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Capital Budgeting in 30 Minutes



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A Guide for Directors and Shareholders

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This whitepaper is a continuation of our series focused on de-mystifying corporate finance for board members and shareholders. Companies face three principal corporate finance decisions:

1. **Capital Structure.** What is the appropriate mix of debt and equity financing for the Company?
2. **Capital Budgeting.** What is the appropriate mix of capital projects for the Company to invest in?
3. **Distribution Policy.** What is the appropriate mix of current income and capital appreciation for the Company's shareholders?

In this installment, we explore the capital budgeting question in more depth.

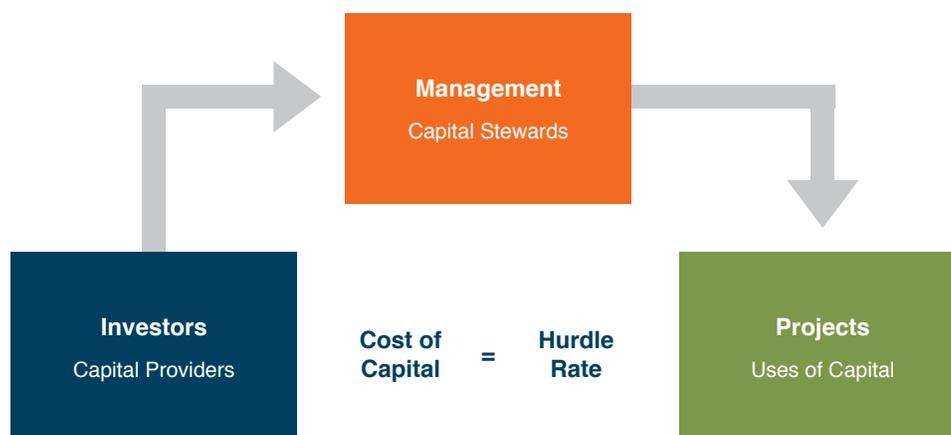
The Objective of Capital Budgeting Decisions

From the board's perspective, it can be helpful to think of management as stewards of the capital entrusted to the company by lenders and shareholders. In this model, management has the task of allocating the company's capital resources to projects anticipated to generate returns sufficient to meet the expectations of the capital providers. When making capital structure decisions, the blended return expectations of the capital providers is referred to as the weighted average cost of capital, or WACC. For capital budgeting decisions, those return expectations are referred to as the hurdle rate. As depicted in Exhibit 1, the hurdle rate for capital budgeting purposes is equal to the WACC in capital structure analysis.

Capital budgeting is a disciplined process for identifying, evaluating, and monitoring capital projects that will generate a return equal to or greater than the hurdle rate.

Exhibit 1

The hurdle rate for capital budgeting is equal to the weighted average cost of capital



A capital project is simply any use of the company's capital resources in the present with a view toward earning a return on that investment over time. Common capital projects include mergers/acquisitions, capital expenditures, research and development, and investment in technology or other intangible assets. The anticipated benefits from a capital project may be in the form of either incremental revenue or cost savings.

What Are the Relevant Cash Inflows and Outflows?

Detailed guidance for constructing a capital budgeting model is beyond the scope of this whitepaper. Preparing such models is not the province of directors or shareholders. However, directors need to be prepared to ask critical and probing questions when management-prepared capital budget analyses are presented to the board for approval.

Exhibit 2, on the next page, illustrates the basic shape of capital budgeting analysis. The principal challenge is identifying the cash flows that are relevant to the decision. To be relevant, the identified cash flows must be marginal; in other words, if the project is not undertaken, the cash outflows will not be incurred and the projected cash inflows will not be received. When the hurdle rate is used to discount the marginal future net cash flows to present, the difference between the initial cost of the project investment and the present value of the anticipated future cash flows is referred to as the net present value of the project.

Initial Investment

The initial investment for a capital project includes all of the marginal cash outflows required to put the project in place. When reviewing capital budgeting analysis prepared by management, directors should confirm that all potential elements of the initial investment are considered and included in the analysis.

Exhibit 2

The relevant cash flows for capital budgeting analysis are marginal (i.e., will not exist in the absence of the project)

<i>Time = 0</i>	<i>Time = 1 through Time = n</i>				<i>Time = n</i>
Initial Investment	Marginal Revenues / Expense Savings Marginal Operating Expenses Marginal Income Taxes Incremental Capital Investment				Terminal Value
(\$1,000)	\$250	\$350	\$300	\$150	\$400
\$1,124					
<u>\$124</u>	Net Present Value				

- **Transaction Consideration.** In a merger or acquisition, the initial investment is the purchase price, which should include both cash and non-cash components.
- **Capital Expenditures.** For other types of projects, the most obvious form of initial investment is the direct cost of capital assets required for the project. The relevant cost includes all shipping, engineering, and installation costs incurred to put the assets in service.
- **Assets Previously Owned.** A proposed capital project may be able to use existing corporate assets, such as vacant land. Since there is no direct cash outlay for such assets, it may be tempting to treat such assets as “free” in the analysis. This temptation should be resisted. If not used in the proposed capital project, the asset could be sold; the net after-tax proceeds foregone are a relevant component of the initial investment.
- **Working Capital.** In addition to fixed assets, many capital projects require investment in working capital assets (for example, inventory) prior to commencing operations.
- **Operating Expenses.** In addition to costs that are customarily capitalized, the initial investment in a project may include other operating expenses. If the expenses would not otherwise be incurred, they should be included in the initial investment.

Annual Net Operating Cash Flows

The annual net operating cash flows for a capital project must be forecast. The following discussion identifies the key components of such a forecast and critical areas for evaluation.

- **Marginal Revenue.** The forecast for marginal revenue is largest single determinant of whether a capital project will prove attractive. Revenue forecasts should be related to the addressable

market for the product, competitor product offerings, production capacity, price/volume analysis, and other factors as appropriate. Capital projects often replace or otherwise cannibalize existing revenue sources for the company; cannibalized revenues should be deducted to derive marginal revenue attributable to the project. Unlike forecasts for business valuation, which are generally assumed to persist indefinitely, revenue forecasts for discrete capital projects will often need to consider total useful life, including an estimate of the rate at which revenues will decline as the project reaches the end of its useful life.

Some capital projects are designed to generate cost savings rather than incremental revenue. In such cases, the projected cost savings represent the “revenue” for the project.

- **Marginal Operating Expenses.** Operating expense forecasts should be related to the revenue forecast. Distinguishing fixed from variable costs is often helpful both in assessing the reasonableness of the expense forecast and in preparing sensitivity analysis. The expenses included in the model should be limited to cash operating expenses. In other words, depreciation (a non-cash expense) and interest (a financing expense) should be excluded from the forecast.

As with the revenue forecast, the expense forecast should identify marginal costs; in other words, costs that will not be incurred if the project is not undertaken. Segregating fixed and variable costs can be a valuable step in confirming that the identified fixed costs are truly marginal to the project.

- **Marginal Income Taxes.** While not included in the forecast of cash operating expenses, the tax shield from depreciation should be factored explicitly into the estimate of cash taxes. Keeping with the theme of marginal analysis, the appropriate tax rate for capital budgeting analysis is the marginal, not the average effective, tax rate. Some projects may give rise to specific tax credits or other benefits – if so, those benefits should be credited to the analysis.
- **Incremental Capital Investment.** The cash flow forecast should also take account of incremental capital investment needs for items such as maintenance capital expenditures, expenditures to build capacity to meet anticipated demand, and working capital to support sales growth. If revenues are projected to slow as the project approaches the end of its life, the corresponding release of working capital is a source of cash flow.

Terminal Value

Since most capital projects have finite lives, the terminal value is limited to after-tax proceeds from sale of capital assets and liquidation of working capital assets. Mirroring the initial investment, operating costs associated with winding down the project should be deducted from the projected terminal value.

How Are Available Capital Projects Ranked?

As shown in Exhibit 2, identifying marginal cash flows is the first step of the capital budgeting project. The next step is to assess what the marginal cash flows suggest regarding the desirability of the project

from a financial perspective. The two primary techniques for evaluating and ranking potential capital projects are net present value and internal rate of return.

Net Present Value (NPV)

Net present value is a measure of the value created by a prospective capital project. The net present value is determined by discounted the projected marginal cash flows to the present at the hurdle rate (which is the weighted average cost of capital). If the present value exceeds the initial investment, the net present value will be positive, signaling that the projected is attractive financially. On the other hand, if the present value is less than the initial investment, the net present value will be negative.

While the theoretically superior method of evaluating projects, net present value is not an intuitive concept. Furthermore, when there are financial constraints on the total amount available for capital investment, net present value does not provide direct guidance on ranking available projects.

Internal Rate of Return (IRR)

The internal rate of return for a capital project is the discount rate which equates the present value of the projected marginal cash flows with the initial investment for a project. In other words, the IRR is the hypothetical hurdle rate at which the project would have a net present value of \$0. Since discount rates and present values are inversely related, it takes a higher discount rate to reduce a more robust set of marginal cash flows to present value. As a result, for a given initial investment, greater levels of projected marginal cash flow will yield higher IRRs.

Exhibit 3

Net present value and internal rate of return are the two primary measures for evaluating capital projects

Projected Marginal Cash Flows					
<i>Initial Investment</i>	<i>Annual Net Operating Cash Flows</i>				<i>Terminal Value</i>
(\$1,000)	\$250	\$350	\$300	\$150	\$400
Net Present Value			Internal Rate of Return		
<i>Use hurdle rate to measure present value of projected marginal cash flows</i>			<i>Solve for the discount rate at which the net present value = \$0</i>		
At 11.5% hurdle rate, NPV = \$124			NPV = \$0 at discount rate of 17.6%		
Project financially attractive if NPV > \$0			Project financially attractive if IRR > WACC (Hurdle Rate)		

Exhibit 3 compares net present value and internal rate of return for a given project. With a couple of fairly obscure exceptions that lie beyond our scope, both NPV and IRR will yield the same conclusion regarding the financial desirability of a given project. The IRR is the more intuitive of the two measures.

In the face of scarce financial resources, however, neither measure provides an unambiguous basis for ranking and selecting from among multiple potential projects.

- Since net present value measures the value created by a project, one might be tempted to simply rank projects by the magnitude of the NPV. However, the NPV is not scaled to project life; as a result, it is not obvious, for example, if a six-year project with an NPV of \$500 is more desirable than a four-year project with a \$350 net present value. While there are techniques for making such comparisons, the ultimate consideration cannot be reduced to a spreadsheet: what capital projects will be available at the conclusion of the project with the shorter life?
- The internal rate of return calculations implicitly assume that all projected cash flows can be reinvested at the IRR through the duration of the project. For high IRR projects, this may not be feasible. As with NPV, there are techniques to work around this issue, but the fundamental question remains: is the calculated IRR sustainable? Furthermore, the IRR does not address the size of the investment. Are shareholders better served by a project with an IRR of 17.5% and NPV of \$200, or an IRR of 14.0% and an NPV of \$300? If the projects are of equal duration, the higher NPV project is theoretically superior. However, the higher IRR project might be interpreted as having a greater margin of safety, and therefore represent a less risky allocation of capital.

When ranking capital projects amid financial constraints, management should carefully explain the rationale for ranking projects to the board with reference to both measures.

What Non-Financial Constraints Does the Company Face?

The tools described in the previous section (NPV and IRR) are useful for prioritizing and ranking capital projects: given a limited capital budget, which projects should be pursued? However, firms are likely to be constrained by non-financial limitations as well. Board members should confirm that management has identified relevant non-financial constraints and has considered such constraints in developing capital project recommendations. Potential non-financial constraints include the following:

- **Management time and attention.** Does the existing management team have the available “bandwidth” to manage the existing operations and oversee the proposed capital project? A successful capital project that imperils the existing business because of the resulting management inattention may be counter-productive.
- **Infrastructure and systems.** Are the company’s information technology resources sufficient and adaptable to the proposed capital project? What about human resources, finance, sales and marketing?
- **Human capital and expertise.** Does the company’s existing staff have the skills and competencies necessary to execute on the proposed capital project? If the project will require an influx of new employees, are qualified individuals available in the relevant labor markets?

The objective in evaluating non-financial constraints is not to inhibit growth, but rather to ensure that the relevant cash flows used in the financial analysis are measured appropriately. Most non-financial constraints have financial solutions. Additional senior managers can be hired, systems can be upgraded, and wages can be adjusted to attract qualified candidates. By explicitly evaluating the presence of such non-financial constraints, however, board members can ensure that the financial costs associated with remedying those constraints are incorporated in the financial analysis.

What Is the Strategic Rationale for the Proposed Project?

Financial spreadsheets are remarkably malleable: with enough tweaks to the assumptions, nearly any proposed project can appear financially attractive. As a result, a positive NPV and attractive IRR should be viewed as threshold requirements for considering a project, but neither measure is a sufficient substitute for a compelling strategic rationale supporting the proposed project's "fit".

Michael Porter's five forces framework can serve as a useful grid for evaluating the strategic rationale for a proposed capital project.

- 1. Industry rivalry.** Is the proposed project intended to provide a cost advantage over competitors or help differentiate the company from its rivals? Will the cost advantage / differentiating factor be sustainable or easily copied by peers? Examples of such projects include investments in production efficiency and brand development expenditures.
- 2. Threat of new entrants.** Does the proposed project reduce the threat of new competitors entering the market? Does it promote customer loyalty or otherwise reduce the likelihood that existing customers will be lured away by new entrants? Acquiring an upstart company with potentially disruptive technology is an example of a capital project addressing this concern.
- 3. Threat of substitutes.** If completed, will the proposed project extend the breadth of the company's product line? Is the project defensive, aimed at limiting a potential loss of market share if the company does not act? Projects attempting to address this concern include efforts to diversify by adding new or complementary products.
- 4. Bargaining Power of Buyers.** Is the proposed project intended to increase customer switching costs or otherwise reduce the sensitivity of demand to price increases? A firm may elect to acquire a primary competitor in an effort to increase pricing power. By acquiring a customer, a company may be attempting to capture a greater portion of the total profit along the value chain.
- 5. Bargaining Power of Suppliers.** Does the proposed project deliver an alternative source of raw materials? In addition to vertically-integrating acquisitions (i.e., purchase of a supplier), capital projects modifying the production process to facilitate the use of multiple and/or cheaper inputs may address this factor.

In short, the "why" of a capital project needs to have an affirmative and compelling strategic rationale; a positive NPV is a necessary, but not sufficient, condition for approving a capital project. The framework and questions identified above can help board members confirm that such a rationale exists.

What Returns Have Prior Projects Earned?

For a growing company, capital budgeting is an ongoing process, not a one-time event. As a result, it is important for the board to monitor realized returns from prior projects to help refine the capital budgeting process for current projects, rooting out potential cognitive biases like systematic over-confidence. As a component of submitting a capital project for board approval, management should also describe the process for measuring and evaluating subsequent performance. The discipline of subsequent measurement can increase the quality and reliability of the forecasts used to support project approval.

Peer Benchmarking Analysis

The results of capital budgeting analysis for a group of public peer companies can be inferred from the statement of cash flows. Exhibit 4 illustrates the basic relationships among the various sections of the statement of cash flows.

By comparing the operating cash flow to the investing cash flow for a business over time, we can categorize the company as either a cash generator (operating cash flow exceeds investing cash flow) or a cash user (investing cash flow exceeds operating cash flow). Since investing cash flows tend to be lumpy, it is best to make such comparisons on a multi-year basis.

Exhibit 5 on the following page summarizes the results of our analysis of small-cap and mid-cap companies in the Russell 2000 index (excluding financials) for the three-year period ending 2015.

Exhibit 4

If operating cash flows exceed investing cash flows, funds are available for distribution to capital providers; otherwise, companies must access additional external capital to support investing activities

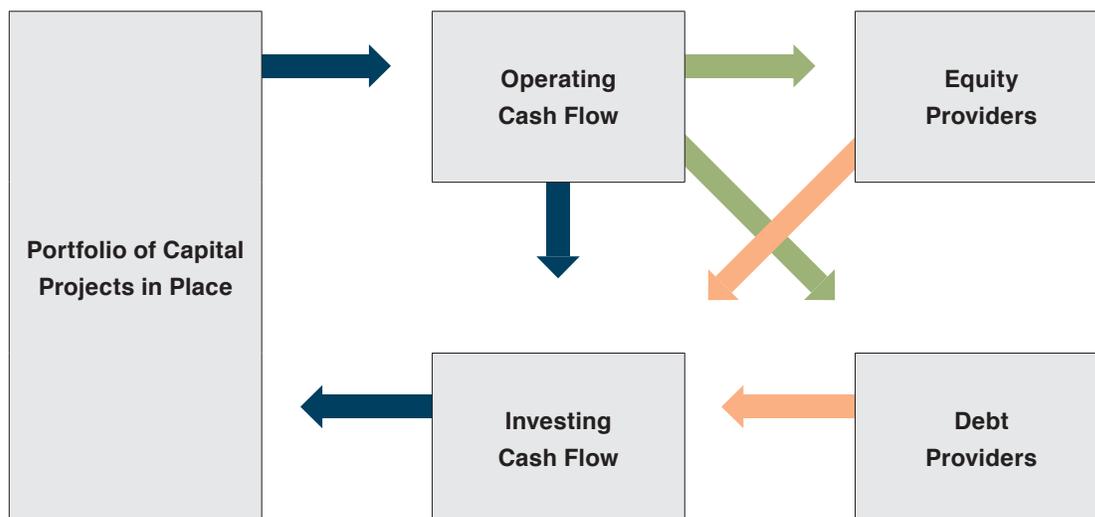


Exhibit 5

	Cash Generators	Cash Users
Number of Companies in Group	683	744
Investment per \$1.00 of Operating Cash Flow	\$0.55	\$1.72
Financial Profile & Risk		
Revenue (millions)	\$666	\$319
EBITDA Margin	12.3%	7.3%
Leverage (Debt / EBITDA)	1.5x	3.5x
Effective Borrowing Cost	4.7%	5.8%
Beta	1.09	1.21
Growth Characteristics		
3-yr Revenue Growth	4.2%	14.3%
3-yr EBITDA Growth	3.3%	13.6%
Valuation & Market Performance		
Enterprise Value / EBITDA	10.4x	11.3x
3-yr Annualized Return	9.7%	9.1%

Note - Median measures for each group, data from CapIQ, Mercer Capital analysis

The overall universe of companies is reasonably balanced between the two groups, with cash generators accounting for 48% of all observations and cash users representing 52% of the sample. We draw the following observations from the analysis summarized in Exhibit 5:

- The cash generators are, on balance, larger than the cash users, with median revenue of \$666 million, more than twice that of the cash users. This suggests that there is a life cycle factor in capital budgeting analysis – smaller firms tend to be more aggressive with regard to capital investment.
- Beyond mere size, the cash generators present a lower-risk financial profile than the cash users, with greater profitability, lower leverage (and borrowing costs), and lower betas.
- The more aggressive investment posture of the cash users leads to higher growth rates in revenue and EBITDA. The pertinent question is whether the incremental revenue and profit growth is sufficient to compensate for the incremental capital deployed in the business. In other words, did the capital projects generate positive net present values? While the answer to that question is not directly observable, corresponding shareholder returns provide indirect evidence.
- Over the three-year period ending in 2015, annualized shareholder returns to the cash generators (9.7%) exceeded those to the shareholders of cash users (9.1%). While we make no effort to discern whether such difference is statistically significant, we note that the relative proximity suggests that – on balance – the capital projects executed by the cash users had net present values approximating \$0. In other words, for this sample of companies over this period, heavy investment translated into significant revenue and profit growth, but did not generate superior shareholder returns.

Exhibit 6

Dispersion of shareholder returns is wider for cash users than for cash generators

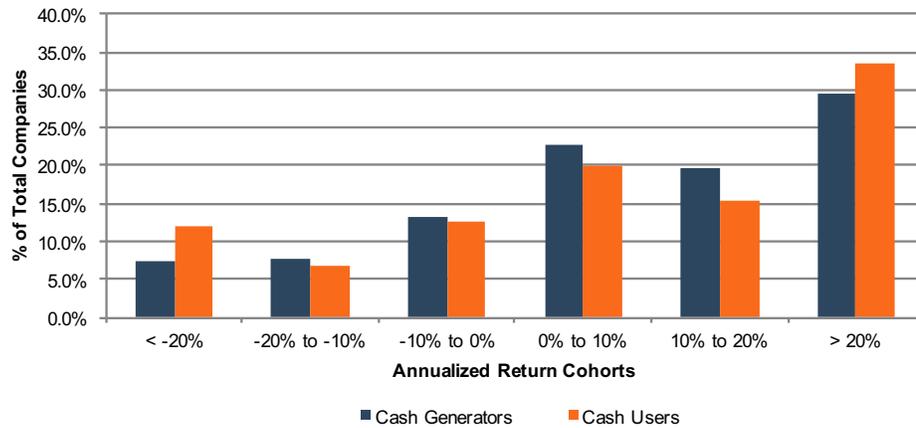
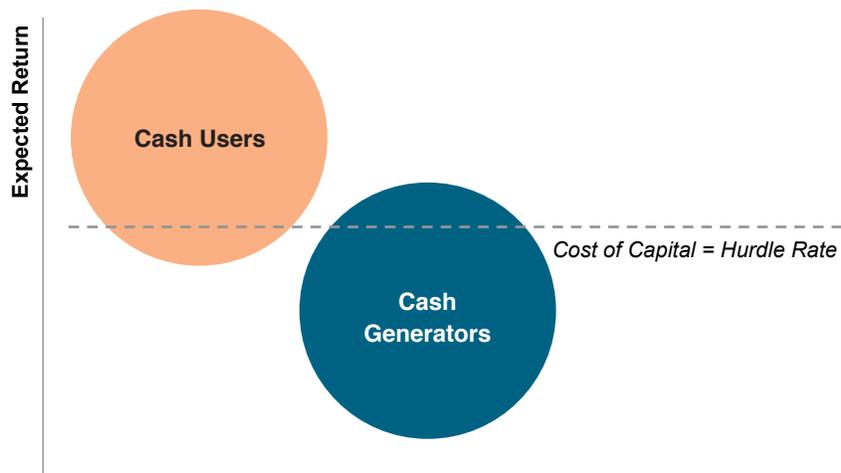


Exhibit 7

The availability of attractive investment opportunities should determine whether a given company is a cash user or a cash generator

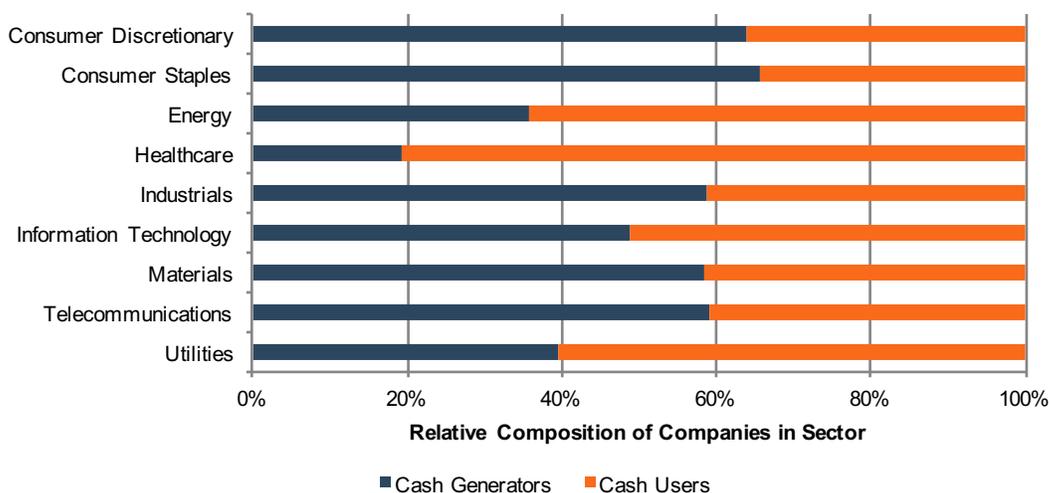


As shown on Exhibit 6, significant investment increases the likelihood of abnormally positive or negative shareholder returns. Approximately one-third of cash users enjoyed annualized shareholder returns greater than 20%, compared to less than 30% for cash generators. On the down side, nearly 12% of cash users suffered annualized shareholder returns of -20% or worse, compared to just 7.5% for cash generators. Heavy capital investment increases the variability of subsequent returns to shareholders, increasing the likelihood of both big paydays and big losses.

As shown on Exhibit 7, the magnitude of capital investment should relate to the availability of attractive capital projects.

Exhibit 8

Availability of attractive projects varies by industry



Given the connection between availability of attractive capital projects and status as a cash generator or cash user, one should expect to find discernable patterns across industry sectors. Exhibit 8 summarizes the relative composition of the industry sectors in our sample.

The industry effect on capital budgeting is pronounced in Exhibit 8.

- The preponderance of cash generators among firms in the consumer discretionary, consumer staples, and industrials sectors is consistent with more limited investment opportunities in mature industries.
- Recent woes in the energy and materials sectors have dried up operating cash flows, increasing the number of cash users.
- The healthcare sector, which includes biotechnology, pharmaceuticals, technology, and equipment in addition to healthcare services, offered the most abundant investment opportunities, with cash users accounting for more than 80% of firms, and median compound annual revenue growth in the sector of 15.4%.
- The information technology sector is maturing, with nearly equal representation among cash generators and cash users.
- Telecommunications and utilities are mature, but capital intensive, industries. The payoff to capital investment in telecommunications over the period analyzed was uninspiring, with median annualized shareholder returns of 8.4% for cash users, compared to 19.7% for cash generators.

The purpose of peer benchmarking analysis is not to suggest that all companies in a given industry should behave similarly. Rather, the purpose is to allow the board and shareholders to identify the

similarities and dissimilarities between the subject company and the peer group, and understand the factors contributing to the differences. For example, if a company is a cash user with a peer group dominated by cash generators, management should be able to identify the unique strategic advantage possessed by the company such that it will realize positive net present values on incremental capital investment while the peer group managers seem to be reaching the opposite conclusion.

Conclusion

From the perspective of the board of directors, capital budgeting is the process of allocating capital to available projects. The optimal portfolio of projects will cohere with the company's broader strategy to generate returns in excess of the hurdle rate.

- Identifying the relevant cash flows is essential to an appropriate financial review of the proposed project. Relevant cash flows are those that would not be received or expended in the absence of the proposed project.
- The two principal tools for evaluating capital projects from a financial perspective are net present value and internal rate of return.
- The capital budgeting process should also consider non-financial constraints faced by the company, such as limited management resources, existing infrastructure and capacity, and the availability of human capital and expertise.
- Beyond financial projections, management should be able to identify the strategic rationale for the proposed project. In other words, a positive net present value is essential, but project approval should also depend on non-financial strategic considerations.
- A healthy capital budgeting process includes a disciplined process for evaluating prior investment decisions with a view toward identifying chronic cognitive biases.
- The appropriate pace of capital investment depends on the availability of attractive capital projects. Benchmarking the pace of capital investment and corresponding investment returns for a group of peers can provide the board with context to evaluate the "fit" and desirability of proposed capital projects.

Switching costs for capital investment are high, and do-overs are expensive. Using the concepts and techniques summarized in this whitepaper will enable directors and shareholders to assess whether management's capital investment plans will enhance, or detract from, the value of the company.



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