	280	1,867	1,400	1,120	2,483– 3,230	57–74
Tires and rubber							
Firestone	1,090	88	587	440	352	503– 738	46–68
Goodyear	2,520	300	2,000	1,500	1,200	520– 1,320	21–52
Uniroyal	400	47	313	235	188	87– 212	22–53
Food processing							
Carnation	1,790	205	1,367	1,025	820	423– 970	24–54
Consolidated Foods	1,190	171	1,140	855	684	50– 506	4–43
General Foods	2,280	317	2,113	1,585	1,268	167– 1,012	7–44

*Source:
Value Line Investment Survey,
August 12, 1983.

**Anticipated earnings are treated
as a perpetuity.

†Ranges of growth option value are
determined by subtracting the
high and low values of capitalized earnings
from the market value of the equity.

Strategic capital budgeting

While some strategically important investments allow for straightforward evaluation using ordinary discounted cash flow (DCF) techniques (for example, a cost-reduction project for a company whose competitive advantage rests exclusively on being the low-cost producer), others seem to defy such analysis. This is true because they are but the first link in a long chain of subsequent investment decisions. Future events often make it desirable to modify an initial project by expanding it or introducing a new pro-

duction technology at some later date. Other spin-off opportunities such as the conversion of by-products to usable goods or the development of complementary products to fill out a line may also arise.

Precisely how and when subsequent investment decisions will be made depend on future events. But the array—and attractiveness—of future investment opportunities at the company's disposal depends critically on the assets put in place in the present.

Realizing the importance of strategic investments and the difficulty of using quantitative techniques to analyze them, companies have developed a number of other methods of evaluation. Unfor-

tunately none has proved totally successful in practice. (For a rundown of the current methodology for analyzing investments, see the second insert.)

In fact, existing cures for quantitative shortcomings may be worse than the disease. What is needed in their place is an approach that overcomes both the restrictiveness of ordinary net present value (NPV) analysis and the lack of analytic discipline that characterizes qualitative evaluation.

Take the opening case example. Proponents of production of the new material understood the value of the opportunity but could not convince skeptics without recalling a precedent. Lacking that precedent, their unstructured application of intuition and judgment would not have overcome formal, quantitative arguments.

The proponents should have organized their arguments around the concept of growth options. They could have argued more effectively that:

Discounted cash flow analysis understates the value of the project.

The risk associated with the project was one of the best reasons to preserve, not reject, it.

In an environment of high and rising interest rates, the capital budget should have been weighted in favor of such projects.

The options approach might have spared the company its subsequent mistake in delaying the capital commitment. In particular, it would have enabled the committee to recognize those conditions under which it should implement the project quickly and those under which it would be safe to defer.

How valuable are growth options?

The value of a call option on an asset depends on the value of the asset itself and the cost of exercising the option. If, for example, IBM's stock traded at \$120, a call option, giving its owner the right to purchase a share of IBM at \$100, would be worth at least \$20 and probably more.

The same logic applies to growth options. The opportunity to undertake a project is worth at least the present value of the project's cash inflow less the present value of its outflow. But the

opportunity to invest can be worth even more than the project's NPV. How much more depends on:

The length of time the project can be deferred. Time is valuable when deciding whether to exercise an option. The ability to defer the decision gives the decision maker time to examine the course of future events and the chance to avoid costly errors if unfavorable developments occur. It also provides an interval during which a positive turn of events can make a project dramatically more profitable. The longer the interval, the more likely it is that this will happen; hence, the longer a project can be deferred the more valuable a growth option will be.

Even a project with a negative NPV can be a valuable "out-of-the-money" growth option if the company can put off the investment decision for a while. A company might maintain such out-of-the-money options even if they require ongoing spending for engineering, product development, market research, and so on, provided there is a realistic chance that future events will make the project more valuable.

Project risk. Paradoxically, risk is a positive factor in the determination of a growth option's worth. If two investment opportunities have identical NPVs and can be deferred for the same amount of time, the riskier of the two projects will be a more valuable growth option. This is because of an asymmetry between potential upside gains and downside losses when an option matures. As *Exhibit II* illustrates, large gains are possible if a project's NPV increases. However, losses can be cut by simply choosing not to exercise the option whenever the project's NPV is negative. This ability means that high risk increases the chance of eventually realizing a large gain without equally increasing the chance of incurring a large loss.

The level of interest rates. High interest rates generally translate into higher discount rates and lower present values of future cash flows for any given project. Clearly, that should depress the value of an option to undertake a project.

But higher discount rates also imply a lower present value of the future capital necessary to exercise an option. Such a countervailing effect helps to buoy the option's value as interest rates rise. This can give certain kinds of projects—specifically, those that create new growth options—a crucial comparative advantage in the capital budgeting process.

How exclusive the owner's right is to exercise the option. Unlike call options securities, there are two types of growth options: *proprietary* and *shared*. Proprietary options provide highly valuable, exclusive rights of exercise. These result from patents or the company's unique knowledge of a market or a technology that competitors cannot duplicate.

Shared growth options are less valuable "collective" opportunities of the industry, like the

their preferences toward projects that generate cash when capital is tight. But one large technology-based company discovered a different kind of comparative advantage during a capital squeeze in the late 1970s. A member of the capital appropriation committee described the problem:

"Allocating capital would be easy if you could do it just 'by the numbers,' but you must consider 'directional' factors as well. The idea of a hurdle-rate [to evaluate projects] becomes even less important in periods of tight capital because directional factors take precedence. When capital is tight, we take a longer-haul view and pick up the savings and cost-reduction projects later."

These "directional" factors are valuable growth options that the company looks for in new or growing markets.

Deciding when to exercise a growth option depends on a comparative analysis of the advantages and disadvantages of going ahead with a project as soon as possible. Because this *option* to invest is worth more than the NPV of the underlying project, a company should wait until the last possible moment before committing funds. That preserves the option's premium while protecting the company from costly and avoidable mistakes. A decision to commit funds to a project any earlier than necessary sacrifices this value.

When to invest early

Experience shows that companies often commit investment funds at a very early date despite their ability to defer a final decision. Companies that do so must believe that the cost of deferring the decision exceeds the value sacrificed from early exercise. For instance, a competitor may preempt the move or take action that raises the cost of the project, as happened to the company in the opening example. In general, a company will find it pays to exercise its growth options earlier than necessary when: competitors have access to the same option; the project's net present value is high; the level of risk and interest rates are low; and industry rivalry is intense.

Exhibit III shows how a company should time the exercise of its growth options based on the extent of industry rivalry and on the exclusiveness of a company's right to exercise the options. The upper right and lower left quadrants offer straightforward directions for companies. The other two present intermediate cases with less obvious results. A company may wish to exercise even proprietary growth options early, for example, if the industry is intensely competitive and a timely commitment is likely to discourage attack.

A company generally tries to obtain a dominant competitive position in order to achieve and protect high returns on investment. But by giving a company the right to *time* the investment more selectively, the growth option provides an important, though often overlooked, motive for dominating the market. One executive stated:

"What you're really trying to do with capital is create a strong competitive position.... We say [to our division managers] 'Do what you have to do to retain a leadership position in the short run.' Of course, over the long run, you can stay a leader only if you have the best cost position, so we must pay attention to that. But get the strongest leadership position, and *that* is what is going to pay off."

"The advantage of being number one in an industry is the opportunity to initiate changes in technology and pricing. If one initiates change, one is in a much better position to take advantage of it because one can, in effect, control the timing and anticipate the outcome."

Using the framework

Given the determinants of a growth option's value and the many different characteristics it can display, no single formula can embody its value reliably. Consequently, the first assessment of a project expected to generate new growth options might best be qualitative, although rooted in established principles of option valuation.

As a first step, the company should classify projects more accurately according to their growth option characteristics. Classification along traditional functional lines such as replacement, cost reduction, capacity expansion, and new product introduction provides little guidance. A more appropriate classification begins by distinguishing between projects whose future benefits are realized primarily through cash flows (simple options) and those whose future benefits include opportunities for further discretionary investment (compound options). Simple growth options—like routine cost reduction and maintenance and replacement projects—create value only through the cash flows stemming from the underlying assets.

Compound growth options—like research and development projects, a major expansion in an existing market, entry into a new market, and acquisitions—lead to new investment opportunities and affect the value of existing growth options.

A simple growth option requires only that the company evaluate cash flows according to net present value or rate of return methods. The complex-

The difficulty with investment analysis

None of the quantitative techniques instituted by large companies to help make investment decisions has proved completely adequate for handling the practical questions they raise. The difficulty with discounted cash flow techniques, for example, is that future investment opportunities are discretionary. Trying to reflect their worth in a terminal value calculation, designed to capture cash flows beyond whatever horizon date is used in a net present value analysis, is not a satisfactory solution because most companies substitute book value, liquidation value, or treat the last year's cash flows as if they continued in perpetuity. Reliance on a market-to-book value multiple to arrive at a terminal value offers only a crude estimate at best.

Decision-tree analysis works in principle because managers are forced to map out all future decision points, contingencies, and probabilities.

Although enlightening, decision-tree analysis can be unwieldy and impossibly complicated for companies with even a modest number of projects to consider.

Consequently, many companies have turned to other methods—for example, isolating and evaluating strategically important projects qualitatively. Such analysis rests heavily on the intuition and judgment of key senior executives. Given the well-known tendency for "hard" analysis to drive out "soft," the isolation of strategic projects is helpful to the extent that valuable executive experience is brought into play and truly important investments are not routinely rejected by simplistic quantitative techniques.

But separate qualitative analysis may also compromise the traditional corporate objective to maximize the value of the company's equity. The breakdown of analytic discipline may result in decisions made on blind faith or by force of personality. "Strategic" importance can become a much-abused rationale for the acceptance of weak projects. By separating strategic projects from others, the company may foster the belief that investing to increase its stock price in the short term is a different activity from investing to generate growth—one of which must be sacrificed when resources are limited.

Another approach makes modified use of DCF techniques. Attracted to business portfolio models, some companies arbitrarily adjust hurdle rates according to a prior strategic classification of the business (whether to grow, sustain, or harvest it). Routine quantitative decision rules then produce the "right" answers. Despite the appearance of rigor with adjusted hurdle rates, however, managers may create the worst of both worlds. The true present value of cash flows is obscured while the potentially valuable application of executive experience and judgment is blunted.

chance to enter a market unprotected by high barriers or to build a new plant to service a particular geographic market. Projects to cut costs are also shared options since competitors usually can and will respond with cost reductions of their own, thus minimizing the benefits to any one company.

Shared growth options are less attractive than proprietary ones because counter investments by the competition can erode or even preempt profits. Only if a company is in a sufficiently strong competitive position to ward off assaults and grab the lion's share of a project's value can a shared growth option be valuable.

Implications for capital budgeting

Thinking of investments as growth options challenges conventional wisdom about capital budgeting. For example, a company may be justified in accepting projects with a negative NPV. Some projects, such as the one in the opening example, may initially drain cash flows. But they may also create options for future growth. If the growth option's value more than offsets that lost from the project's cash flows, then it is worthwhile.

Suppose a company found the present value of construction and future operating costs for a genetic engineering lab to total \$5 million. As a basic research lab, it would not, of course, generate positive cash flows, only opportunities for future commercial development of new discoveries. Still, the project would be justifiable if, in management's judgment, these growth options were worth \$5 million or more.

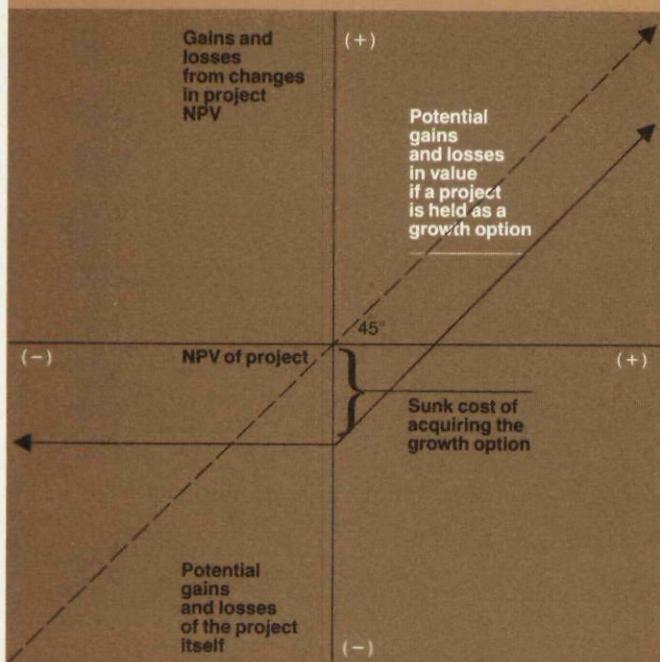
If new growth options are involved, high-risk projects might be preferable to low-risk ones. In light of the beneficial impact of risk on growth option value, companies should hold options on projects whose value swings widely rather than only slightly over time. Projects that create new growth options in risky environments should have an advantage in the capital budgeting process. As an executive of a major consumer products company noted:

"If you know everything there is to know about a [new] product, it's not going to be a good business. There have to be some major uncertainties to be resolved. This is the only way to get a product with a major profit opportunity!" [Emphasis added.]

When capital is scarce and interest rates rise, projects that create new growth options may be less adversely affected than those that generate only cash. This makes them relatively more attractive in the capital budgeting process. Normally, companies tilt

Exhibit II

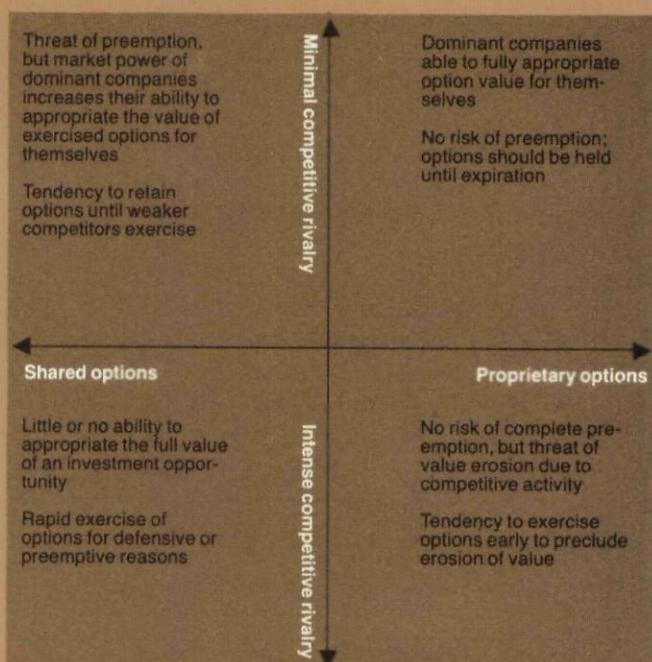
The asymmetry between upside gains and downside losses in option ownership*



*As NPV of project declines below zero, the value of the growth option stops falling and goes flat.

Exhibit III

Timing the commitment of capital



ity of compound options, their role in shaping a company's strategy, and even their impact on the survival of the organization all demand a broader analysis. A company must consider these projects as part of a larger cluster of projects or as a stream of investment decisions that extends over time. Given the company's strategy, executives should question whether a particular option will bring the right investment opportunities in the right markets—within a time frame suitable to their company's needs.

The company must separate projects that require an immediate decision from those on which it can defer final action. For growth options with a shorter time frame, executives need to focus only on the value gained or lost from acceptance. However, deferrable projects should be analyzed according to the relative costs and benefits of deferral.

Finally, the company must ask whether it can capture the option's benefits for itself or whether they will be available to other competitors as well.

Disciplining project evaluations

To illustrate, let's look at a generic chemical investment and alter it to fit different circumstances. A chemical company wants to build a

facility for producing a toxic chemical next to a user's plant. The chemical is a commodity, the facility is to be owned and operated by the company, and the user is scheduled to purchase a fixed percentage of the plant's capacity output under a take-or-pay contract. If the company doesn't construct the facility immediately, however, the offer expires and the user will build and manage a plant on its own.

The chemical company's opportunity is a *simple, expiring, proprietary growth option*. The company should evaluate it by calculating the net present value of cash flows. The project's stand alone cash value in the present is the only measure of the project's worth needed, since that is the value to be gained or lost.

Suppose this offer does not expire within a year and the potential exists for a relaxation of regulations controlling production of the toxic chemical. Under these circumstances, the company now realizes the new facility can be built at a much lower cost in the future. At the same time, the company discovers that the user has approached other chemical companies with the same offer. The company classifies the project as a *simple, deferrable, shared growth option*. Again, the company needs to evaluate only cash flows but must study the impact of deferral on cash since it shares the option with competitors. The company should channel project evaluation into a comparison of

potential costs and benefits from either immediate exercise or deferral.

Finally, suppose that the toxic chemical is actually a new compound developed by the company. As a substitute for existing chemicals, it offers users significant cost savings. If the facility can produce the new compound in volume and the company can prove the cost savings, it can expect demand to grow rapidly, and realize new opportunities to build additional production facilities. On the negative side, the compound is difficult to produce, and government regulations could change radically. Moreover, the user continues to consider proposals from producers of a conventionally used chemical.

This last growth option is *shared, compound, and deferrable*. Even if cash flow analysis indicates that the company should reject or defer the project, top management may accept it immediately if preemption by competitors could seriously erode the worth of future growth options.

A new perspective

The key advantage of the growth-option perspective is that it integrates capital budgeting with long-range planning. Within the framework, capital budgeting is simply the execution of a company's long-range plan.

Because investment decisions today can create the basis for investment decisions tomorrow, capital allocations made in any year are vital steps in the ultimate achievement of strategic objectives. By the same token, a long-range plan necessarily implies the cultivation of particular investment opportunities and can have a direct, dollars-and-cents impact on a company's stock price in the near term as well. The two activities are different but related means to the same end: maximizing the value of the company's equity.

To explicitly link capital budgeting and long-range planning, a company should place them both under the supervision of a single executive or an executive committee. Top management will impose a strategic perspective on what might otherwise be an uncoordinated aggregation of isolated capital expenditures.

Operating with a growth option perspective allows responsible executives to focus on the single, overriding objective of enhancing the value of the company's equity. The capital budgeting process will not be confused by linking the seemingly divergent and mutually exclusive aims of investing for future growth and maintaining a high stock price in

the present. Once headquarters understands that some of the strategic benefits of investments are valuable options on future growth, it becomes clear that such investments add to the value of the company's equity, just as do projects that yield immediate cash flow. The only difference: value comes initially in the form of growth options rather than cash flows.

Such recognition will mark a critical shift in executive attention. A company should not spend time and effort trading off growth with ROI or market share with profitability. Rather, the company's focus should be on the kind of value the investment will create, its durability, and the auxiliary decisions required to protect or enhance it over time.

An executive of a *Fortune "500"* company once claimed that, "You simply can't put a dollar sign on a technological future that may have a tremendous payoff." The executive may be right. But that does not mean future investment opportunities have no value for the company's shareholders. Moreover, it certainly does not mean a company should abandon or distort the one approach available to put a dollar sign on the future—the discounting of expected cash flows using appropriate discount rates.

To be consistent with the objective of maximizing equity value, executives must broaden their perspective on the process of resource allocation so that they can integrate "strategic" factors logically and systematically into the capital budgeting process.

By thinking of discretionary investment opportunities as options on real assets, executives will address other relevant questions that have received little attention so far. How, for example, are growth options created, and which will be most valuable? How permanent and how liquid are growth options as components of company value? Does it matter whether a company owns a growth option exclusively as a collective option of the industry? What influence do industry structure and competitive interaction have on growth option value? What auxiliary financial decisions are required to permit the future conversion of growth options to real assets?

The answers to questions such as these will vary from one situation to another. Thus, the growth-option framework reaffirms the potentially valuable role that executive judgment and experience can play in the resource allocation process. But regardless of the specific situation, the growth option framework establishes a common basis for the analysis needed to answer fundamental questions and provides a coherent structure for organizing the application of executive judgment. □

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