Financial Management

Real Options: The IT Investment Risk-Buster

Every Plan's An Option

The use of real options to evaluate IT projects stems from a central premise: Every plan is an option. Every project remains an option as long as management has the freedom to accelerate, cancel, defer, or expand it. And this freedom has value that can be analyzed quantitatively. That may sound like a simple idea, but its implications are considerable because the marketplace values options differently than real assets.

No radical assumptions are required to use a real-options approach in IT. As in conventional project analysis, the discounted cash flow (DCF) technique is the core first step. But since a plan is subject to risks, and management has considerable flexibility in executing it, its value is more correctly determined by options methods.

It's obvious to Wall Street that the more volatile a market is, the more valuable options become. But that idea is counterintuitive to business decision-makers, who tend to view all forms of risk as bad. In fact, real-options methods are a recent entry in a series of increasingly sophisticated developments in project-valuation practice. Three and four decades ago, engineers talked in terms of time to payback; DCF in the 1970s and '80s, which introduced the cost of capital, took time to gain widespread acceptance. Decision-and-risk analysis and Monte Carlo methods were widely adopted in the '80s and '90s.

The real-options concept has been proving itself since the mid-'80s, when it achieved a breakthrough in acceptance in the pharmaceutical R&D community as a way to decide which projects should be funded and which should not. The cost of a project isn't necessarily set in full at the outset, these companies realized. Rather, investments in small pilot projects to test new ideas can be viewed as options to invest in larger implementations later on. The concept of financial options also is tested daily in setting the prices of a vast quantity of publicly traded derivatives of stocks, commodities, and currencies.

I believe that in time, real options will gain the advantage over DCF for valuing risky investments, including those in IT, because DCF tends to systematically understate the value of long-term R&D projects and other strategic assets. The reasons for that are now better understood. DCF falls short in two ways: It ignores the value of managerial flexibility to change plans if things don't work out; and it incorrectly treats risk by blending unique and market risk into an adjusted cost of capital, sometimes called a risk-weighted hurdle rate. This last approach is triply flawed, because unique project risks typically decrease over the course of a well managed project; unique risks can be diversified; and market risks increase the value of options.

Using real options to evaluate a project involves three steps: framing, analyzing, and acting.

Step 1: Framing the option. This is the process of identifying and defining an opportunity. Typically it's accomplished by dividing the path to the final goal into distinct stages. A rollout of wireless technology, for example, might begin with information-gathering, then a pilot project involving a single work group, then a regional implementation across all warehouses and sales staff, and finally, a global implementation. Starting small lets you test the risks of the project at lower cost before moving to stages in which the increasing cost is offset by decreased risk. It's much easier to get approval for a modest expenditure for information-gathering, to be followed by a fresh analysis at the first-stage gate, than to ask for millions of dollars to transform the company.

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Traditional financial measures just don't capture the strategic value of IT projects. Try a real-options approach for valuing them instead.

by F. Peter Boer [About the Author]
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Business success has always been closely correlated with an executive's talent for framing options. The real gift of leaders such as Steve Case, Bill Gates, John Malone, Ted Turner, and even fallen heroes like Bernie Ebbers is their vision to frame deals, deploy technology and intellectual property, and see possibilities that most people overlook. Successful technical innovation is also largely the story of research scientists and engineers who have creatively linked new discoveries and lucrative markets.

CIOs, with their deep understanding of developing technologies, also can assume the role of building a vision for the future and linking new resources to the company's value-creating engines. But as they do, the traditional measures for evaluating the return and the acceptable risk of technology purchases no longer fit the bill. CIOs need a new way to measure the return on IT investments, especially those on the leading edge.

You may not think of the CIO's job as a daring one, but it involves many small financial investments--and periodic huge ones--that have the economic characteristics of risky capital projects. There's the risk of technical failure, the risk of system obsolescence, and the risk that the workforce or customer won't accept the new technologies. Today's headlines underscore the market risk affecting companies and their customers. And then there's the "bet-the-company" kind of risk that comes with a competitive strategy based on superior IT systems, in which a misjudgment can be lethal to corporate health.

Information officers need to consider a powerful new risk-management tool that's rapidly gaining favor with companies involved in financing risky projects, including pharmaceutical R&D, petroleum exploration, and energy trading. It's called real options, and it's a quantifiable approach to the problem of the strategic premium--the gap between the apparent economic value and the actual value of a company as determined by the marketplace.

The basic concept of real options already has been introduced to readers of Optimize (see "Real Options, Real Opportunities," by James Alleman, January 2002, p. 57). Like Alleman, I believe an options approach can improve the process of IT-project analysis and better show how the strategic value of options drives shareholder value.

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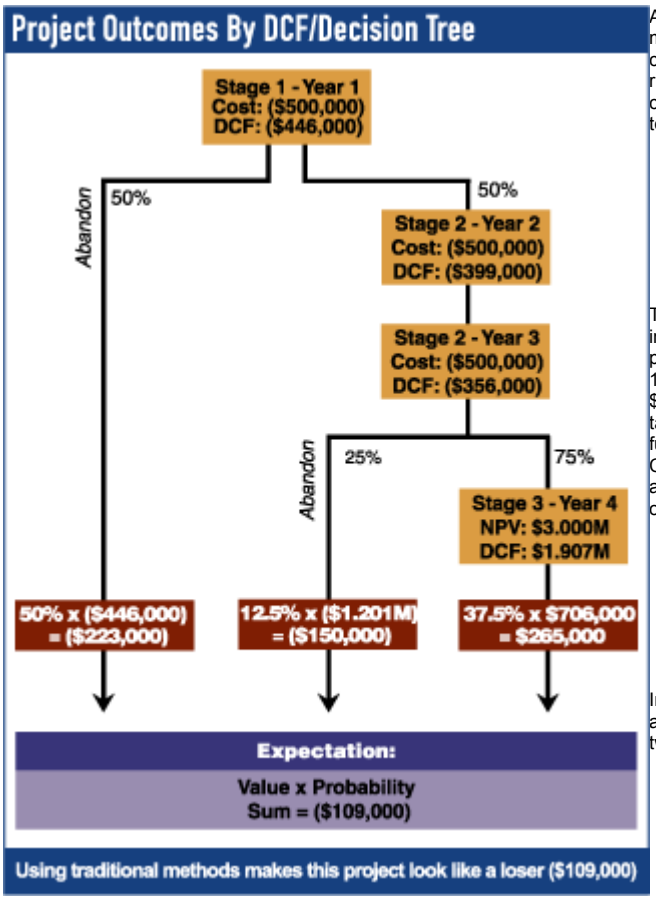
Comparing DCF, RO Analysis: The Power Of Controlling Risk



ABC Chemicals proposes to integrate the process-control system in its manufacturing plant with its inventory-control system, to replace the current process of entering data by hand. The project has high unique risks and a negative economic value when evaluated by a discounted cash flow (DCF)/decision tree. But market risk adds enough of a kicker to make the difference.

The plan calls for three stages spaced over four years: a feasibility study in one plant; then the integration of a single manufacturing site with 10 plants; then, when all technical risk has been eliminated, a rollout to all 15 manufacturing sites. The feasibility study will take one year, cost $500,000, and have a 50% chance of technical success. Integration will take two years, cost $1 million, and have a 75% chance of success. The full rollout will cost $5 million, but is considered free of technical risk. Cash savings, from improved productivity and reduced working capital, are estimated at $8 million, giving a net present value (NPV) in year four of $3 million.

In a cyclic industry, ABC Chemicals estimates a cost of capital of 12%, and its stock has experienced an average volatility of 50% in the past two years. The risk-free rate of return is 5%.

The decision tree for this project shows three possible outcomes: a 50% chance of failure after the feasibility stage, a 12.5% probability of failure after the integration phase (the worst outcome), and a 37.5% chance of success. Applying a 12% cost of capital, the project is a marginal loser, with a weighted NPV of $109,000.

But management has created value by adroitly managing the option to abandon after the uncertain stages. If the stages were combined with a commitment to roll out this technology in year four—for example, by signing a fixed-price contract with a vendor that provided no warranties—the expected reward would be 37.5% x $1.907 million, or $715,000, versus a certain cost of $1.201 million, giving a far worse expectation of $486,000. This risk-mitigation strategy by itself is not enough to save the project.

But restructuring the analysis in options terms, let's assume that stage two is a two-year call option to invest $5 million, the strike price. The underlying security for this option is valued at $6.442 million—that is, the present value of the strike price at the risk-free rate, $4.535 million, plus the discounted NPV ($1.907 million) of a successful project. This option is worth $2.643 million by the Black-Scholes formula at a market volatility of 50%. If we then correct for the unique risk implied in a 75% probability of success, the project value is $1.982 million. In the absence of volatility, this option is worth only $1.907 million, which is in fact the NPV! Correcting for unique risk (75% probability) reduces it to $1.430 million.

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Black-Scholes Formula

Value of call option = [N(d1) x P] – [N(d2) x PV(EX)]

Where
d1 = {log[P/PV(EX)]}/_t_ + _t_/ 2

d2 = d1 - _t_

N(d) = Cumulative normal-probability density function

EX = Exercise price of option; PV(EX) is EX discounted by the risk-free interest rate rf

t = Time to exercise date

P = Current stock price

_ = Standard deviation of continuously compounded stock-price changes

Source: R.A. Brealey and S.C. Myers, Principles of Corporate Finance, International Edition (McGraw-Hill, 1996)

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The 90-Day Plan

Using real-options theory to evaluate an IT project that already has a basic business plan should take only a few weeks—even days if the project is time-sensitive.

Here's a rundown of how to do it when you're not in a rush:

First month: Build a team. Identify a cross-functional evaluation team, including a business owner, a technical expert, and a trained economic evaluator.

Second month: Put together a plan. Sophisticated teams already will understand basic discounted cash flow (DCF) and ROI concepts. If not, begin with training and consider bringing in outside expert help. Gather relevant data and write the base-case business plan.

Third month: Estimate and test the risks. Spend two weeks analyzing the possible risks that might cause your plan to go astray. This is very important and should not be cut short. Then calculate the results and test for reasonableness.